Cognitive Biases, Personality, and Stock Market Behavior: A Comprehensive Investigation

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ABSTRACT

This study examines how personality traits and cognitive biases affects the financial decision-making process of individual investors in today's dynamic market of India. Specifically, it examines the direct and indirect effects of their big five traits i.e. Extroversion (EX), Agreeableness (AG), Conscientiousness (CO), Openness (OP) and Neuroticism (NE) and cognitive biases, such as Risk Tolerance (RT) and Overconfidence (OC). Sample size was collected from individual investors in India through a structured questionnaire using a purposive sampling method. PLS-SEM is subsequently applied to analyze the hypothesized associations among the variables. The findings unveiled strong relations between investors' personality traits (PT), cognitive biases, and investment behaviour (IB). Notably, overconfidence was identified as a strong mediator between personality traits (AG, CO, NE) and investment behaviour (IB) of individual investors. While, risk tolerance (RT) was found to be insignificant mediator. The study provides insights to the investors about their psychological biases and personality traits (PTs) which strongly influence their cognitive process by empowering them to make rational and sustainable investing decisions.

1. INTRODUCTION

Unlike traditional finance, behavioural finance offers a more realistic view of how people actually behave, which has greatly improved our understanding of financial markets. It is currently one of the most important research initiatives and directly contradicts to the Efficient Market Theory. It suggests that all stocks are accurately priced based on their fundamental investment characteristics and all the information are equally accessible to all market participants [1]. Markowitz Portfolio Theory, Modigliani & Miller's Arbitrage Theory, and Sharpe & Lintner's CAPM are the foundations of conventional finance. But conventional finance falls short as a whole financial theory. Most of the time, investors miss out on arbitrage possibilities. They neither build their portfolios in accordance with Markowitz's model, nor even get stock returns that are consistent with the CAPM theory. In traditional finance, people are supposed to take rational decisions. However, in behavioural finance, they are typically normal individuals. Therefore, they often experience framing uncertainty, cognitive psychological challenges, regret, and inability to manage their emotions [2]. The majority of academic discussion in the 1990s completely shifted from these econometric analyses of price, dividend, and profits towards creating models of human psychology in relation to financial markets [3]. Investors' judgments and behaviour are guided by their personalities, which have significant implications for behavioural finance [4]. Personality traits and Cognitive biases significantly impact investment choices, often steering investors toward less favourable outcomes [5]. Awareness about these personality traits and biases may avoid potential losses from risky actions.

In the context of the stock market in India, this study contributes to the body of knowledge on behavioural finance [6]. It also provides useful implications for enhancing investors' performance and results in the financial markets, as well as insights into their cognitive psychology and behavioural processes [7]. Individual investors' investment decision-making process majorly influence stock market fluctuations in India.

In previous studies, the relations between personality traits, cognitive biases such as RT and OC, and IB of individual investors has rarely been explored together. The study bridges the gap by examining how biases such as RT and OC interact with PTs to shape IB. Furthermore, it highlights the need for dynamic models that consider the temporal effects of these psychological factors to enhance the predictive accuracy of investor behaviour. This study

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aims to provide a clear picture of how PTs and psychological biases intertwine to shape investors' decision-making and behaviour in the stock market.

The study is organized into six separate sections. The first section serves as an introduction to the study, while section second showcases prior research relevant to the study. Hypothesized model of the study is presented in section three, followed by the research methodology which is shown in section four. The structural model is presented in Section five and then utilized for data analysis in the study. Section six, the conclusion and implications, and finally, the references are cited.

2. LITERATURE REVIEW

2.1. Personality traits (PTs) and investment decision-making

Numerous studies repeatedly shown that an individuals' personality dimensions are a stronger predictor of their psychological and physical well-being [8]. The five-factor model (FFM) has emerged as the predominant framework, providing valuable insights into understanding various personality traits [9]. As investor behaviour constantly adjusts to shifting market conditions. [7]. Various studies [3]; [11]; [12]; [13] have emphasized the critical role played by personality characteristics in shaping how individual investors behave in the financial market. EX, AG, CO, NU, and OP are used to describe individuals' FFM personalities.

Extroverted: An extroverted individual is more talkative, enthusiastic, energetic, optimistic, positive, and social, which increases their willingness to take risks in stock market ([4]; [11]; [14].

With a high level of AG an individual is usually trustworthy, charitable, kind, sympathetic, and helpful [4]; [15]; [11]. They are more likely to believe and follow investment advisors' advice. Additionally, they tend to hold a positive outlook on financial investments [14].

Those individuals who have a high level of OP are creative, inquisitive, and receptive to alternative beliefs and principles [4]. Those who are receptive to new experiences prefer investing in long-term investments [16].

In neurotic individuals, the negative emotional behaviours of anger, aggression, despair, and anxiety are more prevalent [4]; [14]. They frequently have a negative opinion on stock investments [17].

High degrees of CO in people are correlated with self-control, persistence, motivation, and diligent behaviour [4]; [16]. They are quite selective with regard to their financial choices because of this ability. The study offers the following hypothesis to obtain a better insight of the relations between big five PTs of individual investors' and their financial decision-making:

H1: Investors' PTs have a significant influence on individuals' (IB).

2.2 PTs, RT, and investment decision making

PTs influence RT, which in turn influences investment decisions [14]. It is the cognitive process that shows the amount of risk that an individual can accept, and it significantly and favourably influences the choice of investments [18]; [19]. Depending on an investor's RT and investment objectives, the influence of personality factors on investment decisions can be increased or decreased [20]. To achieve goals that are compatible with their personality attributes, people will either take or avoid risks. With high levels of CO people may be less willing to take risks. Individuals with strong NU may be risk-averse due to the concern about negative outcomes. For instance, EX individuals may take risks because they need to seek excitement [21]. Both risk aversion tendency and socially conscious investment choices are significantly influenced by the AG personality trait [22]. In contrast, individuals characterized by OP tend to make riskier investment judgments [23]; [24]. The degree of financial RT varies among investors based on their personality types. Individuals with high AG, CO, and NU personality traits are less risk-tolerant and take risks less frequently than those who score highly on EX and OP [25]. The study proposed the following hypothesis to investigate the mediation effect of RT between PT and IB

H2a. Individual investors' Personality traits have a significant impact on their RT attitude.

H2b. Individual investors' RT attitude has an impact on IB.

H2c. Individual investors' Personality traits affect IB through RT.

2.3 PTs, OC and Investment decision-making

Personality traits and OC bias are significantly correlated [26]. In contrast to accuracy on the tests, they found that EX is positively connected with OC. As a result, extroverts tend to be si`gnificantly more overconfident. High level of OP leads people more likely to explore opportunities to learn in a variety of fields. However, there is no correlation between NU, AG, CO and OC bias. Investors with OC bias overestimate their expertise and tend to think that past performance of the company is the best indicator for its future performance [27]. They tend to overestimate the accuracy of their knowledge and the potential trading gains they can achieve [28]. Individual investors' behaviour is primarily influenced by OC Bias, ranking as the most significant predictor variable [29]. As a result, they engage in more frequent trading compared to rational investors [30]. Understanding personality traits and behavioural biases are essential for improving individuals' investment efficiency and increasing the overall efficiency of the financial market [31]

By taking these findings into account, the study formulates a hypothesis that emphasizes on examining the

mediating effect of OC between PTs and (IB):

H3a. Individual investors' PTs have a significant effect on OC.

H3b. Individual investors' OC has a significant effect on IB.

H3c. Individual investors' Personality traits affect IB through OC.

3. CONCEPTUAL MODEL

In Figure 1. The individual investors' PTs, such as (NE, EX, OP, AG, and CO) are shown as the exogenous variables and IB as the endogenous variable. Psychological biases, namely OC and RT, are identified as parallel mediators between Big-Five PTs and the IB of individuals in the stock market.

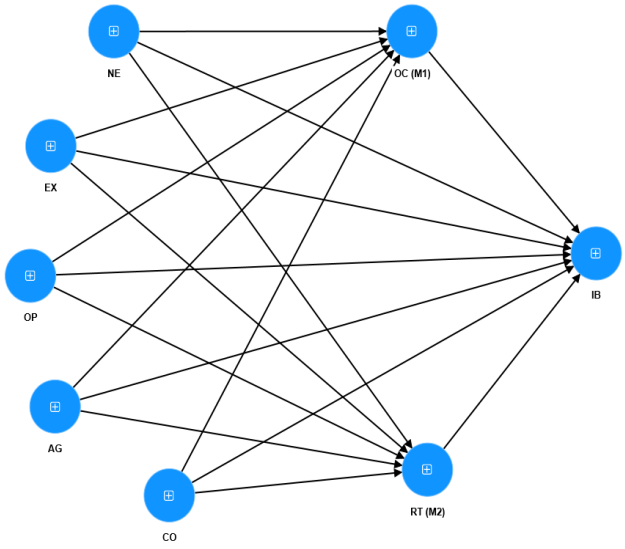


Fig. 1. Proposed conceptual model.

4. RESEARCH METHODOLOGY

The purpose of this study was to examine how cognitive biases such as RT and OC mediate the relationship between PTs and IB among individual investors in Indian stock market. Data were gathered using a structured questionnaire which was measured on a five-point Likert scale. Using purposive sampling, 467 usable responses were collected from individual investors and included for final analysis. The questionnaire consists of four components. The first portion covered the respondents' demographic details, the second segment covered the big five personality traits, the third segment assessed psychological biases, and the fourth segment covered investment behaviour. The measurement model was used to assess the quality of the constructs in questionnaire. Structural Equation Modeling (SEM) was subsequently used to analyze the data and to test the proposed hypotheses [32]; [33].

Table 1. (Reliability & Convergent Validity)

Constructs	Items	Loadings	Cronbach's Alpha	CR	AVE
AG	AG1	0.770	0.800	0.807	0.558
	AG2	0.806			
	AG3	0.745			
	AG4	0.782			
	AG5	0.618			
CO	CO1	0.780	0.832	0.837	0.609
	CO2	0.847			
	CO3	0.566			
	CO4	0.836			
	CO5	0.837			
EX	EX1	0.845	0.891	0.892	0.699
	EX2	0.866			
	EX3	0.879			
	EX4	0.849			
	EX5	0.733			
NE	NE1	0.846	0.912	0.916	0.739
	NE2	0.882			
	NE3	0.871			
	NE4	0.856			
	NE5	0.842			
OP	OP1	0.861	0.929	0.931	0.778
	OP2	0.884			
	OP3	0.910			
	OP4	0.894			
	OP5	0.858			
RT	RT1	0.756	0.890	0.894	0.696
	RT2	0.875			
	RT3	0.848			
	RT4	0.832			
	RT5	0.856			
OC	OC1	0.790	0.847	0.850	0.623
	OC2	0.787			
	OC3	0.816			
	OC4	0.682			
	OC5	0.861			
IB	IB1	0.852	0.891	0.894	0.606
	IB2	0.746			
	IB3	0.732			
	IB4	0.729			
	IB5	0.767			
	IB6	0.801			
	IB7	0.814			

Source: The Authors' Calculations

4.1. Measurement Model

Table 1 assessed the internal consistency reliability and convergent validity for each construct. All constructs demonstrated satisfactory levels of reliability and validity. All the Cronbach's Alpha values and composite reliability (CR) above 0.7 met the threshold criterion [34]. Convergent validity was confirmed, as the average variance extracted (AVE) values are greater than 0.5 [29]. Furthermore, the factor loadings for all constructs ranged between 0.60 and 0.95, indicating a strong relationship between the observed indicators and their respective latent constructs. [35]. Tables 2 and 3 present Discriminant validity using Fornell Larcker

criterion and HTMT Ratio. The results satisfied the discriminant validity as the square root of AVE for each construct exceeded its correlation with other constructs. Also, all HTMT values were lower than the recommended threshold of 0.85 [36]. Thus, all the constructs in the study were found to be reliable and valid.

Table 2. (Discriminant Validity - FornellLarcker Criteria)

Const.	AG	CO	EX	IB	RT	NE	OC	OP
AG	0.747							
CO	0.617	0.780						
EX	0.602	0.657	0.836					
IB	0.569	0.592	0.577	0.779				
RT	0.432	0.532	0.555	0.490	0.835			
NE	0.453	0.441	0.431	0.521	0.472	0.860		
OC	0.468	0.467	0.426	0.628	0.444	0.466	0.789	
OP	0.623	0.716	0.763	0.625	0.512	0.423	0.445	0.882

Source: The authors' calculations

Table 3. (Discriminant Validity – HTMT Ratio)

Cons.	AG	CO	EX	IB	RT	NE	OC	OP
AG								
CO	0.741							
EX	0.687	0.756						
IB	0.666	0.684	0.643					
RT	0.497	0.614	0.622	0.550				
NE	0.540	0.512	0.474	0.573	0.521			
OC	0.570	0.559	0.490	0.718	0.512	0.524		
OP	0.687	0.806	0.836	0.679	0.558	0.454	0.501	

Source: The authors' calculations

5. STRUCTURAL MODEL THROUGH BOOTSTRAPPING

Figure 2 presents the connections between the constructs through the structural model of the study. The direct and indirect relationships between the exogenous, endogenous, and mediating variables are tested using the bootstrap technique [37].

5.1 Path coefficients' Analysis

Table 4 revealed the significant impacts of Big 5 PTs and psychological biases (RT and OC) on IB. The study's findings reveal that all PTs, except for EX, have a positive and significant impact on IB. Specifically, AG, CO, NE, and OP positively influence IB Therefore, Hypothesis (H1) is supported.

Additionally, there is a significant positive influence of EX, CO, and NE traits on RT, while the relations with other traits AG and OP are found to be insignificant. Hence, the Hypothesis (H2a) is partially supported.

However, the relationship between RT and IB of individual investors is found to be insignificant. Consequently, the Hypothesis (H2b) is rejected.

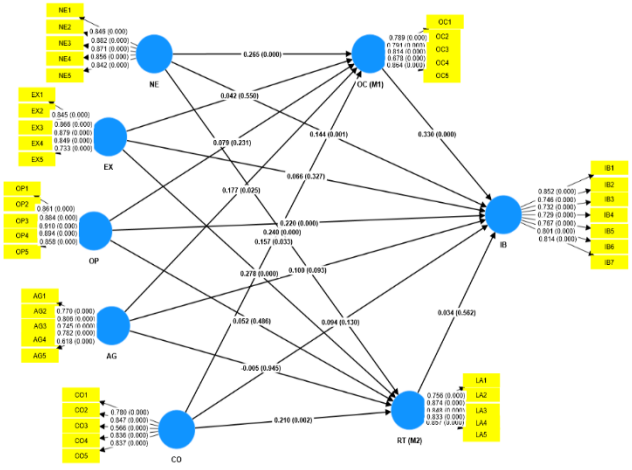


Fig. 2. Structural Model

Table 4. (Path Analysis)

Path Coefficient	β Value	T value	P values
AG -> IB	0.162	2.683	0.007**
CO -> IB	0.153	2.365	0.018**
EX -> IB	0.090	1.346	0.178
NE -> IB	0.238	5.162	0.000**
OP -> IB	0.243	3.876	0.000**
AG -> OC	0.180	2.247	0.025**
CO -> OC	0.158	2.135	0.033**
EX -> OC	0.042	0.598	0.550
NE -> OC	0.264	5.515	0.000**
OP -> OC	0.076	1.199	0.231
OC -> IB	0.330	7.255	0.000**
AG -> RT	-0.004	0.069	0.945
CO -> RT	0.212	3.070	0.002**
EX -> RT	0.275	4.139	0.000**
NE -> RT	0.240	4.212	0.000**
OP -> RT	0.051	0.697	0.486
RT -> IB	0.036	0.581	0.562

Source: Authors' calculation

Moreover, personality traits such as AG, CO, and NE have a significant positive influence on OC, while the

relations with other traits (EX and OP) are found to be insignificant. Most of the investors' personality traits have a significant effect on OC. Therefore, Hypothesis (H3a) is supported. Furthermore, there is a significant positive influence of OC on the IB of individual investors Hence, Hypothesis (H3b) is supported, highlighting the impact of OC on IB.

5.2 Direct and Indirect Effects of PTs over IB

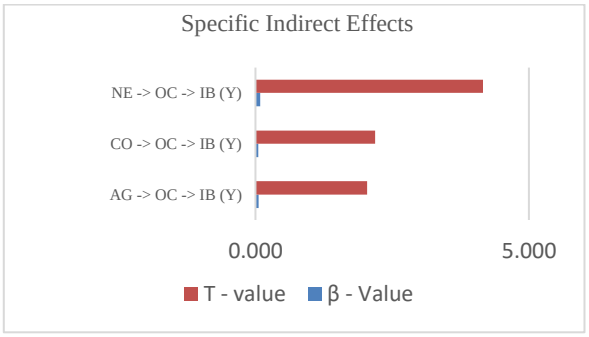
Table 5 and Figure 3 revealed personality traits' total, direct, and indirect effects on the IB of individual investors with the inclusion of mediating variables (RT and OC). The total effect of mediating variable RT on IB is found to be insignificant, so no mediation effect of RT between PT and IB of individual investors and H2c is rejected. Further, the total effect of mediating variable OC on IB is significant but specific indirect effects of personality traits (EX and OP) are found to be insignificant so no mediation effect of OC between EX, OP, and IB, respectively. While the significant mediation effect of OC is found between personality traits (AG, CO, and NE) and IB So, on a majority basis, H3c is supported.

Table 5. (Mediation Analysis: total, direct, and indirect effects)

Type of Effects	Relationship Variables	β values	T Statistics
Total Effect	AG -> IB	0.162	2.683
Indirect Effect	AG -> OC(M1) -> IB	0.06	2.042
Direct Effect	AG -> IB	0.104	1.682
Strength of Mediation	(VAF)	37%	
Total Effect	CO -> IB	0.153	2.365
Indirect Effect	CO -> OC (M1) -> IB	0.051	2.189
Direct Effect	CO -> OC (M1)	0.095	1.513
Strength of Mediation	(VAF)	33%	
Total Effect	NE -> IB	0.238	5.162
Indirect Effect	NE -> OC (M1) -> IB	0.087	4.161
Direct Effect	NE -> OC (M1)	0.141	3.447
Strength of Mediation	(VAF)	37%	

Source: Authors' calculation
Note: (VAF) = (Indirect Effect/Total Effect) *100

Further, with reference to the strength of mediation, the study found 37%, 33%, and 37% values of (VAF) that show moderately strong full parallel mediation of OC between AG and IB and between CO and IB, respectively. Again, the study found moderately strong partial parallel mediation of OC between NE and IB of individual investors [38].



Specific Indirect Effects:

Fig. 3. Mediation Effect of OC between (AG, CO, NE) and IB.

5.3. Predictive Relevance and Goodness of Fit Analysis:

The explanatory power and predictive relevance are key metrics used to determine the effectiveness of a model [39]. These are quantified by R^2 and Q^2 values, respectively. The value of R^2 measures the amount of variance occurs due to independent variables in the model, which also serves as an indicator of goodness of fit of the model. High values of R^2 suggest a large proportion of variance indicating a strong fit to the data [40].

Table 6 shows the values of R^2 for the variables IB, OC, and RT which are 59.6%, 34.2%, and 41.3% respectively. Thus the highest variance 59.6% observed in IB, largely influenced by factors like PTs, RT, and OC. Similarly, 34.2% of the variance in OC and 41.3% in RT can be explained by the model, suggesting moderately strong explanatory power for these constructs [41].

Table 6. (Models' Predictive Relevance & Goodness of Fit)
Note: M1=Mediater1, M2=Mediater2

Endogenous Constructs	R-square	Q-square
IB	0.596	0.495
OC (M1)	0.342	0.308
RT (M2)	0.413	0.384

On the other hand, Q^2 values assess the predictive ability of the model to predict new data points based on the model parameters obtained through techniques like cross-validation. A positive Q^2 value indicates that the model possesses predictive relevance, with higher values denoting stronger predictive capabilities. The Q^2 values reported for IB, OC, and RT are 49.5%, 30.8%, and 38.4%, respectively. These values demonstrate that the model provides strong predictive accuracy for IB.

6. DISCUSSION & IMPLICATION

This study offers insightful information about the relations between individual investors' PTs some specific cognitive biases and their investing behaviour (IB) in the stock market. Except EX, a positive and substantial correlations are found between PTs such as AG, CO, NU, OP and IB. Those who exhibit AG traits have pleasant personalities, are sympathetic toward others and are optimistic about their financial investing choices [4]; [11], 2019; [14]. Also, investors with OP traits are innovative, curious, and receptive to unusual beliefs and ideals and favour stock market investments [4]; [16]. However, NE individuals are more inclined to encounter psychological distress and have unfavourable opinions about stock investments [17]. Individuals with CO traits are usually industrious, exhibit strong self-control, and are highly particular about the investments they make [4]; [16]. By showing how two psychological biases, such OC and RT, have different mediation effects on the connection between IB and PTs in the stock market, the study's findings broadened our understanding of behavioural finance. Although the study indicated that CO, EX, and NU have a significant impact on RT, no significant mediation effect was found between PTs and IB. Further, the study confirms significant and positive relations between AG, CO, and NU and IB via OC bias. Thus, a significant mediation effect of OC bias has been seen between PTs (AG, CO, and NU) and IB. The mediation effect of OC highlights its pivotal role in shaping the relationship between AG, CO, NU, and IB.

The findings of this study offer practical implications for investors, financial advisors, and policymakers seeking to better understand and manage behavioural influences in financial decision-making. Financial advisors may use these insights to tailor their advisory strategies according to individual behavioural profiles, while policymakers can incorporate behavioural considerations into regulatory frameworks and financial literacy initiatives. Additionally, these insights pave the way for future research exploring the dynamic nature of these relationships over time and across diverse market conditions, providing a foundation for more nuanced and effective strategies in financial decision-making.

7. CONCLUSION

The findings of the study indicate that individual investors' IB is positively associated with PTs such as AG, CO, NU, and OP, while EX was found to have no significant influence on investment behaviour. The study concludes that RT does not mediate between personality traits (PTs) and IB, as its effect was found to be insignificant. Conversely, OC significantly mediates the effects of AG, CO, and NU on IB, demonstrating its pivotal role in linking these personality traits to investment decisions. This highlights the importance of considering cognitive biases like OC in understanding and improving financial decision-making processes. The findings demonstrate how OC plays a significant mediating role between PTs and investing choices, especially for NU, AG, and CO. This demonstrates how psychological biases affect financial judgment and implies that correcting these biases can enhance investment strategies. These insights are vital for investors, financial advisors, and policymakers for creating targeted interventions that consider personality-driven biases, ultimately aiding in more informed and effective financial decision-making.

8. LIMITATIONS & FUTURE DIRECTIONS

The study, which focuses mainly on the Indian stock market, restricts its generalizability to other contexts. Self-reported data introduces potential biases, and the examination of only a few psychological biases, such as RT and OC, might overlook other influential biases. Additionally, the limited sample size and diversity could affect the robustness and scalability of the findings.

Future research could address these gaps by incorporating longitudinal study designs to track changes over time, expanding the study to include diverse cultural and economic contexts, and exploring additional psychological biases. Further studies could also investigate the role of other personality traits and their interaction with economic variables in influencing IB, potentially offering a more holistic view of investor psychology.

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