RESEARCH ARTICLE

Relationship Between Behavioral Biases and Investment Decisions: The Mediating Role of Risk Tolerance

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In the present situation speculation is the most significant in everybody's life. The financial specialists dependably lean toward the venture roads as indicated by their reasonableness, hazard and the arrival in light of the fact that there are diverse speculation roads accessible in the market. Thus, the present study focuses on the relationship between the behavioral biases and risk tolerance of the investors and the relationship between the behavioral biases and the investment decisions of the investors. The data was collected from 500 investors who invest through LSC Securities Ltd. in Punjab by using a structured questionnaire. Multiple regression test was applied through SPSS to test the significance of relationship among variables and SPSS Process Macro by Andrew. F. Hayes was used to test the mediation among behavioral biases and investment decisions. The study found the relationship between risk tolerance, behavioral biases and investment decisions to be statistically significant.

Keywords: Behavioral Biases, Investment Decisions, Multiple Regression, Relationship, Risk Tolerance.

JEL Classification: G11, G41, J11

In today's scenario, finance plays an important part in everyone's life. To avoid different types of problems in life, the person should invest the money in different types of avenues. The Indian financial system nurtures the savings among the investors and channels them to their optimum and effective use. In today's competitive era, various investment avenues are available to investors. Investors, in general, have the enthusiasm to invest in those particular avenues which will produce the maximum returns with minimum risks. The investors make investment decisions based on different factors. The investment decisions include various investment strategies, frequency of investment, time period, objectives of investment, factors affecting

investment decisions and many more. The behavioral biases are the most important factor when making investment decisions (Camerer 1997; Bailey 2012).

Behavioral Biases

The study of behavioral finance focuses on how human beings create and manage their financial assets. Behavioral finance implies the psychological and sociological factors which affect the decisions of the investors whether an individual, group, and others.

- Conservatism: It implies that people are not ready to accept the changes, and they will take more time to regulate the changes.
- Overconfidence: The investors become overconfident when predicting that they can forecast the future better.
- Herding: Herding is a situation when the individual cannot make their own decisions, and they do what the majority of the people do.
- Regret: A regret theory says that people predict regret if they make the wrong choice and consider this prediction when making decisions in the future.

Review of Literature

Inaishi, Toya, Zhai, and Kita (2010) studied the overconfident investor behavior in the stock market by simulation. They concluded that when there was a rise in trend, the investors became overconfident. Landa et al (2010) inquired about the relationship between enthusiastic information, character properties and mental slants in understudies. They contemplated that there was a positive association between energetic thought and neuroticism and there was a negative relationship between excited thought with responsiveness and freedom. The excited clearness was unfavorably related to neuroticism and was quite related to extraversion.

Masomi and Ghayekhloo (2011) broke down the impact of the behavioral factors on wander decisions of the budgetary masters. They found that regret was one of the guideline factors which affect the theory decisions of the examiners. Garkaz and Mehrvarzi (2012) broke down the association between eager learning and execution of business firms in Tehran Stock Exchange. There was an association between self-organization and execution yet there was

no association between social mindfulness and execution.

Nawi et al (2012) chose the association between passionate insight and personality trait among school pioneers in High Performance Schools in Malaysia. They found that genuineness, responsiveness to comprehension, extraversion and appropriateness were firmly related with enthusiastic learning of the schools educator pioneers. The good faith had a more grounded association with energetic learning than the other character traits.

Zaidi and Tauni (2012) identified the relation between Personality Traits, Demographics and Overconfidence Bias of investors in Lahore Stock Exchange. The data was collected from 170 respondents and was analyzed by chi square and correlation. They concluded that there was a positive relation between overconfidence bias and extroversion and indirect relation between overconfidence bias and neuroticism.

Bashir, Azam, Butt, Javed, and Tanvir (2013) investigated the influence of demographic factors and personality traits on the behavioral biases and risk taking behavior in Pakistan. The data were collected from 225 bankers and finance students and analyzed using SEM. They concluded that personality traits had significant relationship except for disposition effect with overconfidence, herding behavior, and risk-taking. The demographic factors had no relation to behavioral biases.

Sami and Rizvi (2013) found that the energetic learning was quite related to life satisfaction, and personality qualities had a contrary association with life satisfaction. They also watched that the markers of life satisfaction intra-singular care and neuroticism were in the developed individuals.

Pervez (2014) discovered that the passionate insight qualities of the financial specialists are connected with venture choices of the speculators. Pirayesh (2014) examined the effect of excited information on the theory frameworks of retail money-related authorities in Tehran Stock Exchange. He derived that there was a positive association between excited learning and hypothesis decisions. He found that there was certain association between chance unwilling and estimations of excited information.

Rzeszutek et al (2015) found that not only are unremitting retail theorists were defenseless against various behavioral slants when settling on decisions that but the level of vulnerability was more grounded

in this social occasion than among the people who were simply serenely involved with contributing.

Alquraan, Alqisie, and Shorafa (2016) studied the relationship between investment decisions and behavioral factors. They found that overconfidence had a significant relation with the investment decisions of the investors and there was no relationship between the herding behavior and the investment decisions of the investors. Chavali and Mohanraj (2016) studied the relationship between risk tolerance and investment decisions and found that the investors prefer sure gain rather than an uncertain future.

Tanvir et al (2016) thought about the association between energetic understanding and theory decisions. They found that there was an unimaginable effect of care, self organization, empathy, yet low obsession with relationship organization.

Objectives of the Study

The objectives of the study are:

1. To study the relationship between investors behavioral biases and their risk tolerance
2. To study the relationship between investors behavioral biases and their investment decisions

On the basis of the above objectives, the following hypotheses have been framed and tested. The hypotheses are developed on the basis of literature review.

H_1: There is a relationship between behavioral biases and risk tolerance of investors
H_2: There is a relationship between behavioral biases and investment decisions of investors
H_3: The behavioral biases - investment decisions relationship is mediated by risk tolerance

In this study, the behavioral biases are the independent variables and the investment decisions, of the investors are the dependent variable. The standardized scale for behavioral biases scale was taken from (Chin, 2012), which is reliable and validated 24 item, five-point Likert scale that measures the behavioral aspects of the individuals

that is overconfidence, regret, herding behavior and conservatism. The standardized scale for investment decisions used a reliable and validated 35 item Likert scale (Hameed, 2012). The standardized scale for risk tolerance was from a reliable and validated 9 item likert scale (Gananasekar & Arul, 2013).

The dimensions of behavioral biases are coded as overconfidence (X_{11}), Conservatism (X_{12}), herding (X_{13}), and regret (X_{14}).

Research Methodology

There are various studies on the relationship between risk tolerance and behavioral biases and the relationship between investment decisions and behavioral biases and the relationship between investment decisions and the risk tolerance. As per the literature review, there are no such studies in which the mediating role of risk tolerance among behavioral biases and investment decisions has been studied.

Sample

The data was collected from 500 investors who invest through LSC Securities Ltd. in Punjab State with the help of a standardized questionnaire. Secondary data was collected from journals, books, websites, and the review of the literature. A pilot study had been done on 50 investors to test the reliability, and the Cronbach alpha was 0.857, which is more than 0.6. It shows that the data was reliable.

Sampling Technique

The purposive sampling technique was used in this study. It is a non-probability sampling technique which is based on features of a population and the objective of the study. The purposive sampling technique is also known as judgmental sampling, selective sampling, or subjective sampling. It is also based on the opinion of the expert.

Questionnaire

The standardized questionnaire has been used to collect data from the investors. The behavioral biases scale, risk tolerance scale and the investment decisions scale have been used in the study.
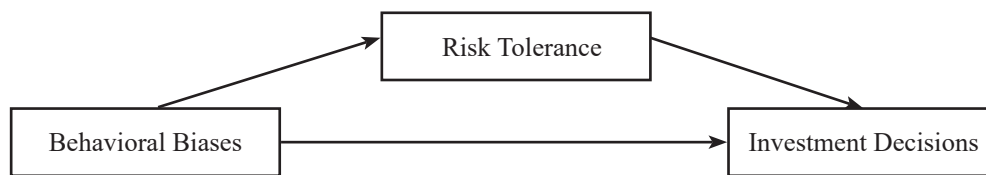
Figure 1: Relation of behavioral biases and investment decisions through risk tolerance as the mediator

Analysis

Relation Between Behavioral Biases and Investment Decisions of Investors

The in-depth study has been done to find out which dimensions of behavioral biases are related to investment decisions and which are not related to investment decisions. Thus, multiple regression analysis has been used. The dimensions of behavioral biases include overconfidence, conservatism, herding, and regret.

$H_{1(a)}$: There is a relationship between overconfidence and investment decisions of investors

$H_{1(b)}$: There is a relationship between conservatism and investment decisions of investors

$H_{1(c)}$: There is a relationship between herding and investment decisions of investors

$H_{1(d)}$: There is a relationship between regret and investment decisions of investors

Table 1 exhibits the significance of the model at a 95 % confidence interval. It shows that the model develops a prediction level at 0.615 or 61.5% which is good. The coefficient of determination means the change in the dependent variable is defined by the change in the independent variables. The coefficient of determination is R-square value which shows the variability of the dependent variable is explained by the independent variable. The independent variable explains 37.9% of the dependent variable (investment decisions).

ANOVA is used to find out the significance of the model used in the study. The F- ratio shows the fitness of the overall regression. Table 2 exhibits that the different independent variables used in the study are significant at $F_{(4, 495)} = 75.471$, $p < 0.05$. It shows that the model used in the study is fit.

Table 3 exhibits that the t-test is significant for X_{11} and X_{14} at 0.05 level. Therefore, the hypotheses $H_{1(b)}$ and $H_{1(c)}$ are not accepted and $H_{1(a)}$ and $H_{1(d)}$

are accepted. It shows that there is a significant relationship between overconfidence and investors investment decisions, regret and investors Investment decisions. There is no significant relation between conservatism and investor's investment decisions, herding and between investors investment decisions.

The intercept is 1.004. The coefficients are $0.385(X_{11})$ and $0.218(X_{14})$ which are for significant variables. X_{11} (Overconfidence) has the largest value among the coefficients as in Table 3. Thus, overconfidence is the main predictor of investors investment decisions. When there is increase of one point in overconfidence it will result in increase of 0.385 points in investors' Investment Decisions. Investors are over-confident regarding the decisions they have taken for the investment. They think that they make all the right decisions regarding investment. The results of the present study also gain support from the findings in the past years (Norsinger, 2002).

When there is an increase of one point in regret, it will result in an increase of 0.218 points in investors' investment decisions. The investors regret their decisions when they purchase the stock at a high price and sell the stock at a price lower than their purchase price. They hold the stock for a long time until the price will reach the price that is lower than their purchase price. The investors who always base their decisions on past experience, invest more in the stock market and take more risk. The results are consistent with the previous findings of (Shefrin, 2009; Muermann & Volkman, 2007). There is no significant relationship between conservatism and investment decisions. This is the mentality of people to be conservative or risk-averse and sticks to their prior views and they find newer options to be costly. There is no significant relationship between herding and investors investment decisions (Chin, 2012). Therefore, based on the above analysis the predictive regression equation is:

Table 1. *Model Summary of Behavioral Biases and Investment Decisions of Investors*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.615	.379	.374	.38205

Table 2. *Model Fitness in Multiple Regression Model Summary of Behavioral biases and Investment Decisions of investors*

Model 1	Sum of Squares	Df	Mean Square	F	Sig.
Regression	44.064	4	11.016	75.471	.000
Residual	72.252	495	.146		
Total	116.316	499			

Table 3. *Coefficients From Multiple Regression Models of Behavioral Biases and Investment Decisions of Investors*

	Model	Coefficients						
		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
Behavioral Biases	(Constant)	1.004	.127		7.932	.000		
	Overconfidence (X_{11})	.385	.033	.430		.000	.912	1.097
	Conservatism (X_{12})	.024	.020	.044	1.202	.230	.945	1.058
	Herding (X_{13})	.001	.019	.002	.068	.946	.965	1.036
	Regret (X_{14})	.218	.026	.320	8.466	.000	.876	1.142

$$Y = 1.004 + 0.385 \, X_{11} + 0.218 \, X_{14}$$

where,

Y= Investment Decision
X_{11} = Overconfidence
X_{14} = Regret

Relation Between Behavioral Biases and Risk Tolerance Of Investors

An in depth study has been done to find out which dimension of behavioral biases are related to risk tolerance and which are not related to risk tolerance. Thus, multiple regression analysis has been used. The dimensions of behavioral biases include are overconfidence, conservatism, herding and regret.

$H_{2(a)}$: There is a relationship between overconfidence and risk tolerance of investors

$H_{2(b)}$: There is a relationship between conservatism and risk tolerance of investors

$H_{2(c)}$: There is a relationship between herding and risk tolerance of investors

$H_{2(d)}$: There is a relationship between regret and risk tolerance of investors

Table 4 exhibits that the significance of the model at a 95 % confidence level. It shows that the model develops the level of prediction at 0.434 or 43.4 % which is good. The coefficient of determination means that change in the dependent variable is defined by the change in the independent variables. The coefficient of determination is R-square value which shows that variability of the dependent variable is explained by the independent variable. The independent variable explains 18.9% of the dependent variable (risk tolerance).

Table 4. *Model Summary of Behavioral biases and Risk Tolerance of investors*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
1	0.434	.189	.182	.44798	1.825

Table 5. *Model Fitness of Behavioral biases and Risk Tolerance of investors*

Model 1	Sum of Squares	Df	Mean Square	F	Sig.
Regression	23.079	4	5.770	28.751	.000
Residual	99.338	495	.201		
Total	122.417	499			

Table 6. *Coefficients From Multiple Regression Models of Behavioral Biases and Risk Tolerance of Investors*

		Coefficients						
		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	Model	B	Std. Error	Beta			Tolerance	VIF
Behavioral Biases	(Constant)	1.428	.145		9.879	.000		
	Overconfidence (X_{11})	.324	.039	.353	8.309	.000	.910	1.098
	Conservatism (X_{12})	.019	.024	.034	.804	.422	.915	1.093
	Herding (X_{13})	-.003	.024	-.005	-.118	.906	.940	1.064
	Regret (X_{14})	.111	.031	.159	3.630	.000	.856	1.168

ANOVA is used to find out the significance of the model used in the study. The F- ratio shows the fitness of the overall regression. Table 5 exhibits that the different independent variables used in the study are significant at $F_{(4, 495)} = 5.770$, $p < 0.05$. It shows that the model used in the study is fit.

Table 6 exhibits that the t-test is significant for X_{11} and X_{14} at 0.05 level. Thus, the hypotheses $H_{2(b)}$ and $H_{2(c)}$ are not accepted and $H_{2(a)}$ and $H_{2(d)}$ are accepted. It means that there is a significant relationship between overconfidence and investors risk tolerance, and between regret and investors risk tolerance. There is no relationship between conservatism and investors risk tolerance, and between herding and investors risk tolerance. The intercept is 1.428. The coefficients are $0.324(X_{11})$, $0.111(X_{14})$ which is for significant variables only. X_{11} (overconfidence) has the largest value among the coefficients as in Table 6. Thus, overconfidence is the main predictor of investors risk tolerance. When there is an increase of one point in overconfidence it will result in an increase of 0.324 points in investors'

risk tolerance. Investors are over-confident regarding the decisions they have taken for the investment. They think that they take all the right decisions regarding investment. The results of the present study also gain support from the findings in the past years (Nofsinger, 2002).

When there is an increase of one point in regret, it will result in an increase of 0.111 points in investors' risk tolerance. The investors regret their decisions when they purchase the stock at a high price and sell the stock at a lower price. They hold the stock for a long time untilthe price will reach a price thatis lower than their purchase price. The investors who always base their decisions on past experience, they invest more in the stock market and take more risk. The results are consistent with the previous findings of (Shefrin, 2009; Muermann &Volkman, 2007). There is no relationship between conservatism and investors' risk tolerance. This is the mentality of people to be conservative or the risk-averse and sticks to their prior views, and they find newer options to be costly.

There is no relationship between herding and investors' risk tolerance.

Therefore, based on the above analysis the predictive regression equation is:

$$Y = 1.428 + 0.324 \, X_{11} + 0.111 \, X_{14}$$

where,

Y= Risk Tolerance
X_{11} = Overconfidence
X_{14} = Regret

Behavioral Biases - Investment Decisions relationship is mediated by Risk Tolerance

In this, X is behavioral biases (independent variable), Y is investment decisions (dependent variable) and M is risk tolerance (mediating variable) as given in Figure 1. All the conditions of process macro have been studied. Therefore, the following hypothesis is framed and tested.

H_3: The Behavioral Biases - Investment Decisions relationship is mediated by Risk Tolerance

1. X variable predicts Y – path c
a) $F(1,498) = 130.5036$, $p < 0.05$, $R^2 = 0.2076$
b) $b = 0.4704$, $t(498) = 11.4238$, $p = 0.000$

2. X variable predicts M – path a
a) $F(1,498) = 95.68$, $p < 0.05$, $R^2 = 0.0862$
b) $b = 0.3109$, $t(498) = 6.85$, $p = 0.000$

3. X and M together predicting Y
   $F(2,497) = 246.59$, $p < 0.05$, $R^2 = 0.498$
a) M variable predicts y---path b
   $b = 0.5495$, $t(497) = 16.9579$, $p = 0.000$
b) X variable no longer predicts y or lessened predicts y—path c'
   $b = 0.2995$, $t(497) = 8.7287$, $p = 0.000$

4. Indirect Effect = 0.1708, $z = 6.3445$, $p = 0.000$

First of all, the relationship between the behavioral biases of the investors and investment decisions are checked. The F-value is 130.5036, R-square is 0.2076, As the p-value is 0.000 which is less than 0.05, there is a significant relationship between the behavioral biases and the investment decisions of the investors, and there is mediation between the behavioral biases and the investment decisions of the investors. The beta coefficient is 0.4704, which is used to determine the size and direction of the relationship. It shows that when there is a one-point increase in the behavioral biases, the investment decisions will change by 0.4704.

The relationship between risk tolerance and the behavioral biases of the investors are considered. The F-value is 46.9670; R-square is 0.0862. As the p-value is 0.000, which is less than 0.05, there is a significant relationship between risk tolerance and the behavioral biases of the investors. The beta coefficient is 0.3109, which is used to determine the size and direction of the relationship. It shows that when there is a one-point increase in the behavioral biases, the risk tolerance will change by 0.3109.

The relationship between risk tolerance and the investment decisions of the investors are considered by controlling the behavioral biases of the investors. The F-value is 246.5861, R-square is 0.4981. As the p-value is 0.000, which is less than 0.05, there is a significant relationship between risk tolerance and the investment decisions of the investors. The beta coefficient is 0.5495, which is used to determine the size and direction of the relationship. It shows that when there is a one-point increase in risk tolerance, the investment decisions will change by 0.5495.

The relation between investment decisions and the behavioral biases of the investors are considered by controlling the risk tolerance of the investors. The F-value is 246.5861, R-square is 0.4981. As the p-value is 0.000, which is less than 0.05, there is a significant relationship between the investment decisions and the behavioral biases of the investors. The behavioral biases predict the investment decisions of the investors in a lessened value while controlling the risk tolerance of the investors. The beta coefficient is 0.2995, which is used to determine the size and direction of the relationship. The beta value has been reduced from the direct relationship between the investment decisions and the behavioral biases of the investors. Therefore, it shows that there is partial mediation.

Risk tolerance plays a partial mediator role in the behavioral biases and the investment decisions of the investors. Therefore, hypothesis H_{11} is accepted;the behavioral biases–investment decisions relationship is partially mediated by risk tolerance.The indirect effect of the behavioral biases on the investment decisions of the investors is done by applying the Sobel test. As

the p-value is 0.000, which is less than 0.05,there is an indirect effect of the emotional intelligence on the investment decisions of the investors. It shows that there is partial mediation present in the emotional intelligence and the investment decisions of the investors. The effect is 0.1708 and the z value is 6.3445.

Suggestions

On the basis of above results, the following suggestions will be provided to the investors as well as to the advisors.

- The investors must not follow the majority of the people. He should have knowledge about his investments wheninvesting in any stock.
- The financial advisors should focus on the overconfidence and regret behavioral biases of investors whenmaking investment decisions so that they can advise them accurately to lessen such type of biases.
- Investors should be patient before and after taking investment decisions.
- Investors should carefully identify and analyze the behavioral factors which affect the investment decisions of the investors.
- The companies should provide more information on the Internet about the investment avenues. So, individual investors should get all recent information about investment avenues.
- The financial advisors should consider the behavioral factors which affect the risk tolerance of the investors so that they can advise them accordingly.
- As risk tolerance partially mediates between the investment decisions and the risk tolerance,the companies should focus on the behavioral biases of the investors to have better decision-making.
- The investorshaveto increase their knowledge regarding behavioral finance.
- The investors of all age group must have knowledge regarding the investment so that they can select the best investment avenue accordingly.
- The companies should provide information to investors regarding the benefits of investing in the stock market.

Conclusion

The study significantly enhances the investment decisions and risk tolerance literature. Though we do not claim the generalization of findings, the study has contributed in more than one way. The study contributes to the literature by providing validated scales for risk tolerance, investment decisions, and behavioral biases. The study found that there is a relationship between risk tolerance and overconfidence bias and regret bias. The individuals, when making an investment, think that they can take all the right decisions regarding the investment and are ready to take a high risk. The study also found that there is a relationship between investment decisions and overconfidence bias and regret bias. Thus, behavioral biases can better explain investment decisions through risk tolerance. The investors who always base their decisions on past experience take more risks and, ultimately, they invest more in the stock market. Therefore, when behavioral biases are changed, it will affect the risk tolerance of the investors and, ultimately, affect the investment decisions of the investors. The study will help individual investors to invest according to their risk tolerance and behavioral biases.

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