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Moderating-Mediating Role of Marital Status and Risk Tolerance in the Relationship of Behavioral Biases and Equity Investors Decision Making

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ABSTRACT
The study examines the Pakistani equity market, where many investors unknowingly fall prey to these biases, affecting both individual investment outcomes and the investor-advisor relationship. The study is carried out by considering that humans are not fully rational agents and their decision making is based on heuristic and shortcuts. Primary data were collected using a structured questionnaire from the 1015 individual equity investors. The data were analyzed by using the multivariate analysis, followed by the Confirmatory Factor Analysis (CFA) and Structural Equational Model (SEM). The results show that there is statistically significant effect of representative bias, overconfidence bias, anchoring bias, and availability bias on investment decision making whereas optimism bias is no effect of investment decision making. The behavioral biases including representative bias, overconfidence bias, availability bias and optimism bias significantly influence the investment decision making through the mediators like risk tolerance. The marital status moderates between the behavioral biases and investment decision making.

Keywords: *Behavioral Biases, Investment Decisions, Socio-Demographics, Risk Tolerance, Pakistani Equity Market, Behavioral Finance, Marital Status, Pakistan Stock exchange.*

1.0 INTRODUCTION

In the Pakistani context, many equity investors are unaware of these biases, which not only result in poor investment choices but also strain the relationship between investors and financial advisors (Gulzar & Ali, 2023). To illustrate the need for more study across various investor categories, Saleem et al.,(2023) examined the impact of behavioral biases and financial knowledge on investment decisions made by individual investors in Pakistan.

Most of the equity investors unknowing indulge in behavioral biases during the investment decision making and due to this reason make suboptimal decision. It is need of the time to aware the behavioral biases to make optimal decision

To address these gaps, this research will explore the nexus between behavioral finance and investment decision-making, considering the moderating effects of socio-demographic variables and the mediating roles of risk tolerance, within the context of the Pakistan Stock Exchange. This study aims to provide a more nuanced understanding of how various factors interact to influence investment decisions in a developing country setting, offering insights that could inform both academic research and practical interventions in financial education.

The following are the objectives of the study:

1. To investigate the effect of behavioral biases (Representative Bias, Overconfidence Bias, Anchoring Bias, Availability Bias, and Optimism Bias) on investment decisions
2. To examine the moderating influence of marital status on the relationship between investment decisions and behavioral biases (Representative Bias, Overconfidence Bias, Anchoring Bias, Availability Bias, and Optimism Bias)
3. To examine the mediating effect of risk tolerance on investment decisions and behavioral biases (Representative Bias, Overconfidence Bias, Anchoring Bias, Availability Bias, and Optimism Bias)

The current study is valuable to a wide range of stakeholders, including financial advisers, portfolio managers, corporate decision-makers, legislators, educators, and firms that operate in financial markets or consumer finance sectors. By explaining the complex links between cognitive biases, psychological mediator, and demographic moderator, the study provides a solid conceptual foundation for these actors to improve their practices and tactics. Financial professionals, for example, might use these data to create more sophisticated, individualized advice methods that anticipate and address investor biases as well as individual variations, boosting portfolio resilience and client trust. An evidence-based strategy not only improves decision-making results, but it also builds client-advisor relationships, which promotes company growth.

2.0 LITERATURE REVIEW

Perveen et al., (2020), analyzed the effects of representative bias on investment decisions of Pakistani investors. They illustrated that investors develop a bias when choosing investment instruments of investing in known or locally available opportunities like property or gold as compared to other securities that may be comparatively better in risk-adjusted manner.

Where by Hsu et al., (2021) recognize that in China, studies were done to establish the effects of overconfidence bias on stock market participation and trading. The study also revealed some behavioral biases that were exhibited by the Chinese investors for instance over confidence of the individual in his ability to select the right stock to invest resulted to high turnovers within their portfolio. However, this implies less actual performance on the average as compared to most other conservative investors. The authors proposed that interventions in the forms of improving Chinese investors' financial literacy and implementing behavioral remedies might effectively narrow the gap of overconfidence bias and thus enhance the investment performance (Hsu et al.,2021).

Riaz and Iqbal (2015) conducted research to determine the correlation between overconfidence bias and performance of individual investor. They found out that there was high positive significant between overconfidence and high-risk taking propensity among the Bangladeshi investors. The investors were overconfident and went out to invest even though majority of them lacked adequate financial knowledge as well as trading experience and thus ended up losing lots of money. To combat overconfidence bias therefore, there is the need to change the regulations and conduct investors' education programmes to improve decision making (M. Khan, 2017).

In a similar context, Kumari & Sar Kumar (2017) investigated the availability bias and its impact on investments, especially among retail investors in an emergent economy like India. It brought up different aspects of how the media and the tips that investors receive from friends, family, or colleagues may affect their decision-making process and, in turn, affect their decision in selecting the right security, creating market anomalies. The outcomes recognized the need to encourage the teaching and knowledge of information literacy and cognitive bias to improve the quality of decisions and investors.

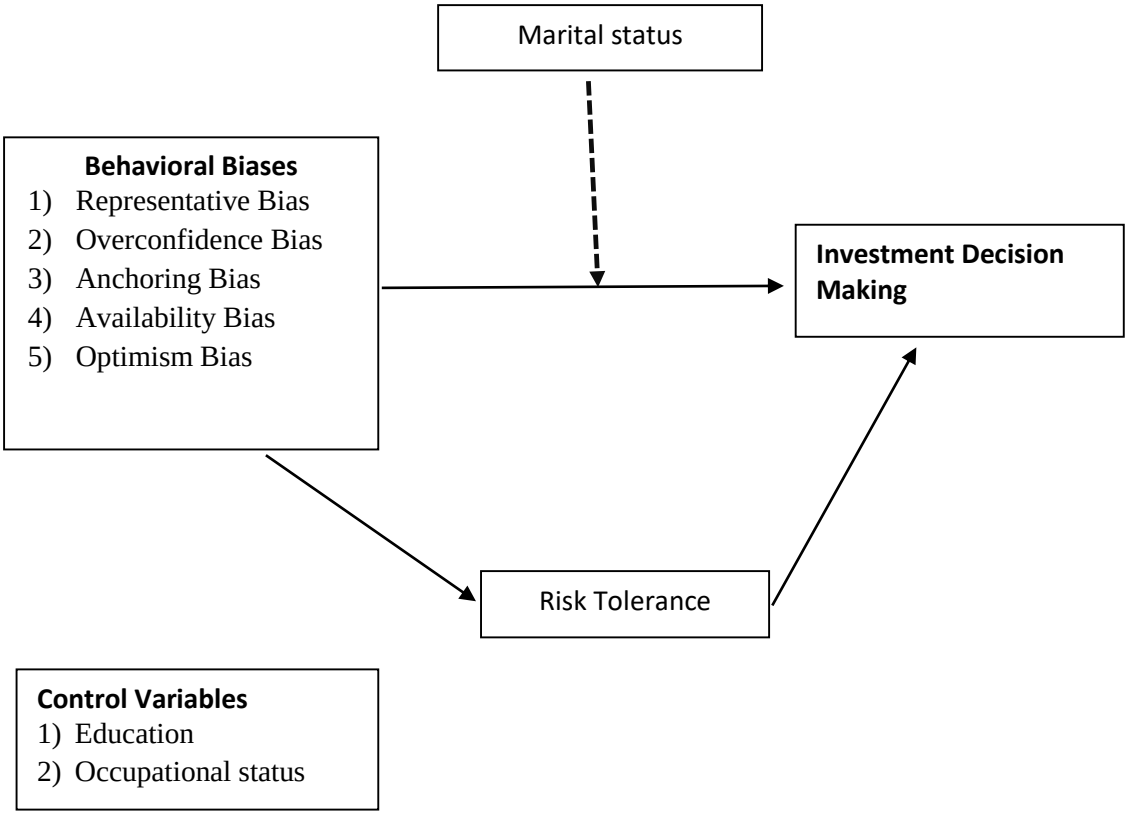
Khan et al., (2017) also looked at the effects that availability bias exerts on the investment decisions of retail investors in Bangladesh. The researchers continue to note that the investors emphasize the recent events or information that are most memorable and, therefore, follow the herding behavior and momentum investment strategies. This paper pointed out the significance of engaging in investor education, endeavors, and policies to tackle availability bias to reduce its impact on the efficiency and welfare of the markets.

Ishfaq et al.,(2020) recommended a study that emphasized the relationship between optimism bias and the performance of investors in Pakistan. The research also found that investors' self-confidence to be on the right side of the market boom and buck the general trend with superior performance is mostly a fallacy since it usually ends up with poor results owing to unmet high expectations.

Marital status emerges as a significant factor, with single individuals generally displaying elevated levels of risk-taking and overconfidence, while married investors tend to emphasize financial security, show increased risk aversion, and participate in collaborative decision-making owing to heightened familial responsibilities (LeBaron-Black et al., 2023).

Overconfidence bias may lead investors to underestimate risks, but risk tolerance mediates this by influencing the extent to which such biases translate into aggressive investment decisions (I. Khan et al., 2020).

2.1 Research Model



2.2 Research Hypotheses

H1: Representative Bias significantly affect the Investment Decision
H1a: Overconfidence Bias significantly affect the Investment Decision
H1b: Anchoring Bias significantly affect the Investment Decision
H1c: Availability Bias significantly affect the Investment Decision
H1d: Optimism Bias significantly affect the Investment Decision
H2: Marital status moderates the relationship between representative bias and investment decision-making.
H2a: Marital status moderates the relationship between overconfidence bias and investment decision-making.
H2b: Marital status moderates in the relationship between anchoring bias and investment decision-making.
H2c: Marital status moderates in the relationship between availability bias and investment decision-making.
H2d: Marital status moderates in the relationship between optimism bias and investment decision-making
H2: Financial literacy mediates representative bias and investment decision-making.
H3a: Financial literacy mediates overconfidence bias and investment decision-making.
H3b: Financial literacy mediates anchoring bias and investment decision-making.
H3c: Financial literacy mediates availability bias and investment decision-making.
H3d: Financial literacy mediates optimism bias and investment decision-making.

3.0 RESEARCH METHODOLOGY

3.1 Data Description

The nature of the study is exploratory. This study is conducted to analyze behavioral biases and investment decisions and education and occupational status are the control variables. A target population is the individual group or entity that the research is being conduct by using the surveys. The population of this study was the total population of Punjab. As Punjab is Pakistan's biggest province, most equity investors belong to Punjab. The target population of such research was the individual equity investors who had invested in the Pakistan Stock Market and belonged to the province of Punjab.

A purposive sampling strategy is applied to obtain information from respondents. A sample of 1100 was taken in this study, and 1025 correct research questionnaires were used.

3.2 Research Methodology

Structural equation modeling (SEM) was used to evaluate the hypotheses in the research model, followed by confirmatory factor analysis (CFA) to decide value of the measurement model and convergent as well as discriminant legitimacy of the construct.

Smart PLS 4.0 software used to employ SEM. SEM remains a statistical technique for testing and examining their causal relationships.

3.3 Econometric Equation

In below written econometric equation IDM represents Investment Decision Making, and i denote respondents of the study. Independent variables are representative bias, overconfidence bias, anchoring bias, availability bias, and optimism bias. α indicates intercept, and βs represents the slope of the variables. ε is the error term.

a) Marital Status as Moderating Variable

$$\begin{aligned} \boldsymbol{IDM_i} = {} & \boldsymbol{\alpha + \beta_1 representativeness_i} \\ & \boldsymbol{+ \beta_2 overconfidence_i + \beta_3 anchoring_i} \\ & \boldsymbol{+ \beta_4 availibility_i + \beta_5 optimism_i + \varepsilon_i} \end{aligned} \quad 1$$

$$\begin{aligned} \boldsymbol{IDM_i} = {} & \boldsymbol{\alpha + \beta_1 representativeness_i} \\ & \boldsymbol{+ \beta_2 overconfidence_i + \beta_3 anchoring_i} \\ & \boldsymbol{+ \beta_4 availibility_i + \beta_5 optimism_i} \\ & \boldsymbol{+ \beta_6 representativeness.marital\ Status_i} \\ & \boldsymbol{+ \beta_7 overconfidence \times marital\ Status_i} \\ & \boldsymbol{+ \beta_8 anchoring \times marital\ Status_i} \\ & \boldsymbol{+ \beta_9 availibility \times marital\ Status_i} \\ & \boldsymbol{+ \beta_{10} optimism \times marital\ Status_i + \varepsilon_i} \end{aligned} \quad 2$$

Where?

IDM = Investment Decision Making = Dependent Variable

Marital-status = Moderate Variable

The broad independent variables that can be empirically tested in concert with this study are Representative Bias, Overconfidence Bias, Anchoring Bias, Availability Bias, and Optimism Bias.

b) Risk Tolerance used as Mediating Variable

$$IDM_i = \alpha + \beta_1 representativeness_i + \beta_2 overconfidence_i + \beta_3 anchoring_i + \beta_4 availibility_i + \beta_5 optimism_i + \varepsilon_i \quad (3)$$

$$Risk - tolernace_i = \alpha + \beta_1 representativeness_i + \beta_2 overconfidence_i + \beta_3 anchoring_i + \beta_4 availibility_i + \beta_5 optimism_i + \varepsilon_i \quad (4)$$

$$IDM_i = \alpha + \beta_1 representativeness_i + \beta_2 overconfidence_i + \beta_3 anchoring_i + \beta_4 availibility_i + \beta_5 optimism_i + \beta_6 risk_{tolerance_i} + \varepsilon_i \quad (5)$$

Where?
IDM = Investment Decision Making = Dependent Variable
Risk - tolerance = Mediating Variable
Representative Bias, Overconfidence Bias, Anchoring Bias, Availability Bias, and Optimism Bias are the independent variables.

4.0 DATA ANALYSIS AND RESULTS

4.1 Descriptive Statistics Analysis

Descriptive analysis helps in understanding the respondents and the general levels of the variables within the organization under study. Because descriptive analysis is helpful in drawing useful conclusions. Table shows the results of descriptive statistics.

Table 4.1: Descriptive Statistics

	N	Min	Max	Mean	Std. Dev	Skewness	Std. Error	Kurtosis
Education	1025	1	6	3.9333	1.1026	0.1356	0.3087	-1.0155
Occupational status	1025	1	3	1.6000	0.6162	0.5037	0.3087	-0.5928
Marital status	1025	1	3	1.6667	0.6013	0.2867	0.3087	-0.6073
RB1	1025	1	5	3.000	1.2351	-0.5025	0.3087	-0.7880
RB2	1025	1	5	3.1500	1.2327	-0.9131	0.3087	-0.5793
RB3	1025	1	5	3.2167	1.1945	-0.6206	0.3087	-0.4358
RB4	1025	1	5	3.1500	1.2327	-0.9131	0.3087	-0.5793
RB5	1025	1	5	3.1667	1.1224	-0.8610	0.3087	-0.2997
OB1	1025	1	5	3.0833	1.2391	-0.6607	0.3087	-0.6504
OB2	1025	1	5	3.0000	1.1789	-0.7063	0.3087	-0.6137
OB3	1025	1	5	3.0333	1.2208	-0.7015	0.3087	-0.8179
OB4	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170

AB1	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
AB2	1025	1	5	3.1333	1.2277	-0.8879	0.3087	-0.5947
AB3	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
AB4	1025	1	5	3.1167	1.2363	-0.7855	0.3087	-0.6279
AvB1	1025	1	5	3.1167	1.2363	-0.7855	0.3087	-0.6279
AvB2	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
AvB3	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
OpB1	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
OpB2	1025	1	5	3.0833	1.2114	-0.8155	0.3087	-0.6238
OpB3	1025	1	5	3.0167	1.2418	-0.6368	0.3087	-0.9851
OpB4	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
OpB5	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
RT1	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
RT2	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
RT3	1025	1	5	3.1667	1.291	-0.6637	0.3087	-0.6874
RT4	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
RT5	1025	1	5	3.1333	1.255	-0.739	0.3087	-0.6441
IDM1	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
IDM2	1025	1	5	3.0833	1.2114	-0.8155	0.3087	-0.6238
IDM3	1025	1	5	3.1000	1.2171	-0.8391	0.3087	-0.6170
IDM4	1025	1	5	3.1333	1.2277	-0.8879	0.3087	-0.5947
Valid N (listwise)	1025							

Table 4.1 provides descriptive statistics for various variables in a sample of 1025 participants. The variables include education, age, occupational status, marital status, and multiple items related to biases (Representative Bias - RB, Overconfidence Bias - OB, Anchoring Bias - AB, Availability Bias - AvB, Optimism Bias - OpB), risk tolerance (RT), and investment decision-making (IDM). For each variable, the table displays the minimum, maximum, mean, standard deviation, skewness, and kurtosis.

Education ranges from 2 to 6, with a mean of 3.9333 and a standard deviation of 1.1026. Age, ranging from 1 to 4, has a mean of 1.6667 and a standard deviation of 0.9508. Occupational status, on a scale of 1 to 3, has a mean of 1.6 and a standard deviation of 0.6162, while marital status, ranging from 1 to 3, has a mean of 1.6667 and a standard deviation of 0.6013.

The table also presents statistics for the various bias items (RB1 to RB5, OB1 to OB4, AB1 to AB4, AvB1 to AvB3, OpB1 to OpB5), risk tolerance (RT1 to RT5), and investment decision-making (IDM1 to IDM4). Each set of items shows consistent patterns of means, standard deviations, skewness, and kurtosis.

Overall, these descriptive statistics provide a comprehensive overview of the sample's characteristics and the distribution of variables, setting the foundation for further analyses and insights into the relationships between education, age, marital status, occupation status, biases (representative bias, overconfidence bias, anchoring bias, optimism bias, and availability bias), risk tolerance, and investment decision-making behaviors.

4.2 Multicollinearity Test

Table 4.2: Multicollinearity Statistics (VIF)

Variables	Items	VIF
Anchoring Bas	AB1	1.344
	AB2	1.585
	AB3	1.581
	AB4	1.455
Availability Bias	AvB1	1.208
	AvB2	1.487
	AvB3	1.458
Investment Decision Making	IDM1	1.248
	IDM2	1.243
	IDM3	1.282
	IDM4	1.208
Overconfidence Bias	OB1	1.420
	OB2	1.494
	OB3	1.582
	OB4	1.526
Optimism Bias	OpB1	1.327
	OpB2	1.430
	OpB3	1.777
	OpB4	1.666
	OpB5	1.441
Representative Bias	RB1	1.394
	RB2	1.435
	RB3	1.665
	RB4	1.628
	RB5	1.536
Risk Tolerance	RT1	1.820
	RT2	1.742
	RT3	1.730
	RT4	1.896
	RT5	1.801
Marital Status	M-status	1.000

Table 4.2 provides collinearity statistics, specifically Variance Inflation Factor (VIF), for a set of variables in a dataset. Collinearity refers to the extent to which independent variables in a regression model are correlated. High collinearity can lead to issues in statistical analyses, such as inflated standard errors and difficulties in interpreting the effects of individual variables. The VIF measures the degree to which the variance of an estimated regression coefficient is increased due to collinearity.

In this table, each variable is associated with its respective items, and the VIF is reported for each item. The VIF values are low, ranging from 1.000 to 1.896, which suggests that multicollinearity is not a significant concern among the listed variables. Specifically, variables related to biases (Anchoring Bias, Availability Bias, Investment Decision Making, Overconfidence Bias, Optimism

Bias, Representative Bias, and Risk Tolerance) exhibit VIF values below 2, indicating low collinearity.

The variable Marital Status have VIF values of 1.000, suggesting no issues of collinearity among these demographic factors. Overall, the low VIF values indicate that the included variables in the analysis are not highly correlated, which enhances the reliability of regression analyses involving these factors. This would create a level of assurance to the researchers and analysts about the stability of the estimated coefficients and the possibilities of interpreting the findings of the regression analysis on the examined variables.

4.3 Measurement Model

As for the measurement model, PLS-SEM was conducted to verify the theories in this study, and the description of measures showed that the model was reliable and valid. Given that the study adopted PLS-SEM as the measurement model, the assessment was, therefore, most suitably done using Smart PLS 4.0 (Henseler et al.,2009).

This assessment is done based on factor loading, Cronbach alpha, composite reliability, average variance extracted (AVE), and discriminant validity.

Table 4.3: Item loadings, Cronbach's Alpha, Composite Reliability

Variables	Items	Loadings	CA	CR
Representative Bias	RB1	0.801	0.816	0.868
	RB2	0.813		
	RB3	0.885		
	RB4	0.811		
	RB5	0.833		
Overconfidence Bias	OB1	0.888	0.815	0.878
	OB2	0.817		
	OB3	0.777		
	OB4	0.813		
Anchoring Bias	AB1	0.817	0.885	0.866
	AB2	0.861		
	AB3	0.886		
	AB4	0.886		
Availability Bias	AvB1	0.777	0.868	0.836
	AvB2	0.888		
	AvB3	0.888		
Optimism Bias	OpB1	0.778	0.878	0.857
	OpB2	0.761		
	OpB3	0.881		
	OpB4	0.801		
	OpB5	0.884		
Risk Tolerance	RT1	0.889	0.831	0.886
	RT2	0.813		
	RT3	0.868		
	RT4	0.816		
	RT5	0.881		
Investment Decision Making	SE6	0.851	0.813	0.884
	IDM1	0.834		
	IDM2	0.861		

	IDM3	0.806
	IDM4	0.810

Source: Author

Regarding the various forms of biases or traits in the items, table 4.3 provides statistic loadings that indicate strength levels where various specific questions or indicators are related to the specific factor being measured. Third, the validity of the measurement scales that have been used in the survey has further been assessed through Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE), as presented in the table below.

That is the reason representative bias is evaluated and measured using five items, namely RB1 to RB5. The loadings of these items vary between 0.801 and 0.885, which are highly related to the BIAS factor. In the table, the reliability index, Cronbach's Alpha is 0.816, which is responsive to internal consistency. The Composite Reliability (CR) is computed to be 0.868, which suggests that the measure is reliable. The AVE of 0.716 means that the amount of variance accounted for by the construct can be estimated to be reasonable, considering the amount of variance in the items. These measurements are based on four items labeled OB1 to OB4, the loadings of which are 0.777, 0.788, 0.888, and 0.826, respectively. Internal consistency reliability is acceptable as the Cronbach's Alpha score for this variable is 0.815, and the CR is 0.878. The AVE is 0.801, which is quite high and can be interpreted such that a sizable portion of the variance is attributable to the overconfidence factor.

Anchoring bias consists of four items from AB1 to AB4, with a loading of 0.817 to 0.886. The obtained Cronbach's Alpha is 0.885; thus, internal consistency is very satisfactory, and the CR of 0.866 was obtained, which proves that this construct is adequately measured. However, in the case of the AVE, it stands at 0.589, which is lower, meaning that the items contribute less to explaining the variance than other biases. The reliability of the Availability bias is measured with three questions (AvB1 to AvB3), and all of these have loadings of 0.777, 0.888, and 0.888, respectively. It is evident that Cronbach's Alpha for the availability bias is 0.868, meaning that the results have substantial internal reliability. The CR stands at 0.836, thus supporting the reliability, while the AVE is at 0.788, showing a good amount of commonality that is captured by this factor.

The reliability estimate for optimism bias is determined with five items (OpB1 to OpB5), and the loadings of these items are as follows: 0.761- 0.884. Internal consistency is satisfactory: Cronbach's Alpha = 0.878, and CR is equal to 0.857. However, the AVE is 0.561, which is a comparatively low value, but it denotes that 56.1% of the variance is explained by the factors.

The construct investment decision-making has four items, namely IDM1 to IDM4, with the loadings attained being 0.806, 0.834, 0.847, and 0.861, respectively. The Cronbach's Alpha is 0.813, which shows satisfactory reliability between the test items. The CR of 0.884 signifies that the constructs have reliable data, and the AVE of 0.788 means that a considerable portion of data variance is accounted for by this construct. As indicated in Table 4.3, all the variables have internal consistency and reliability, as captured by Cronbach's Alpha and Composite reliability, which are higher than the acceptable standard of 0.7. Besides, most of the AVE values are greater than 0,5, which means that the items used reflect the variance of the corresponding construct adequately.

4.4 Convergent Validity

The convergent validity is found to be 0.716 by using the Average Variance extracted from the representative bias having the item RB1 to RB5, which ensures the convergent validity of more than 0.7.

The Convergent Validity was measured by using the Average Variance Extracted (AVE) of the overconfidence bias, with the items OB1 to OB4 being 0.801, which is more than 0.7. The AVE of 0.801 suggests a reasonable amount of variance is explained by the latent construct.
The Convergent Validity was measured by using the Average Variance Extracted (AVE) of the anchoring bias, with items AB1 to AB4 being 0.589, which is more than 0.5. The AVE of 0.589 suggests a reasonable amount of variance, which is explained by the latent construct.
The Convergent Validity was measured by using the Average Variance Extracted (AVE) of the availability bias, with the item AvB1 to AvB3 being 0.788, which is more than 0.7. The AVE of 0.788 suggests a reasonable amount of variance, which is explained by the latent construct.
The Convergent Validity was measured by using the Average Variance Extracted (AVE) of the optimism bias, with items AB1 to AB4 being 0.561, which is more than 0.5. The AVE of 0.561 suggests a reasonable amount of variance, which is explained by the latent construct.
The Convergent Validity was measured by using the Average Variance Extracted (AVE) of the investment decision-making, with the items FDM1 to FDM4 being 0.788, which is more than 0.7. The AVE of 0.788 suggests a reasonable amount of variance, which is explained by the latent construct.

*Table **Error! No text of specified style in document.**.4: Convergent Validity*

Variables	Items	Loadings	AVE
Representative Bias	RB1	0.801	0.716
	RB2	0.813	
	RB3	0.885	
	RB4	0.811	
	RB5	0.833	
Overconfidence Bias	OB1	0.888	0.801
	OB2	0.817	
	OB3	0.777	
	OB4	0.813	
Anchoring Bias	AB1	0.817	0.589
	AB2	0.861	
	AB3	0.886	
	AB4	0.886	
Availability Bias	AvB1	0.777	0.788
	AvB2	0.888	
	AvB3	0.888	
Optimism Bias	OpB1	0.778	0.561
	OpB2	0.761	
	OpB3	0.881	
	OpB4	0.801	
	OpB5	0.884	
Risk Tolerance	RT1	0.889	0.707
	RT2	0.813	
	RT3	0.868	
	RT4	0.816	
	RT5	0.881	
Investment Decision Making	IDM1	0.834	0.788
	IDM2	0.861	

	IDM3	0.806
	IDM4	0.810

4.5 Discriminant Validity

Table 4.5: Discriminant Validity through Fornell-Larcker Criterion Method

	1	2	3	4	5	6	7	8
Education	1.000							
Occupational Status	0.000	1.000						
Availability Bias	-0.001	0.520	0.784					
Investment Decision Making	-0.014	0.455	0.350	-0.177				
Optimism Bias	0.009	0.532	0.543	-0.052	0.549			
Overconfidence Bias	-0.028	0.472	0.366	-0.183	0.370	0.449		
Representative Bias	0.034	0.508	0.517	0.051	0.370	0.357	0.112	
Anchoring Bias	0.063	0.442	0.381	-0.084	0.544	0.623	0.018	0.01

Source: Author

Table 4.5 presents the results of a discriminant validity analysis using the Fornell-Larcker criterion method for various constructs. Each diagonal element represents the square root of the average variance extracted (AVE) for the corresponding latent variable, indicating the proportion of variance captured by the items measuring that construct. The absence of correlation values between different constructs (off-diagonal elements) or low correlations underscores the distinctiveness of each construct. Variables such as "Anchoring Bias," "Availability Bias," "Investment Decision Making," "Optimism Bias," "Overconfidence Bias," "Representative Bias," also demonstrate discriminant validity, with AVE values higher than the correlations with other constructs. Conversely, Overall, the table provides convincing evidence for the discriminant validity of the measurement model, confirming that each variable is distinct and reliably measured in the study.

4.6 Hypotheses Testing

Table 4.6: Direct Effects

Hypothesis	Relationship	Original sample	Mean	SD.	T Value	P values	Decision
H1	*Representative Bias -> Investment Decision Making*	*0.034*	*0.032*	*0.038*	*2.563*	*0.031*	*Accept*
H2	*Overconfidence Bias -> Investment Decision Making*	*0.021*	*0.026*	*0.037*	*4.912*	*0.006*	*Accept*
H3	*Anchoring Bias -> Investment Decision Making*	*0.112*	*0.112*	*0.038*	*2.951*	*0.003*	*Accept*

H4	*Availability Bias -> Investment Decision Making*	*0.008*	*0.008*	*0.037*	*3.561*	*0.009*	*Accept*
H5	*Optimism Bias -> Investment Decision Making*	*0.059*	*0.054*	*0.044*	*1.352*	*0.177*	*Reject*

Note: P value is 5%.

Table 4.6 provides a comprehensive overview of the direct effects and the associated statistical significance in the examined hypotheses related to the influence of biases, financial literacy, risk tolerance, and self-efficacy on investment decision-making. Each hypothesis is scrutinized, considering the original sample statistics, including mean, standard deviation, T statistics, P values, and the ultimate decision regarding hypothesis acceptance or rejection.

The results reveal a nuanced pattern across different biases. Representative Bias (H1) is accepted, indicating the positive and significant impact on investment decision-making. The value of Beta is 0.034.

Overconfidence Bias (H2) demonstrates a positive and significant impact on investment decision-making and the value of Beta is 0.021.

Anchoring Bias (H3) indicating a significant positive influence on investment decision-making. The value of Beta is 0.112.

Availability Bias (H4) has a positive and significant impact on investment decision-making and the value of Beta is 0.008.

Optimism Bias (H5) is rejected in terms of its effect on investment decision-making and the value of Beta is 0.059.

Table 4.7: Moderating Effects

Hypothesis	**Moderating Effects**	**Original sample**	**Mean**	**SD.**	**T Value**	**P values**	**Decision**
H2	*Marital-status x Representative Bias -> Investment Decision-Making*	*0.113*	*0.111*	*0.053*	*2.119*	*0.034*	*Accept*
H2a	Marital-status x Overconfidence Bias -> Investment Decision-Making	-0.135	0.127	0.047	2.839	0.005	Accept
H2b	Marital-status x Anchoring Bias -> Investment Decision-Making	-0.063	0.059	0.041	2.845	0.002	Accept
H2c	Marital-status x Availability Bias -> Investment Decision Making	0.032	0.029	0.048	4.268	0.001	Accept
H2d	Marital-status x Optimism Bias -> Investment Decision Making	-0.008	0.014	0.057	3.991	0.000	Accept

Marital status has mixed moderation effects. H2 and H2a suggest that the interactions between marital status, Representative Bias, and Overconfidence Bias significantly influence investment decision-making (Accepted). However, H2b, H2c, and H2d also indicate significant moderation

effects of marital status on Anchoring Bias, Availability Bias, and Optimism Bias, respectively, to investment decision-making (Accepted).

In summary, these results highlight the varying influence of demographic factors on the relationship between different biases and investment decision-making, providing valuable insights into the nuanced impact of individual characteristics on financial choices.

Table 4.8: Mediating Effects

Hypotheses	Relationship	Original sample	Mean	SD	T Values	P values	Decision
H3	Representative Bias -> Risk Tolerance -> Investment Decision Making	0.006	0.006	0.005	1.991	0.008	Accept
H3a	Overconfidence Bias -> Risk Tolerance -> Investment Decision Making	0.026	0.026	0.008	3.116	0.002	Accept
H3b	Anchoring Bias -> Risk Tolerance -> Investment Decision Making	0.029	0.029	0.009	3.165	0.002	Accept
H3c	Availability Bias -> Risk Tolerance -> Investment Decision Making	0.019	0.019	0.007	2.894	0.004	Accept
H3d	Optimism Bias -> Risk Tolerance -> Investment Decision Making	0.065	0.065	0.019	3.379	0.001	Accept

The mediation analysis reveals that risk tolerance significantly mediates the relationship between behavioral biases and investment decision-making. The findings suggest that representative bias indirectly influences investment decisions by shaping investors' willingness to take risks, indicating that individuals often rely on past patterns or experiences when determining their investment behavior. Similarly, overconfidence bias positively affects investment decision-making through risk tolerance, implying that investors with higher confidence in their abilities are more willing to accept greater levels of risk in pursuit of returns. Anchoring bias also demonstrates a significant indirect relationship, showing that initial information or reference points can influence investors' risk preferences and, ultimately, their investment choices. In the same way, availability bias affects investment decisions through risk tolerance, suggesting that investors tend to rely on readily available information when evaluating risky opportunities. Among all the behavioral biases, optimism bias appears to have the strongest mediating influence through risk tolerance, highlighting that optimistic investors are generally more inclined toward higher-risk investment decisions. Overall, the results confirm that risk tolerance acts as a critical psychological mechanism through which behavioral biases shape investment decision-making behavior**.**

4.7 Goodness of Fit Model

Table 4.7 presents various model fit indices comparing the saturated model and the estimated model in structural equation modeling. The Standardized Root Mean Square Residual (SRMR), a key measure of model fit, indicates the discrepancy between observed and predicted

correlations. Both the saturated model (SRMR = 0.071) and the estimated model (SRMR = 0.075) fall within the acceptable threshold of 0.08, suggesting a good fit for both models.

The d_ULS (Unweighted Least Squares Discrepancy) and d_G (Geodesic Discrepancy) values measure overall model discrepancies, with lower values indicating better fit. The saturated model shows slightly lower d_ULS (4.108 vs. 4.593) and d_G (1.044 vs. 1.082) values compared to the estimated model, indicating a marginally better fit in the saturated model.

The Chi-square statistic assesses the difference between the observed and expected covariance matrices. The estimated model has a slightly higher Chi-square value (6214.778) than the saturated model (6087.474), suggesting that the saturated model fits the data better.

Finally, the Normed Fit Index (NFI), which ranges from 0 to 1 and reflects incremental improvement over a baseline model, shows low values for both models (NFI = 0.660 for the saturated model and NFI = 0.653 for the estimated model). These values indicate room for improvement in model fit, as an NFI closer to 0.90 is typically desirable.

Table 4.7: Goodness of Fit

Test	Saturated model	Estimated model
SRMR	0.071	0.075
d_ULS	4.108	4.593
d_G	1.044	1.082
Chi-square	6087.474	6214.778
NFI	0.660	0.653

5.0 CONCLUSION

The findings show that, aside from optimism bias, the majority of behavioural biases have a statistically significant effect on investing decision-making. In particular, representational bias exhibits a tiny but substantial positive effect (β = 0.034, t = 2.563, p = 0.031), which results in H1's acceptance. Similarly, H2 is supported by overconfidence bias, which shows a substantial influence (β = 0.021, t = 4.912, p = 0.006). H3 is confirmed by the somewhat greater effect of anchoring bias (β = 0.112, t = 2.951, p = 0.003). Despite having a very small coefficient (β = 0.008), availability bias is statistically significant (t = 3.561, p = 0.009), which results in H4 being accepted. H5 is rejected because optimism bias does not significantly correlate with investment decision-making (β = 0.059, t = 1.352, p = 0.177). Overall, the results indicate that while optimism bias had little effect on investment decisions in this study, cognitive biases including representativeness, overconfidence, anchoring, and availability do have a substantial role.

Marital status has mixed moderation effects. H2 and H2a suggest that the interactions between marital status, Representative Bias, and Overconfidence Bias significantly influence investment decision-making (Accepted). However, H2b, H2c, and H2d also indicate significant moderation effects of marital status on Anchoring Bias, Availability Bias, and Optimism Bias, respectively, to investment decision-making (Accepted).

The results show that risk tolerance significantly mediates the relationship between behavioral biases and investment decision-making. This means that behavioral biases influence how much risk investors are willing to take, which in turn affects their investment choices. Investors with higher levels of overconfidence, anchoring, availability, and optimism tend to show greater risk-taking behavior. Overall, risk tolerance serves as an important link between psychological biases and investment decisions.

5.1 Future Research

The current study could be expanded upon in future research by examining other behavioural and psychological aspects, such as loss aversion, herding behaviour, and financial literacy, that may affect investing decision-making. To better understand how various groups react to behavioral biases, it would also be beneficial to investigate the moderating or mediating effects of demographic variables (such as age, income, education, and investment experience). Furthermore, longitudinal designs may be used in future research to evaluate how these biases change over time and affect long-term investment performance.

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