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Full Length Article

Exploring market overreaction, investors' sentiments and investment decisions in an emerging stock market

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Abstract

The representative heuristic and overconfidence are cognitive biases that influence the decisions of the investors in the stock market. Overconfident investors tend to rely on representative heuristic for decision making under uncertainty. Investors overestimate their knowledge and think that past performance is the best indicator to measure the future performance of a company. Investors who are overconfident and use representative heuristics overreact to any new information that arrives in the market, and it affects their decisions. To measure the presence of overconfidence and representative heuristic in decisions making of investors trading at Pakistan Stock Exchange (PSX), we have used primary as well as stock market secondary data. Primary data was collected from 446 retail investors, and secondary data was collected from 301 companies listed in 35 sectors of PSX. We have found a significant effect of overconfidence and representative heuristic on the decision making of investors and the trade volume of the stock market. This paper adds to the literature of behavioral finance concerning the role of overconfidence as a mediator between representative heuristic and investment decisions. The evidence documented in this paper is first known to measure the role of mediator between representative heuristic and investment decisions.

Keywords: Overconfidence bias; Representative heuristic; Earnings announcement; Past returns; Trading activity; Investor reaction

1. Introduction

In the real-world, the concept of rationality is hard to define as human behavior is not predictable, and inefficiency and instability in markets are due to behavioral factors (Tuyon & Ahmad, 2016). Scientists and researchers are more focusing on the field of behavioral finance to explain the behaviors of investors in the financial markets. According to behavioral finance, the behaviors of the people are irrational towards decisions making (Statman, 2014). Their behavior affects investment decisions, portfolio selection, and timings of buying and selling of securities (Barberis & Thaler, 2003; Statman, 2014; Thaler & Ganser, 2015, p. 358). After the global financial crisis of 2008, investors' behavior is considered to be an essential determinant of changes in the stock market. The behavior of investors is not rational during the trading of stocks, and it is influenced by biases and heuristics (Jacobs, 2016; Nofsinger, 2005). Along with these biases and heuristics, it is not easy to get all the information needed for trading securities due to the time and cost limitations (Figs. 1–5).

Behavioral finance is the amalgamation of psychology, sociology, and economics, and the theories of behavioral finance come from these three disciplines. These theories focus on the behavior of people in the financial markets that is irrational, and it affects their decisions (Singh, 2012). The sentiments of investors influence the trade volume and prices of assets in stock markets (Tan & Taş, 2019). Likewise, in risky and complicated conditions, investors make decisions based on mental shortcuts instead of objectively obtaining all accessible information and analyzing it (Uygur & Taş, 2014).

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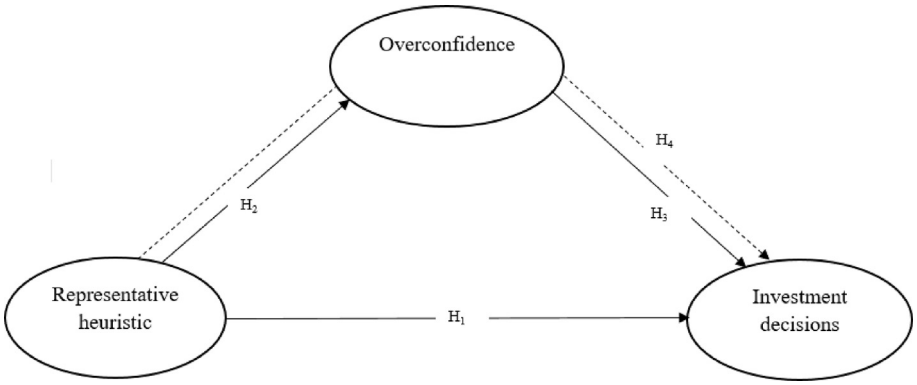

Fig. 1. Mediation between representative heuristic and investment decisions.

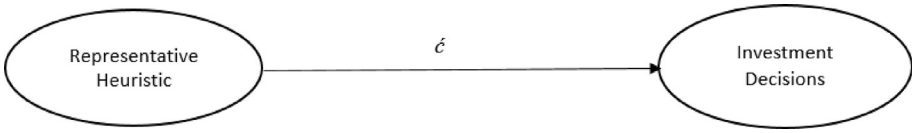

Fig. 2. Model with total effect. Representative heuristic → overconfidence → Investment decisions = *ab*.

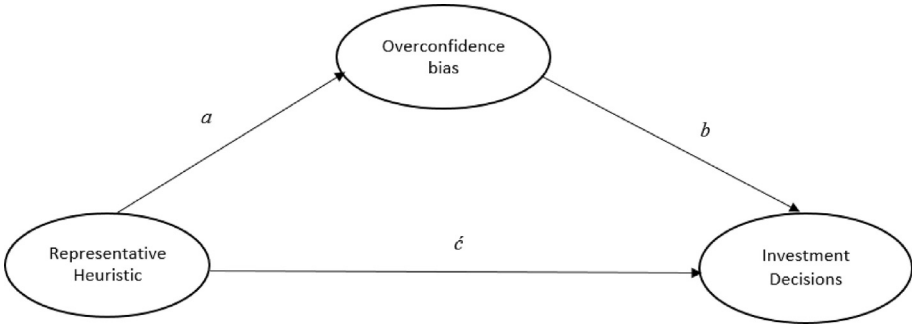

Fig. 3. Model with process variable (M).

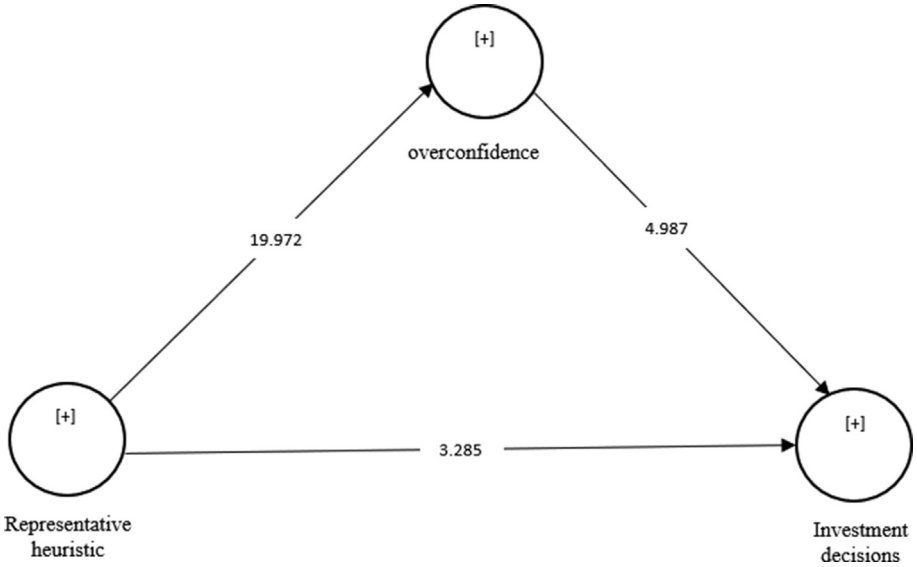

Fig. 4. Mediation between Representative heuristic and Investment Decisions.

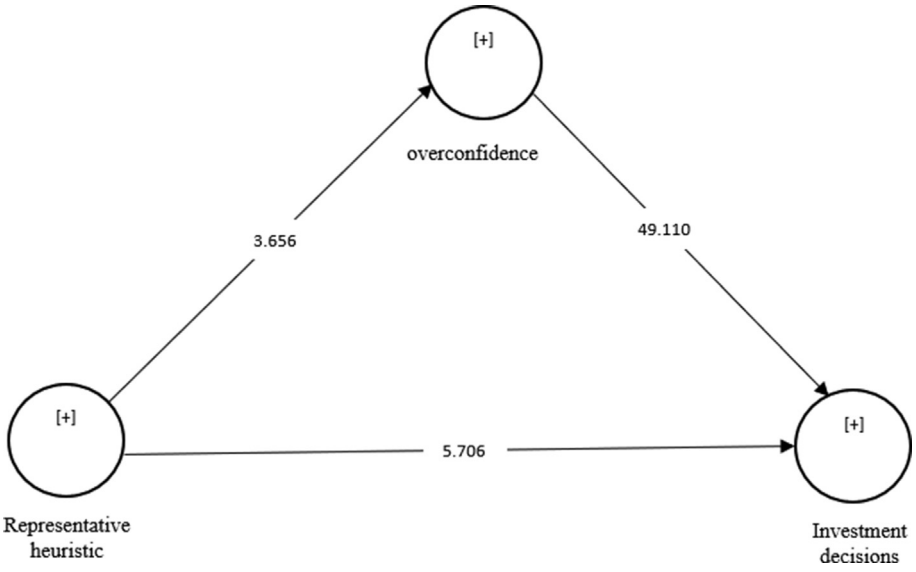

Fig. 5. Mediation between Representative heuristic and Investment Decisions.

Limited time and cost are a reason that leads people to use heuristics, and sometimes it leads to poor financial outcomes for investors (Kahneman & Tversky, 1979). Heuristics can be defined as a "rule of thumbs" that are used to solve complex problems with quickly available alternatives (Barberis & Thaler, 2003). People do not evaluate all the available information as they want quick results. They make decisions based on their past experiences, recent trends, and some reference points (Kengatharan & Kengatharan, 2014).

Many studies have been conducted on the impact of behavioral heuristics and biases and investment decisions in developed countries, but a handful of studies are available in developing countries like Pakistan. Pakistani investors have the tendency to follow herd behavior, and they are influenced by the opinion of their family and friends (Bashir, Arshad, Nazir, & Afzal, 2013). There are good chances that behavioral heuristics and biases influence the decision making of Pakistani investors. Another critical factor is that the findings of studies conducted in developed countries cannot be generalized to the developing countries because of the difference in culture, values, the infrastructure of financial markets, financial literacy, and education level. It is, therefore, becomes necessary to see which behavioral heuristics and biases impact the decision making of investors in Pakistan stock exchange.

Heuristics help in spurring overconfidence, and overconfidence influence the investment decisions of investors (Kahneman, Slovic, & Tversky, 1982). Therefore, we have introduced the role of overconfidence bias as the mediator between representative heuristic and investment decisions. This paper adds to the literature of behavioral finance concerning the role of overconfidence as a mediator between representative heuristic and investment decisions. The evidence documented in this paper is first known to measure the role of mediator between representative heuristic and investment decisions.

The present study will contribute to the prospect theory and dual-process theory with the context of developing countries and behaviors of their investors. The behavior of investors and stock market efficiency of developing countries can better be explained by utilizing the outcomes of the present study in light of these theories. This study has utilized aggregate market-level data and individual-level data to find out about the behavioral heuristics and biases in the decisions making of investors trading in the Pakistan Stock Exchange. So, the present study has tried to remove the limitations of secondary market data as well as primary market data. The limitation of secondary market data includes reducing the dimensions of a variable that has been removed by including investor level data. Whereas, the limitations of primary data has been removed by taking market trading data. So, it is a contribution in the area of behavioral finance as the present study has studied both sides of trading, i.e., individual investors' data and aggregate trading data. For this purpose, the current study has established a theoretical model that shows the link amongst different biases and their joint effect on investment decisions of investors in Pakistan. This model has incorporated variables that deny the generally accepted traditional finance theories based on the concept of rationality. Hence, contributions of the present study can help investors in designing their present and future portfolios of securities accordingly. By using the results of the present study, researchers can utilize the outcomes and findings to develop new links in theory, and policymakers can guide investors by arranging training and workshops on heuristics and biases and their influence on the decisions.

2. Literature review

The research in behavioral finance is growing as time passes. Researchers are trying to explore the influence of behavioral biases and heuristics on the securities return for the investors in the stock market. Markets have grown complex and more significant, with many investors trading in them. So, using only intuition to make a decision can generate known errors and causes losses (Hirshleifer, 2015). There is a growing use of heuristics, and this can be seen in research by Santos and Rosati

(2015). They did literature review of the origin of decision making and found that behavioral biases exist in the decision process of humans in the modern complex world. Research studies by Apicella, Azevedo, Christakis, and Fowler (2014) and Zhang et al. (2014) also found the presence of endowment effect and risk aversion in the decision-making process. Therefore, an intuitive system heavily regulates the minds and decision-making process of individuals, and an intuitive system depends on heuristics that may lead to systematic and known errors in certain situations (Norman et al., 2017).

The idea of heuristics was given by Kahneman and Tversky (1972). Heuristics are defined as mental shortcuts that offer quick decisions under uncertainty. Heuristics are simple to use but sometimes lead to systematic errors (Tekce, Yılmaz, & Bildik, 2016). For example, the representative heuristic is explained as the propensity to estimate the likelihood of happening of an occasion in the future by its similarity to the typical case in past (Guo, McAleer, Wong, & Zhu, 2017; Pompian, 2011) but this approach may lead to wrong conclusions in the future.

The representative heuristic can be defined as "the small sample represents the population from which it is drawn" (Baker & Nofsinger, 2010; Tversky & Kahneman, 1974). This heuristic is used by the investors when they intend to buy stocks from the stock market, and it leads the investors to buy past winners (Barber, Odean, & Zhu, 2009). Representative heuristic explains the likelihood that the 'item A belongs to set B or C.' For example, the managers assess the probability of an event based on its familiarity with the other events in the past (Chang, Young, & Lin, 2016).

Representative heuristic leads people into stereotype thinking. They tend to match a person' characteristics with the profession he is in and draw the conclusions on it (Ariyabuddhiphongs, 2011). It can lead to wrong conclusions as the focus is only on familiar events, and all other factors and related information is not analyzed. Followers of this heuristic think that past events can predict the future. It causes investors to make investment decisions according to the management type, present financial positions, the company's reputation, its price/earnings ratio, and the products it is offering. Investors pick stocks of the companies with good past returns by utilizing the information available about the company and its stocks. They are prone to invest in the winner stocks as they predict future returns using past information on returns. This heuristic contradicts the concept of efficient market hypothesis and rationality (Gervais & Odean, 2001; Guo et al., 2017; Toma, 2015).

The concept of under-reaction and overreaction in the behaviors of investors in the stock market was first modeled by Barberis, Shleifer, and Vishny (1998). They stated that investors do not realize the random walk in the earnings movements. Investors follow two concepts during the investment: one is the trend of the earnings, and secondly, they believe that after profit from earnings announcement, there will be adverse shocks, and it will cause them a loss on their investment.

Investors follow current news, latest financial position, and the reputation of the company in the market to make investment decisions. According to Chari at el. (2017), investors get affected by any announcement from the company. Their investment decisions are modified according to the current news prevailing in the market. Such overreaction in the market causes investors to earn above-average returns. According to Ni, Wang, and Xue (2015), the extent of market overreaction is positively related to the previous earnings announcements, which indicates the existence of representative heuristic in the decisions of investors in the stock market trading.

In line with the above argument, investors use past performance and return to estimate future income, gains, and trends in the financial markets. Investors show overreaction to a similar type of information. There are research studies (Aziz & Khan, 2016; Obara, 2015; Wickham, 2003) that have explored the behavior of investors in light of representative heuristics in investment, and the results of these studies were mixed. Most studies on representative heuristics were carried out in a controlled environment, and these studies were experimental. Few studies have used real-time data of the stock market to find out the effect of heuristics on the investment decisions (De Bondt, Muradoglu, Shefrin, & Staikouras, 2015; Jain, Jain, & Jain, 2015; Subash, 2012).

De Bondt and Thaler (1985) conducted a study on the market overreaction by using stock market monthly return data. They used the overreaction hypothesis to show the presence of representative heuristic in the market and the decision of investors. The results of their study proved that investors did overreact to different events in the market and violated the Bayesian rule. Investors displayed irrational behavior in the market. A study was conducted by Onsomu (2014) on earnings announcements and its impact on short term returns. The investors showed under-reaction to the earnings announcement, and their investment was influenced in the shorter run.

A study conducted by Frieder and Shanthikumar (2008), explored that investors invest more in stocks after successive positive earnings and returns. A loss of investment follows this excessive buying of stocks. Investors generalize the past performance of stocks and overreact in the market. Alwathainani (2010) stated that investors overestimate past performance. He has also found that stocks with increasing prices perform better than stocks with decreasing prices in one year, but loser stocks outperform the winner stocks in the next four years. The forecasting processes of individuals can be affected by representativeness. Tversky and Kahneman (1974) found that people forecast the future value of stocks based on representativeness. Investors will be interested in buying those numbers of stocks that have been observed increasing patterns in the past.

The concept of overconfidence is derived from extensive literature, which shows that people are not good at estimating the probabilities of an event. They think that they are smart and have better knowledge, but the reality is different (Baker & Nofsinger, 2010). It does not mean that overconfident people are incapable and unskilled, but they think highly of themselves. A typical example of overconfidence is the ability of the investor to choose the stocks and to sell them. Such investors trade more using their private information and receive less return on a single day. Overconfident investors rely less on diversification because they invest most of their money in the companies they know well or have more information about

(Johnson, Blumstein, Fowler, & Haselton, 2013). Overconfidence leads them to overestimate the precision of the information they hold, underestimate their risk-taking behavior, and overstate their capacity to handle and control different events. So, they trade in the single security (Subash, 2012). According to Odean (1998), investors who traded more on a single day earn less return than the average market. People are most overconfident about their ability in the selection of stocks of various companies (Nofsinger, 2005). Such type of people thinks they are good at estimating the future returns of the stocks. They know when stocks should be purchased and when these should be sold. They also think that their knowledge level is better than other people in the market, but again it is not the reality (Shefrin, 2002; Zaidi & Tauni, 2012).

From the above discussion of the literature on representative heuristic and overconfidence bias and investment decision, we have proposed the following model:

H1. Representative heuristic significantly affects the investment decisions of investors in the stock market.

H2. Representative heuristic significantly affects the overconfidence of the investors in the stock market.

H3. Overconfidence bias significantly affects the investment decisions of investors in the stock market.

H4. Overconfidence bias partially mediates the relationship between representative heuristic and investment decisions of investors in the stock market.

3. Methodology

A structured questionnaire was used to collect data that is adopted from different research studies. It has two sections. First, it consists of demographics characteristics of the respondents, and second, demonstrates the investors' behavior such as heuristic and bias, respectively (Representative and overconfidence) and investment decisions while making investment decisions. There are a total of 21 items in the questionnaire (close-ended questions) that were asked from the target population. Respondents were asked to answer all items on scale 1 (Strongly Disagree) to scale 6 (Strongly Agree), which is the "6 Point-Likert Scale". Generally, "6 Point-Likert Scale" is used to know about respondents" opinions and behaviors (Kengatharan & Kengatharan, 2014). Details of each variable and their items are given below:

3.1. Overconfidence

Measurement of overconfidence of the investors in their investment or trading decisions of stock exchange includes 8 items in which three questions states three dimensions of overconfidence such as overestimation, over replacement and over precision that are identified by Barber and Odean (2000) and Odean (1999). The first four items are adopted from Mouna and Jarboui (2015), and the other four are adopted from Lin (2011).

3.2. Representative heuristic

Representative heuristic in trading decisions of investors is measured through 6 items. These six questions are adopted from Rasheed, Rafique, Zahid, and Akhtar (2018), which are based on base rate neglect, extrapolation bias, and the conjunction fallacy.

3.3. Investment decisions

Dependent variable is "investment decisions" which investors make at the time of trading in the stock market measured through 7 items which are based on situations related to fundamental analysis, historical high values, past prices, past returns and high trade volume and these questions are adopted from Khan, Naz, Qureshi, and Ghafoor (2017).

The representative heuristic can be defined, for secondary market data measurement, as investment decisions are made by using recent information regarding earning announcements. So, a market overreaction that defines representative heuristic is measured using abnormal returns because of earning announcements. The present study has used the methodology of De Bondt and Thaler (1985); Boussaidi (2013) and Liargovas and Repousis (2010) to measure representative heuristic.

Market data is used to calculate expected returns. For this purpose, the event window and estimation window is used. The market model helps in finding the difference between actual returns and estimated returns for each stock in time during the event window. Following equation was used to find daily abnormal returns:

$$AR_t = R_t - E(R_t) \tag{1}$$

The event window was taken from −30 to 30 from the day of earnings announcements. After that average abnormal returns were calculated for all stocks using the following formula:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t} \tag{1.1}$$

After that average abnormal returns in event window were summed up to get cumulative average abnormal returns using the following formula:

$$CAAR_t = \sum_{i=1}^{N} AAR_{i,t} \tag{1.2}$$

It will show the total impact of abnormal returns because of event announcements on trading volume.

For overconfidence measurement, the methodology of Statman, Thorley, and Vorkink (2006) is used. KSE-100 index data is taken from 1st, 2004 to December 31st, 2017, to measure volatility in daily returns. Volatility in returns is expressed as the arrival of new information impact on earnings announcements. We have used the following formula:

$$\delta^2 m,t = \sum_{i=1}^{N_t} r_{i,t}^2 + 2\sum_{i=1}^{N_{t-1}} r_{i,t}(r_i + 1_t) \quad (2)$$

$\delta^2 m, t$ = Market volatility.
$r_{i,t}$ = Market daily returns.
N_t = Number of trading days.

Investment decisions measured by taking differentia log of daily trading volume by following the methodologies of Adel and Mariem (2013) and Statman et al. (2006). A positive value shows that investors will be more willing to invest and trade more. On the contrary, they will be reluctant to invest. Here, the differential log of trade volume is:

$$\text{InvsDec} = dln\left(\frac{V_2}{V_1}\right) \quad (2.1)$$

InvstDec = Investment decisions
dln = Differential log.
V_2= Recent day security's trade volume.
V_1= Previous day security's trade volume.

4. Regression equation

When we want the effect of X on Y:

$$Y = b0+b1X+\mu$$

When we want the effect of X on M:

$$M = b0+b2X+\mu$$

When we want the effect of M on Y:

$$Y = b0+b4X + b3M+\mu$$

For this study, the equation one can be explained as:
Y=Investment Decisions
b = Intercept.
X = refers to representative heuristic.
M = mediator (overconfidence).
b1X = Intercept of representative heuristics
b3M = Intercept of mediation
$\boldsymbol{\mu}$ = Residual term.

4.1. Sample size

The target population for primary data collection was all retail investors who were trading in the Pakistan Stock Exchange, which also includes brokers who invest for themselves or invest on behalf of others. The target population for secondary data collection was all the registered companies from 35 sectors, which are a total of 559 companies in numbers in Pakistan Stock Exchange. The current study has selected five major cities of Pakistan, i.e., "Karachi, Lahore, Rawalpindi, Islamabad, and Peshawar." These cities are economically developed and show a high literacy rate. Despite this, these cities are considered a larger part of the total population (Sawe, 2018).

Total questionnaires were 1000 in numbers that were distributed equally among above mentioned five major cities of Pakistan to get maximum responses of investors. Reasons for equal distribution also involve getting equal responses from the selected five cities regardless of the population size and generalizability of the present study. In the following table, the total number of sent/returned questionnaires is presented:

Total questionnaires that were 1000 in numbers distributed both in hard form and electronically through different sources such as brokers and personal links. Investors from Rawalpindi and Islamabad responded online because they were easily reachable due to personal contacts. Investors from other cities did not respond online; rather, they answered questionnaires in a hard form that were distributed to them through brokers and also through personal links. Out of 1000 questionnaires, 623 were returned, and 446 questionnaires from 623 were fully answered or fully completed that were used for analysis. So, the response rate of the present study is 62.3 percent. Saunders et al. (2009) highlight the sample size that depends on factors such as time availability, financial resources, and researcher abilities. Data from 100 respondents will be enough to get reliable results.

Secondary data was collected from the Pakistan Stock Exchange, and the website of business reorder from January 1st, 2004 to December 31st, 2017. Data was collected for 301 companies (that represents the business and industrial sector of Pakistan) out of a total of 559 listed companies because the other 258 companies were dropped from the sample with zero variation or incomplete data. For calculation and analysis purposes, firstly, variables of the present study were calculated by applying different quantitative methodologies on Stata 14. Then, structural equation modeling was applied to find out the relationship among variables as well as the role of mediation between representative and investment decisions (Table 1).

4.2. Data analysis and discussion

SPSS 21, Stat 14, and SmartPls 3.0 were used to analyze the data. SPSS 21 and SmartPls3.0 were used for primary data analysis, whereas Stata 14 was used to generate series or code for each variable from secondary market data. To analyze primary data, calculations were done to find out discriminant validity and composite reliability, and then the structural equation model was measured through bootstrapping and path analysis. Alarcon et al. (2015) highlight that the acceptance of composite reliability at the value of 0.70 or higher. The present study shows that all the given values are higher than 0.70, which claims the use of reliable instruments in the present study. It can be seen that all the values are higher than the acceptable level, which ensures the generalizability of the results, and future researchers can confidently use this scale. Present study results can be generalized to developing countries and their stock markets. The calculation of the average variance extracted (AVE) explains convergent validity. AVE is used to determine the amount of change and variance that a latent variable can explain. So, AVE values are equal to 0.5 or

higher than this leads to achieving convergent validity (Fornell & Larcker, 1981). Hence, in the present study, the values of all the latent variables are higher than 0.5, and it establishes the convergent validity for the instrument of the current study. Table 2 shows the reliability of the present study:

By keeping this criterion in view, discriminant validity can be determined by checking diagonals cell values. Discriminant validity establishment needs assurance that diagonal values must be higher than the values below them (Cheung & Wang, 2017; Marsh, Morin, Parker, & Kaur, 2014). As can be seen in below Table 3, all values lie in the acceptance criteria that ensure the establishment of discriminant validity for the present study.

4.2.1. F-square

Cohen introduced it, and it is also called Cohen's f squared. According to Cohen (1992), it is used to measure the strength of each independent variable in explaining the dependent variable. According to Preacher and Kelley (2011), "effect size is defined as any measure that reflects a quantity of interest, either in an absolute sense or as compared with some specified value." Effect size measurement becomes significant when we want to determine the practical significance of the research findings. The effect size shows that to what extent the null hypothesis is rejected as it shows the impact of one variable on another variable (Fairchild & MacKinnon, 2009).

F squared has three values to measure the strength of the relationship among variables. These values show the small, moderate, and large effect of independent variables on the dependent variable. The small effect has a cut-off value of $\leq$0.02, the moderate effect has a cut-off value of $\leq$0.15, and a large effect has a cut-off value of $\leq$0.35. When values of f-squared are less than 0.02, then the effect of the independent variable on the dependent variable is weak even if it has a significant p-value. This happens when the sample is large (Hair et al., 2014). We can see in Table 4 that representative heuristic and overconfidence have a moderate effect on the investment decisions of investors trading in Pakistan stock exchange.

Effect size helps researchers to find out which variables are more affecting the dependent variable. When hypotheses are tested, effect size, p-value, and sample size are linked with each other. According to Xiong et al. (2015), effect size gives more significant analysis than traditional statistical significance approaches. The effect of each variable on the dependent variable can be checked by removing other variables one by one from the model. It will also show an effect on R^2. It highlights the importance of each variable in the model according to their effect size on the dependent variable.

Table 1
Returned questionnaires.

No	Name of City	Questionnaire Sent	Questionnaire Received/Returned
1	Karachi	200	123
2	Lahore	200	113
3	Islamabad	200	131
4	Rawalpindi	200	142
5	Peshawar	200	114
	Total	**1000**	**623**

Table 2
Reliability analysis.

Variables	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Overconfidence	0.954	0.961	0.670
Representative heuristic	0.868	0.901	0.675
Investment decisions	0.920	0.936	0.758

4.3. Model fit

Model fitness shows the goodness of the model, and it can find out using SmartPls3.0 for hypothesis testing and to find out their significance. Model fit measures like "Standardized Root Mean Square Residual (SRMR), Normed Fit Indexed (NFI) that are based on the value of Chi-square (χ^2)" that must be significant at 5%. Henseler, Ringle, and Sarstedt (2015) state that acceptance criteria are based on the value of SRMR that should be less than 0.08, and it can be noted that perfect model fit can be obtained from '0' SRMR value. According to Hair et al. (2014), NFI value must be greater than 0.90 to meet the acceptance criteria, and when NFI is close to '1', it can be considered as model fitness. R^2 is an indication of how much predictor variables have an influential impact on the outcome variable. Representative heuristics and overconfidence contribute 73.8% toward the decisions of the investors in the Pakistan stock exchange. So, according to these quality criteria, our model is fine and statistically fit, and it is presented in Table 5.

4.4. Mediation analysis

In mediation analysis, direct effects and indirect effects are presented by the following equations:

$$\text{Total effect} = \text{direct effect} + \text{indirect effect}$$

The total effect is represented by 'c' and direct effect by 'c' and an indirect effect by 'ab'.

Table 3
Fornell-larcker criterion.

	Representative	Overconfidence	Investment decisions
Representative	0.776[a]		
Overconfidence	0.308	0.871[a]	
Investment decisions	0.208	0.731	0.822[a]

[a] Off diagonal values.

Table 4
Effect size.

Independent Variables	Investment Decisions
Overconfidence	0.091
Representative	0.035

Table 5
Model fit.

Model Fit Measures	Model Values
SRMR	0.007
Chi-Square	32.843
NFI	0.994
R^2	0.738

$$ab = c - c'$$

Representative heuristic → Investment decisions = ć.

Overconfidence bias as a mediator was tested between the representative heuristic and investment decisions. To explore the significant role of mediator between representative and investment decisions, different estimations were obtained that are total effect, indirect effect, path coefficients, and the bootstrapping. Table 6 shows the results of all these estimations:

Table 6 shows the direct effect of representative heuristic and overconfidence on investment decisions. Results are showing higher *t*-values than its threshold value of 1.96 at a 5% significance level. It can be observed that the values of path coefficients are high and statistically significant. We have mentioned earlier the moderate effect size of the link of overconfidence bias and representative heuristic with investment decisions. The "effect size" is a measure of the degree or extent of an effect that is independent of sample size. Researchers may use it to explain the existence of partial or full mediation. The path coefficients are standardized beta coefficients that explain the change in the dependent variable using standard deviation (Hair, Risher, Sarstedt, & Ringle, 2019). Standard error and standard deviation are equal in SmartPls. We get standard deviation estimates in bootstrapping results. We can only find the standard deviation that is bootstrapped standard error. The standard deviation shows the amount of variations in the set of values (Henseler, Hubona, & Ray, 2016). The effect size of overconfidence is larger and significant on investment decisions as values are greater than $\leq$ *0.35*. The effect size of the representative heuristic is moderate, as the value is of $\leq$ *0.15*. The overconfidence bias changes the decisions of investment *by 51.3%* when other factors remain constant. The representative heuristic brings a *17.6%* variation in investment decisions when earnings are announced by the companies. The effect size of a representative heuristic for overconfidence is larger as its value is *85.9%*, which shows the tendency of overconfident investors towards the utilization of mental shortcuts in their decision making. Here, it is also demonstrating the importance and impact of cognitive bias and heuristic on Pakistani investors when they make investment decisions during trading in the stock market.

Findings show the role of mediation that is positively significant. The overconfidence bias partially mediates between representative heuristic and investment decisions. The effect size of mediation is larger as value is $\leq$ *0.35*. The influence of representative heuristic increases on investment decisions when it combines with the overconfidence bias, which is *44.1%*. Specific indirect results (which represent mediation) of the representative heuristics, with the investment decisions, are highlighting investor's behavior that their decisions depend on the past performance of the companies. As mentioned earlier, overconfident investors overestimate their abilities and rely on their knowledge, skills as well as they use past information and reference prices at the time of trading. The positive role of overconfidence shows that relying on past performance gives them positive returns.

Pakistani investors tend to be more dependent on their behaviors such as representative heuristic and overconfident bias because they live in a collective culture where they are more prone to be affected by suggestions and behaviors of family members and friends and try to copy them when they make their own investment decisions. Another reason for their imitating behavior is financial illiteracy. They are not so much literate to control and analyze their behavior or not aware of these psychological characteristics, which may have a significant and robust effect on their investment decisions. With all the above arguments, they are risk-averse and interested in short term returns as it can be seen in the tables of total effect and mediation.

To sum up the mediation analysis, it can be noted that overconfidence bias partially mediates the relationship between representative heuristic and investment decisions, and it is complementary mediation that is significant at $p \leq 0.05$ and *t*-values.

5. Secondary data analysis

5.1. Structural model assessment

Overconfidence bias as a mediator is tested between the representative heuristic and investment decisions. Following are the results for secondary data analysis:

Table 6
Direct effect and specific indirect effect.

	Path Coefficients	Standard Deviation	*t-value*	*p-value*
[a]Overconfidence - > Investment Decisions (H_1)	0.513	0.103	4.987	0.000
[a]Representative Heuristic - > Investment Decisions (H_2)	0.176	0.074	2.369	0.018
[a]Representative Heuristic - > Overconfidence (H_3)	0.859	0.043	19.972	0.000
[b]Representative - > overconfidence - > Investment Decisions (H_4)	0.441	0.102	4.338	0.000

[a] Direct Effect = ć.
[b] Mediation analysis = ab.

Table 7
Direct effect and specific indirect effect.

	Path Coefficients	Standard Deviation	*t-value*	*p-value*
[a]Overconfidence - > Investment Decisions (H_1)	0.589	0.012	49.110	0.000
[a]Representative Heuristic - > Investment Decisions (H_2)	0.162	0.041	3.942	0.000
[a]Representative Heuristic - > Overconfidence (H_3)	0.296	0.081	3.656	0.000
[b]Representative - > Overconfidence - > Investment Decisions (H_4)	0.347	0.101	3.438	0.001

[a] Direct Effect = ć
[b] Mediation analysis = ab.

Table 7 shows the total effect of representative heuristic and overconfidence on investment decisions for secondary data. The event window used for measuring abnormal returns due to earnings announcements is −30 to 30. The results are showing higher *t*-values than its threshold value of *1.96* at a *5%* significance level. It can also be seen that path coefficients are high and significant statistically. The effect size of overconfidence is large as the effect size of the path coefficient is $\leq$ *0.35*. The effect size of representative heuristic is moderate as values are greater than cut off value $\leq$ *0.15*. The overconfidence bias changes the decisions of investment *by 58.9%* when other factors remain constant. The representative heuristic brings *a 16.2%* variation in investment decisions when the companies announce earnings. The effect size of a representative heuristic for overconfidence is moderate, its value is *29.6%*, which shows the tendency of overconfident investors towards utilization of mental shortcuts in their decision making. These results indicate the significance and impact of cognitive bias and heuristic on Pakistani investors when they make investment decisions during trading in the stock market.

Findings show the role of mediation that is positively significant. The overconfidence bias partially mediates between representative heuristic and investment decisions. The effect size of mediation is moderate as the value is $\leq$ *0.15*. The influence of representative heuristic increases on investment decisions when it combines with the overconfidence bias, which is *34.7%*.

The findings of the present study show the role of mediation that is positively significant. The overconfidence bias partially mediates between representative heuristic and investment decisions. Indirect results (which represent mediation) of the representative heuristics with the investment decisions are highlighting investors' behavior that their decisions depend on the past performance of the companies. As mentioned earlier, overconfident investors overestimate their abilities and rely on their knowledge, skills as well as they use past information and reference prices at the time of trading. The positive role overconfidence shows that relying on past performance gives them positive returns. As new information and data arrive, such as earning announcements in the stock market, then investors use reference prices for trading that brings positive results in their decisions. It has been shown in the mediation results of the current study. Pakistani investors got positive returns from using earnings announcements with market volatility from *2004 to 2017*.

Pakistani investors tend to be more dependent on their behaviors such as representative heuristic and overconfident bias because they live in a collective culture where they are more prone to affected by suggestions and behaviors of family members and friends and try to copy them when they make their own investment decisions. Another reason for their copying behavior is the absence of financial knowledge. They are not so much literate to analyze their behavior or not aware of these psychological characteristics, which may have a strong effect on their investment decisions. Representative heuristic positively influences overconfidence bias, which means investors become more overconfident regarding positive returns on their invested amount because of earning announcements availability and start to trade more. The impact of representative heuristic on investment decisions is positive at a *5%* level of significance.

The mediation impact has been calculated among the representative heuristic and Pakistani investors' decisions. Here, '*X*' is representing representative heuristic, '*M*' is representing overconfidence as a mediator, and investment

Table 8
Summary of hypotheses.

Hypothesis	Impact	Hypothesis supported
H_1	Repre heu significantly affects investment decisions.	Yes
H_2	Repre heu significantly affects overcnf bias.	Yes
H_3	Overcnf significantly affects investment decisions.	Yes
H_4	Ovrcnf partially mediates between repre heu and investment decisions.	Yes

Note. *p < 0.05. Overconfidence bias(ovrcnf), Representative heuristic (repre heu).

decisions are represented by '*Y*.' It is visible that t-statists are meeting the acceptance criteria as the value is higher than the threshold value and p-value is less than *5%* significance level. In the presence of a mediator, the path coefficient is positively related and statistically significant. Hence, overconfidence has an influential impact on investors' investment decisions as a mediator between representative heuristic and investment decisions. Overconfident investors use earning announcements for making investment decisions daily, which results in a good return in their investment. These results, with the presence of overconfidence, makes the right combination for Pakistani investors from *2004 to 2017*. It can be noted from the direct link between representative heuristic and investment decisions that the mediator has a significant role in a present study. Before indulging the impact of overconfidence between representative heuristic and investment decisions, the relationship between them was negative. As overconfidence bias intervenes between the relationship of representative heuristic and investment decisions, it turns to be positive. It is concluded that the simultaneous use of abnormal returns and market volatility generates positive returns for investors of the stock market. So, the above discussion concludes that overconfidence bias does mediate the relationship between representative heuristic and investment decisions that is partial meditation at a *5%* significance level.

The values of secondary data outcomes are less than the results of primary data. The reason for this is that in secondary data, we have reduced the dimensions of the variables in the measurement formula used. In primary data, all the dimensions of variables have been used, so the values we got are higher than secondary data results in all findings. Another reason for small values of secondary data results is the event window we have used. Using the short window event studies may not provide precise and correct influence and interpretation of strategic actions and events like acquisitions and announcements (Oler, Harrison, & Allen, 2008).

Thus, the following hypotheses have been accepted for the current study:

H1. Representative heuristic significantly affects the investment decisions of investors in the stock market.

H2. Representative heuristic significantly affects the overconfidence of the investors in the stock market.

H3. Overconfidence bias significantly affects the investment decisions of investors in the stock market.

H4. Overconfidence bias partially mediates the relationship between the representative heuristic and the investment decisions of the investors in the Pakistan stock exchange.

Summary of accepted hypotheses is given in Table 8:

All hypotheses have been proved in case of primary and secondary data analysis. Both primary data and secondary data results are aligned in the current study. Biases prevail not only in the individual investors but also at the aggregate level of the Pakistan Stock Market. The findings of the present study show that overconfidence bias partially mediates the relationship between representative heuristic and investment decisions. So, H_4 is accepted, which states that the overconfidence bias mediates between the relationship of representative heuristic and investment decisions. Evidence proves the link among the variables such as overconfidence bias, representative heuristic and investment decisions (Chang & Kao, 2017; Chen, Kim, Nofsinger, & Rui, 2007; Prosad, Kapoor, Sengupta, & Roychoudhary, 2017; Rasheed et al., 2016). Further, behavioral heuristics are mental shortcuts which are used by investors to make investment decisions and overconfidence bias makes them able to use limited knowledge and private information that only they have, rather considering other available investment options and that's, why they overrate their abilities and consider themselves as better than others. According to Shah, Ahmad, and Mahmood (2018), it is important to study the mediator role and its impact between the variables representative heuristic and investment decisions.

The results of the current study show that all the variables influence independently each other, and also overconfidence as the mediator is statistically significant. Behavioral heuristic impacts overconfident investors' behavior that shows overconfident investors use mental shortcuts when they are making investment decisions. So, overconfident investors are not rational and use mental shortcuts, which leads to poor investment decisions (Baker & Nofsinger, 2010; Kahneman et al., 1982).

Prior research has explored the overconfidence bias as a mediator which supports the **H_4** for both primary and secondary data. For instance, Park, Konana, Gu, Kumar, and Raghunathan (2010) proposed a model in their study in which they took overconfidence bias as the mediator between the behavioral biases and trading volume. Metawa, Hassan, Metawa, and Safa (2018) explored the overconfidence and herd behavior as a mediator and its significant impact on the relationship between demographics and investment decisions. Iqbal, Jebran, Rao, Ahsan, and Mirza (2015) and Haixia (2018) also found that overconfidence bias acts as a mediator between behavioral biases and investment behavior. Hence, H_4 for the current study is accepted because results show the statistically significant impact of overconfidence as a mediator between the representative heuristic and investment decisions.

The results highlight that the Pakistan Stock Market has been affected by behavioral heuristics and biases from January 1, 2004 to December 31, 2017. Reasons for this are that Pakistan Stock Market is not so developed and financial literacy rate among investors is not high. They live in a collective culture and usually get influenced by the behavior of other people around them, such as family members and friends. Pakistani investors are risk-averse and do not go for long term investment. So, it can be concluded that behavioral biases and heuristics affect the investment decisions of Pakistani investors during trading.

6. Conclusion

Findings indicate that heuristics and biases prevail in the investors when they make investment decisions. Overconfidence bias partially mediates between the representative heuristic and investment decisions. It can be noted from the results that the Pakistan Stock Market is not developed, and investors are not financially literate to avoid prevailing psychological factors that influence them. Investors, academicians, and researchers of other emerging markets can get benefit from these results and make themselves aware of these poor decision-making factors. As academicians can use these results to find out other behavioral factors that are simultaneously linked and work in a single model. For policymakers, these findings will help train their investors about how to avoid these psychological factors at the time of trading to get positive and higher returns without making any mistake. This study provides a new perspective by introducing overconfidence bias as a mediator between the representative heuristic and investment decisions, which is a contribution to behavioral finance literature.

Future researchers can use the same model to make a comparison between developing countries. Other cognitive biases can be added to the present theoretical model as a mediator and moderator like disposition effect, confirmation biases, financial literacy, etc.

Conflict of interest

There is no conflict of interest.

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