Impact of Neurotransmitters, Emotional Intelligence and Personality on Investor's Behavior and Investment Decisions

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Abstract

Mainstream of the investors and investment advisory consultants suggest and focus on standard finance models and do not take into account the behavioral and neurological dimensions of finance as neurotransmitters, emotional intelligence and personality of investors. These aspects of individual investors can cause of several mistakes while investing in stock market. The primary data of 455 investors from Pakistan Stock Exchanges is used for analysis. The data analysis performed with the help of Hierarchical Latent Variable Models in PLS-SEM by using the reflective-formative type constructs as guided by Becker et al., (2012). The empirical evidence of the study reveals that personality dimensions especially openness and consciousness as well as emotional intelligence dimensions especially self emotions apraisal and regulation of emotions have significant relations with the behavioral features of investor especially investment horizon, personalization of loss and control level. Similarly, neurotransmitter's dimensions dopamine and epinephrine have significant relation with investment decisions of indiviual investors. In view of this, emotional intelligence, neurotransmitters and personality collectively have 13.2% impact on ivestor behavior and these dimensions collectively have 4.1% impact on investment decisions of individual investor. The study opens new horizon by providing supplemented inner view of investor's behavior and their decision's in the stock market of Pakistan and demands more effort to determine universal latent constructs for combine model of neurofinance and behavioral finance. However, limitation of study is that it does not analyze the current model beyond the current sample size for stock market of other regions of the world.

Keywords: neuro-finance, behavioral finance, neurotransmitters, emotional intelligence and personality.

1. Introduction

In current circumstances, investment is extremely imperative for every person because individuals constantly favor the investment opportunity according to their behavioral elements of investment (Dhiman & Raheja, 2018). Similarly, the stock market's environment is becoming very competitive in the world integrated economy, where as in Pakistan the investors progressively more worried on the subject of humanizing their acts to meet up the modern challenges. Mainstream of the investors and investment advisory

consultants both suggest and focus on standard finance models and do not take into account the neurological facets of finance as neurotransmitters and behavioral psychological aspects of finance as emotional intelligence and personality of investors and their investment decisions. These aspects of individual investors can cause several mistakes while investing in stock market as to make unprofitable decisions.

Normally, investors behavior takes part an indispensable job in sustainability, efficiency as well as prosperity of the investing environment in liberated financial system. neurotransmitters, emotional intelligence (EI) and personality are being documented, at the same time as a system in support of scheming along with implementation of a self-regulated checking and remedial method, where feeling or sentiment or emotion as statistics or figures. This study would be center of attention on shaping the impact of neurotransmitters, EI and personality measures on investor's behavior and its eventual rear-ender on investment decisions in stock market.

The transformation in the financial system as well as scenery of equity investment sector from investing to profit/loss concentrated actions has activated the worth of neurofinance concept as neurotransmitters. The neurotransmitters are chemical messenger in human brain which generates the signals from one neuron to another neuron (Lodish, 2000). In individuals neurotransmitters enter into a most important responsibility in daily life and working (Cherry, 2015). Neurotransmitters composed of dopamine, serotonin, epinephrine and norepinephrine which may have association with investor behavior of individuals. Harlow & Brown (1990) explored that dopamine, serotonin and norepinphrine as the neurotransmitters are involve in signaling and have relation with investor's behavior.

Pompian (2006) explored that dopamine has contribution towards the investor's behavioral aspects for instance optimism, overconfidence and loss aversion possibly will be a straight forward outcome of low level of serotonin. Individuals have different presences towards the risk as Preuschoff et al. (2006) illustrated that dopamine is associated with risk and reward. Kuhnen & Chiao (2009) studied and found that neurotransmitters dopamine and serotonin are important factors of risk taking in decisions of investment and these mentioned neurotransmitters have consequence towards the method a human being process the facts and figures related to the financial incentive as well as the loss avoidance.

Mayer, et al. (2000) describe emotional intelligence as sentiments of mind-set that someone have whereas cleverness as the capability of reasoning with something. Cherniss (2000) describes that EI shows the approaches wherein one makes fastidious large support in the coming time period. Ameriks et al. (2009) studied and found the clue of significant associations between emotional intelligence and investor's behavior in numerous, although not the entire areas which were investigated.

Rubaltelli et al. (2015) studied that emotional intelligence estimate the motivation for the investment as well as EI has a distinctive consequence on investor's behavior by manipulating the additional extent that was explored. Salovey (2006) described that emotional intelligence has relationship with behavioral features of investor as loss aversion, endowment effect and status quo bias. Lubis et al. (2015) studied that emotional

intelligence and personality are defense mechanism and have relationship with individual investor decisions.

Psychological variables in finance as personality and individual investor behavior are efficient and helpful in stock market operation and then it is impossible for the investors not be successful in information base world and integrated equity market system. As we know that personality is the concept which has been derived from the diverse theoretical corner as well as different phases of ideas (John et al., 1991). Durand et al. (2013) explored that personality traits have correlation with investor's overconfidence and overreaction while investing in the stock market. Similarly, Mallick (2015) investigated that different personality traits have straight and unambiguous relation with different behavior aspects of individual investor. Meanwhile, Rizvi & Fatima (2015) investigated and found that investor's personality traits such as extraversion, agreeableness, conscientiousness, neuroticism, and openness have relationship with the individual investor behavior.

Investor's behavior has been identified as a most key element in the capital market which acts as a decisive operator towards investment program that give astonishing economic benefits. Wood & Zaichkowsky (2004) mentioned that behavior constructs of investors are as risk attitude, personalization of loss, investment horizon, confidence and control. Ghun & Mimg (2009) performed the research in the Malaysian perspective and exposed that constructs of investor's behavior are overconfidence, anchoring, loss aversion and representativeness. Chin (2012) also studied the investor behavior in Malaysian stock market and mentioned in his work that regret, self-confidence, belief and snake and bite effect shapes the investor's behavior. Thapa (2014) studied the individual investor behavior in the Stock Market of Nepal and said that Overconfidence, optimism, risk attitude and involvement are constructs which shapes the investors behaviors. Tedongap (2015) exposed that different investment horizon have different relation with cross sectional expected gain from stock. Alaoui et al. (2015) performed investigation and found that investment horizon have association with gain of stock. Dangl et al. (2015) revealed that loss-averse investors come out to utilize a standard for assessment to estimate the profit and loss of investment of bunch of stock of different companies. Sheikh & Riaz (2012) found that overconfidence has association with stock market gain and other things as volatility and trading volume.

Further the investigation expands and pursues the upcoming direction related to research recommended by Ameriks et al. (2009) emotional intelligence and different psychological aspects of investor behavior. Kuhnen et al. (2013) during the investigation of the different neurotransmitters and financial choice, found unlear relation and recommended that futher studies of neural or hormonal influence on the investment decisions of investors with large sample size. Mosher & Rudebeck (2015) recommended the futher studies on reward related planning signals association with cognitive functions.

Neurofinance is inter-disciplinary field for probing which engage neurobiology with over and above financial market while behavioral finance involves behavioral psychology and financial market and their participant's activities. Particularly the research would respond the following main query.

> ➢ How do neurotransmitters, EI and personality have effects on the investor behavior and investment decisions in stock market?

This research is an effort to show the possible linkages of neurotransmitters, EI and personality with investor behavior and investment decisions in stock market so that individual investors by avoiding the feelings or sentiments or emotions intelligently with reasons that would mold the neurological, psychological issues in favor of profitable investment program.

The objective of the investigation to build up unique sculpt showing the relation between the neurotransmitters, EI, personality, investor behavior and investment decisions in stock market with some latest constructs to amplify and inflate the association. Further, specifically the investigation would be focused to:

i) Find out the relationship of neurotransmitters, EI, personality, investor behavior and investment decisions in stock market

ii) Explore the impact of neurotransmitters, EI and personality on investor behavior

iii) Explore the impact of neurotransmitters, EI and personality on investment decisions in stock market

Neurofinance is a comparatively latest research area in order to make the struggle for recognizing the monetary verdicts as a result of joining the forthcoming as of neuroscience and psychology with financial hypothesis (Miendlarzewska et al., 2017). In the meantime, Kumar & Sireesha (2017) disclosed that neurofinance act as bridge among the human mind and decisions in the financial market. While studying "collaboration of psychology, neurology and investor behavior" Diacogiannis & Bratis (2013) revealed that neurofinance make addition to the traditional finance with the help of neuroscience as well as psychology. Similarly, author also disclosed the advantages of the advancement in neurofinance as a substitute way of internal best judgment of the selection process while making investment decisions.

The capability of investors to carry on and nurture in the 2st century, awareness base market can be controlled, depending upon know-how of effective and efficient neurotransmitters to exploit financial assets of investors. Neurotransmitter's signals movement in human brain act as hammering force for the behavioral aspects (Harden & Klump, 2015). Similarly, Shao et al. (2015) documented that role of neural bases observed in individuals' investors when making decisions regarding the total sum of appreciated outlay of funds and percentage of required return. Dornelles et al. (2007) studied and found that neurotransmitter namely epinephrine makes adjustment in the human remembrance process for the psychologically triggering situation. In recent times, Conway & Slavich (2017) revealed that neurotransmitters, dopamine and serotonin involve in different aspects of behavior which are beneficial for individuals of society. For the time being, Efremidze et al. (2017) observed that dopamine has various functions in the human mind as well as physical structure, along with inspiring concentration to latest news in the surroundings as long as the human being with a enjoyable know-how.

Mayer et al. (2001) studied that individuals in the midst of superior emotional intelligence are best practiced to recognize their personal as well as outsiders sentiment in circumstances, utilize that data to direct their dealings, as well as oppose forces as compare to others. Ameriks et al. (2009) reported that emotional intelligence takes up the person's glee, rage, or attitude on a specific moment and sensations like figures or statistics. Pizzani (2017) revealed that emotional intelligence is your capability to identify and realize our emotion and exploit this understanding to administer yourself as well as your associations among others. Akhtar et al. (2015) documented that investor making decisions, related to the tolerance of threat as well as the investing plans, are highly influenced by the personality features. Investment decisions determine a degree of safety, ability to meet the financial obligations. As we know that investment decisions are critical and tricky particularly in a stock market moreover these kinds of decisions require superior sympathetic and insight (Qureshi, 2012).

2. Literature Review

The world give attention to neurofinance in 2005 when the first study related to the neurotransmitters role in financial decision making gives awareness to the individuals who keenly occupied positions in the field of business, especially stock market business. The label of initial research was "neural basis of financial risk taking" by the (Kuhnen & Knutson, 2005) in the Stanford University, USA. Emotional Intelligence and complementary psychosomatic attribute as personality has incredible relationship with different aspect of investor's behavior. Due to the worth mentioning role in stock market for investors show the need of advancement in these neurofinance and behavioral finance aspects.

The majority of the existing literature related to the neurotransmitters and behavioral aspects of investors appears in the developed world and proposed that connection stay alive among the stock trading, dopamine, serotonin and buying as well selling of stocks and trading behavior in stock market. No single study has ever tried to combine these four measures of neurotransmitters with investor behavior and investment decisions. Just only single investigation try to explore the relationship between EI and investor behavior however to achieve the concluding remarks as of limited view of investor behavior (Ameriks et al., 2009).

Scholarly discussion about the investor behavior of individual openly started when Klein in 1951, wrote a section with the title of "Studies in Investment Behavior" in the book of "Conference on Business Cycles" under the umbrella of National Bureau of Economic Research in Cambridge. Klein (1951) called it as investor behavior theory and financial circumstances that are scene to be occur. Wood & Zaichkowsky (2004) said that stock market investor's behavior includes investment horizon, risk attitude, confidence, control and personalization of loss. Chun & Ming (2009) discussed the investor behavior of Malaysian stock market investors that includes constructs as overconfidence, representativeness, loss aversion and anchoring. Similarly, Chin (2012) investigated the investor behavior of Malaysian stock market investors that may include their belief, decision making and psychological concepts as regret, self-confidence. Thapa (2014)

studied the investor behavior of individual in the stock market of Nepal and finalized the constructs as overconfidence, optimism, involvement and risk attitude.

First time in scholarly studies few words were exchanged about the relation of neurotransmitters measures and investor behavior openly in scholarly investigation, by the Kuhnen & Knuston (2005) when got in print his manuscript in neuron academic periodical in the discipline of neuroscience, it is believed, at that time the earliest piece of writing on neurotransmitters measures and behavioral aspects of investor (Sahi, 2012). Lodish et al. (2000) documented that neurotransmitters are something like substance/material that makes possible communication with the help of impulses/signals in innermost anxious structure of body. Mayer et al. (2004) defined the EI as the personnel capability to practice the emotional data and utilize it to downbeat the situation. Carolyn et al. (2014) describe that EI as a talent of recognizing the feelings, combine the feelings to assist thinking process, realize feelings as well as adjust feelings to support individuals strengthening.

Scholarly work of the personality gives a scientific description about the uniqueness of individuals. It also highlights the determinants of inner behavioral aspects as qualities, desires, intentions, and social facets of person's uniqueness (Storm, & De-Vries, 2006). Allport & Allport (1921) investigation on personality features started then countinue grow over and over. As explored by the Allport (1961) that personality is a vibrant involvement, in the inner personality of the individual, of psychophysical configuration so as to make the individual's characteristic prototype of dealings, decisions and frame of mind. Different experts work done on it as McCrae & Jr (1997). Similarly, Parashar (2010) studied that individual's personality characteristics may be helpful for experts of assets supervisors who can give better advice to their customers and these personality features may be source in favor of assembling the opinion regarding the psychology of investor, investment preferences, adventuresome even as making investment in stock market. Sadi at al. (2011) performed the study in Iranian equity market and fond that personality features as openness and extroversion have positive relation with the behavioral characteristics of investor as hindsight, neuroticism also have relation with overconfidence but negative relationship among the openness and availability. Kourtidis et al. (2011) investigated and documented that personality characteristics have influence on the investor behavior as overconfidence as well as hazard forbearance.

The latest litrature revealed the linkages among the different dimensions of study as personality characteristics influence the investment decisions (Dhochak & Sharma, 2016). It is revealed that behavioral features of investors influenced by emotional intelligence and personality features (Dhiman & Raheja, 2018). Similarly, Tauni et al. (2017) revealed the relation among the personality charcteristisics and behavior features of investor and found that individual who have openness and neuroticism qualities make investment more repeatedly at the same time as investors with extraverted and conscientious personality traits buy or sell shares with less concentration. Similarly, Lazer et al. (2017) studied the Cloninger's model of personality with neuropsychological aspects of individuals and observed the association between the neurotransmitters and attitude of risk. They also revealed the relation between the personality dimensions and decision making while making the investment. Raheja & Dhiman (2017) revealed the constructive connection

among the personality and investment decisions. He also recommended that investor must be vigilant about what, where, why, when and how to take decision of investment in diverse investment opportunities. Similarly, Kaur (2017) disclosed that personality characteristics have influence on behavioal aspect of investment decisions.

Similarly, Lang et al. (2017) examine the associations among the neurotransmitters and investment decisions. At the same time, Mamula & Blazanin (2017) examine the links among the signal of brain and investment decisions. Meanwhile, Singh et al. (2017) observed the association of dopamine, serotonin and norepinephrine with investment decisions in stock market. Fineberg et al. (2017) studied and observed the association among the neurotransmitters and decisions of investment. Wang et al. (2017) showed the role of dopamine in decision making regarding the expenditures and gain and concluded that the level of dopamine will decide the investment. Ty et al. (2017) suggested that neurotransmitters support to financial decisions which gave benefit to society. Pertl et al. (2017) observed the relation of neurotransmitters and decisions related to the investment for saving purpose.

Ingram et al. (2017) point out the relationship among the emotional intelligence measures and investment decision measures. Nakamura et al.(2017) exposed the relation of investment decisions and facets of emotional intelligence. Similarly, Vakola et al. (2017) discussed the linkages among the long run investment decisions and measures of emotional intelligence. Reid (2017) disclosed that non-natural intelligence of emotions can improve the decisions about the investment. According to Corea (2017) emotional intelligence is wisdom and talent and this will explore the decisions concern to the investment. However, according the Salehi & Mohammadi (2017) emotional intelligence and investment decisions have no relationship.

On the base of above mentioned literature, following hypotheses are developed to test the impact of neurotransmitters, emotional intelligence and personality on investor behavior and investment decisions in stock market:

- ➢ **H_1:** Neurotransmitters have significant influence on investor behavior
- ➢ **H_2:** Emotional Intelligence has significant influence on investor behavior
- ➢ **H_3:** Personality has significant influence on investor behavior
- ➢ **H_4:** Neurotransmitters have significant influence on investment decisions
- ➢ **H_5:** Emotional Intelligence has significant influence on investment decisions
- ➢ **H_6:** Personality has significant influence on investment decisions
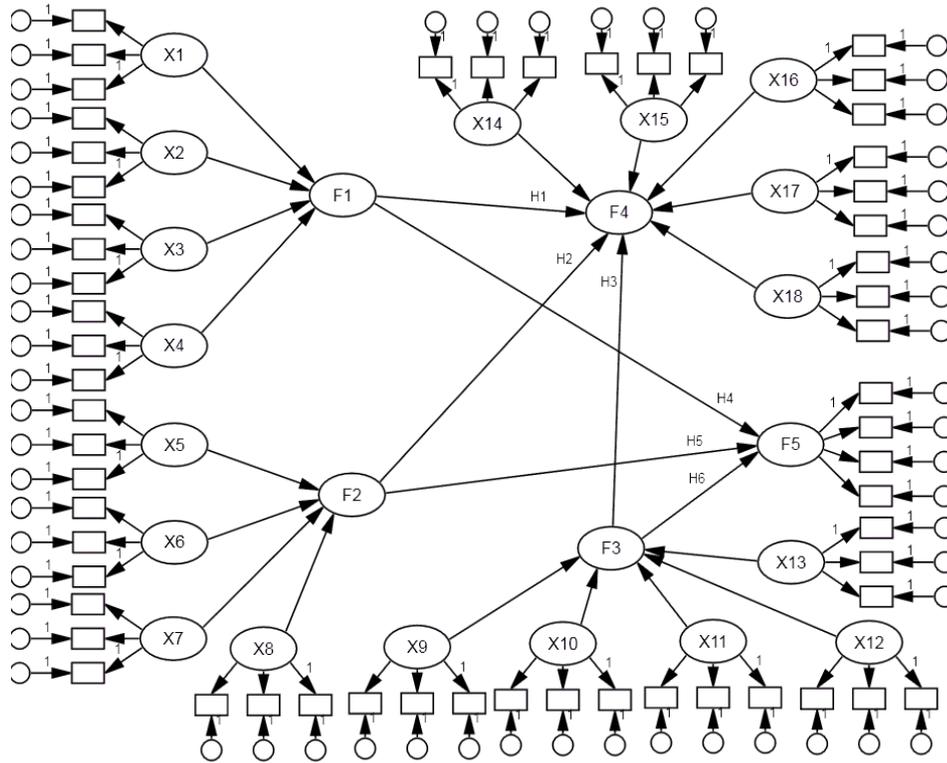
Figure 1: Conceptual Framework of Study

The main dimensions of the latent variables and their description is given below:

Table1: Higher Order Latent Constructs and Their Description

Main Latent Variables	Description
F1	Neurotransmitters (NT)
F2	Emotional Intelligence (EI)
F3	Personality (PR)
F4	Investor Behavior (IB)
F5	Investment Decisions (ID)

Each of the latent will be measured with the help of set of questions. The main dimensions, their latent variables and their description given below:

Table 2: Higher Order Latent Constructs with Their Lower Order Constructs and Their Description

Main Latent Variables	Sub-Latent variable	Description
Neurotransmitters (F1)	X1	Dopamine
	X2	Serotonin
	X3	Norepiphrine
	X4	Epiphrine
Emotional Intelligence (F2)	X5	Reading Emotion
	X6	Using Emotion
	X7	Understanding Emotion
	X8	Managing Emotion
Personality (F3)	X9	Extraversion
	X10	Agreeableness
	X11	Conscientiousness
	X12	Neuroticism
	X13	Openness
Investor Behavior (F4)	X14	Investment Horizon
	X15	Risk Attitudes
	X16	Control
	X17	Confidence
	X18	Personalization of loss
Investment Decision (F5)	X19	Investment decisions

3. Research Methodology

3.1 Population and Sample Size

This study used the primary data from individual investors who trade at Pakistan Stock Exchange (PSX) and unit of analysis of study is individual investor at Pakistan Stock Exchange (PSX) because, According to Alam (2015) there are approximately 0.22 million individual investor at Pakistan Stock Exchange. As said by Associated Press of Pakistan (2016) Pakistan Stock Exchange is paramount amongst the globally most excellent performing stock exchanges between the 2009 and 2015. For data collection, author visited 100 brokerage houses at Pakistan Stock Exchange and gave them approximately 12 questionnaires to each and asked them to be filled up questionnaires from their clients (individual investors) if they visited. This way of data collection believed to be a suitable process for the reason that it is up to the readiness of subjects to respond the questions.

The data collection process does not show as much of consequence of common attraction toward the answers because of the nonattendance of researcher (Duffy et al., 2005). That is why, 1200 questionnaire distributed in the brokerage houses then these questionnaires

were forwarded to the individual investors by the brokerage houses. After few days, researcher again visited the brokerage houses and collected the 595 questionnaires and remaining did not returned by the respondents and 501 out of 595 were completed. So, the rejoinder rate was 49.58 percent. So, According to Osborne & Costello (2004) there is no accurate rule to decide the size of sample in behavioral investigation. They response and question moreover 20 percent of scholarly work used the proportion below the 5:1 between the response and question. The size of sample 455 is used for further analysis after detection of outlier. So, in this research, it is still superior as compared to the ratio of 5:1 between the respondent and question which is deem to be suitable to carry out the study. As Wolf et al. (2013) suggested that sample of 460 will be appropriate for SEM to obtain the suitable results.

3.2 Measurements of Variables

Peterson (2014) revealed that other than the labortroy setting, there are several method to measure the neurotransmitters that neurofinance researchers used as surveys, personality testing such as the NEO, and specific psychometric instruments or scales. As Song et al. (2010) in their study measured the neurotransmitters with the help of symptom scale of neurotransmitter deficiency (SSND) questionnaire having 111 items. Similarly, Ge & Lui (2015) in their research used questionnaire with 111 items to measure the few facets of neurotransmitters.

As previous studies indicates that neurotransmitters measurement is possible with the help of questionnaire. In the view of Aupperle et al. (1985) we should develop a questionnaire to avoid some of methodological setback of earlier scholarly work because of the importance of the design and validation of scale. Stone (1978) said that the questionnaire is the frequent way of data gathering in field research. So, In this research the scale of neurotransmitters developed by using items of Colbert (2012) for dopamine, serotonin, norepinephrine and Tessler (1997) for epinephrine with the help of seven steps procedure from item generation to replication of scale recommended by the (DeVellis, 1991; Hinkin, 1995; Hinkin et al. 1997; Hinkin, 1998; Kinicki et al. (2013) and Zheng, et al. (2015). The questionnaire of (Wong and Law, 2002) used for measurement of emotional inteligence having 16 items 4 items for each construct. Similarly, Personality is measured with the help of five constructs as openness, extraversion, agreeableness; conscientiousness and neuroticism with opposite positions having 44 items and these 44 items were developed by the (John & Srivastava,1999). However, for the measurement of investor behavior the questionnaire of (Wood & Zaichkowsky, 2004) is used having 18 items. Similarly, investment decisions are measured by the (Pasewark & Riley, 2010) having 14 items.

3.3 Developing the Structural Equations

As a final point, research model of this study is to be build up by generating structural equations that make connections among the neurotransmitters, EI and personality on investor's behavior and investment decisions.

3.4 Measurement Model

In Figure 1 all indicators (shown in squares) build and influence their respective main and sub- latent constructs (shown in circles). These main and sub-latent constructs can be measured in mathematical terms as:

$$F1= \lambda1X1+ \lambda2X2+ \lambda3X3+ \lambda4X4+\mathcal{E}$$

$$F2= \lambda5X5+ \lambda6X6+ \lambda7X7+ \lambda8X8+\mathcal{E}$$

$$F3= \lambda9X9+ \lambda10X10+ \lambda11X11+ \lambda12X12+ \lambda13X13+\mathcal{E}$$

$$F4= \lambda14X14+ \lambda15X15+ \lambda16X16+ \lambda17X17+ \lambda18X18+\mathcal{E}$$

$$F5= \gamma1Y1+ \gamma2Y2+ \gamma3Y3+ \gamma4Y4+ \gamma5Y5+ \gamma6Y6+\mathcal{E}$$

3.5 Structural Model

The first hypothesis (H_1), impact of latent exogenous variable, neurotransmitters measures (F1) on latent endogenous variables, investor's behavior (F4) would be measured through:

$$F4= \beta1F1+ \mathcal{E} \qquad (H_1)$$

While second hypothesis (H_2), impact of latent exogenous variable, EI measures (F2) on latent endogenous variables, investor's behavior (F4) would be measured through:

$$F4= \beta2F2+ \mathcal{E} \qquad (H_2)$$

In this way, third hypothesis (H_3) impact of latent exogenous variable, personality (F3) on latent endogenous variables, investor's behavior (F4) would be measured through:

$$F4= \beta3F3+ \mathcal{E} \qquad (H_3)$$

Similarly, forth hypothesis (H_4) impact of latent exogenous variable, neurotransmitters measures (F1) on latent endogenous variables, investment decisions (F5) would be measured through:

$$F5= \beta1F1+ \mathcal{E} \qquad (H_4)$$

In this way, fifth hypothesis (H_5), impact of latent exogenous variable, EI measures (F2) on latent endogenous variables, investment decisions (F5) would be measured through:

$$F5= \beta2F2+ \mathcal{E} \qquad (H_5)$$

In this way, sixth hypothesis (H_6) impact of latent exogenous variable, personality (F3) on latent endogenous variables, investment decisions (F5) would be measured through:

$$F5= \beta3F3+ \mathcal{E} \qquad (H_6)$$

While the impact of neurotransmitters, EI and personality on investor's behavior and investment decisions would be calculated through:

$$F4= \beta1F1+ \beta2F2+ \beta3F3+ \mathcal{E}$$

$$F5= \beta1F1+ \beta2F2+ \beta3F3+ \mathcal{E}$$

Detail of proxies for exogenous and endogenous variables is given in the Table (1 and 2). However, Greek letters λ, γ and β are coefficients of main and sub-latent constructs while Greek letters $\mathcal{E}$ indicates an error term.

3.5 Partial Least Squares base Structural Equation Modeling (PLS-SEM)

This research employed the most flourishing statistical method of multivariate analysis known as Partial Least Squares Structural Equation Modeling (PLS-SEM) because according to the Becker et al. (2012) in modern days charm of partial least squares structural equation modeling (PLS-SEM) is growing. In addition to this, Henseler et al. (2009) said that PLS-SEM is best method even for data which did not meet the condition of normality.

3.6 Hierarchical Latent Variable Model in PLS-SEM using Reflective-Formative Type Model

In this study, we applied the hierarchical latent variable model in PLS-SEM using reflective-formative type model as per the guideline of (Becker et al., 2012). Because this research have four higher order latent formative constructs and nineteen lower order reflective constructs and these lower order reflective constructs consist of their respective items. In modern days, according to Becker et al. (2012) hierarchical latent variable models in PLS-SEM using reflective-formative type model are most preferable. Previously, Chin (1998b) said that the component model or hierarchical or higher-order latent variable models are clear demonstration of multi aspect variables that are present at a superior stage of concept. So, we used reflective-formative type II model in hierarchical latent variable model using PLS-SEM because according to Chin (1998b) first or subordinated or lower order variable should be quantify reflectively that form the concept of construct. However, in this study we applied the two stage approach because of nature of hypothesis of study. Because, Becker et al. (2012) said that two stage method is most appropriate as compare to repeated indicator or hybrid approach when researcher are interested mainly in higher order latent constructs. They also said that two stage methods are more practical when guessing advance practical type of model on the second order level of study. Lee & Cadogan (2012) proposed the two stage approach when higher order latent constructs have formative nature.

4. Results and Discussion

Prior to the application of the statistical technique to answer of research question of this study, numerous pre analyses are conducted such as mahalanobis distance for outliers detections as guided by Hodge & Austin (2004). Subsequently, demographics of respondent are studied and after that adequacy of sample and trustworthiness of bunch of items of latent constructs are checked with the help of EFA as guided by (Williams et al., 2010). Therefore, to analyze the model, structural equation modeling approach (SEM) has been used with help of (PLS-SEM) with hierarchical latent constructs by using the guide line of (Becker et al., 2012). As said by Chin et al. (2010) PLS-SEM outcomes may be communicated into two most important steps, talking about the conditions of measurement and structural models. Author use the latest version of SmartPLS for the evaluation of the models of this research. The detail of this is given below.

4.1 PLS-SEM Analysis

This study used PLS-SEM with help of hierarchical latent variable in reflective-formative type model for the analysis of the research with the help of most recent edition of SmartPLS 3.2.7 with two stage approach as the guideline provided by (Becker et al., 2012).

4.1.1 First Stage: Evaluation of Reflective Measurement Model at Lower Order

In the first stage of hierarchical latent variable model, there are thirteen independent latent constructs and five dependent latent constructs at lower order, author will discuss the evaluation of reflective measurement model with the help the statistical measures which are as: reliability of construct with the help of outer loading, composite reliability (CR), Cronbach's alpha (α) whereas convergent validity of construct with the help of (AVE) and discriminant validity of construct with the help of Fornell-Lacker Criterion, cross loading of indicators and Heterotrait-Monotrait Ratio (HTMT). Along with these measures latent score of lower order variables determines which will be used as indicators for higher order latent constructs in second stage on the recommendation of (Wilson and Henseler, 2007; Wetzels et al., 2009). The figure 2 shows the evaluation of reflective measurement model at lower order in first stage.
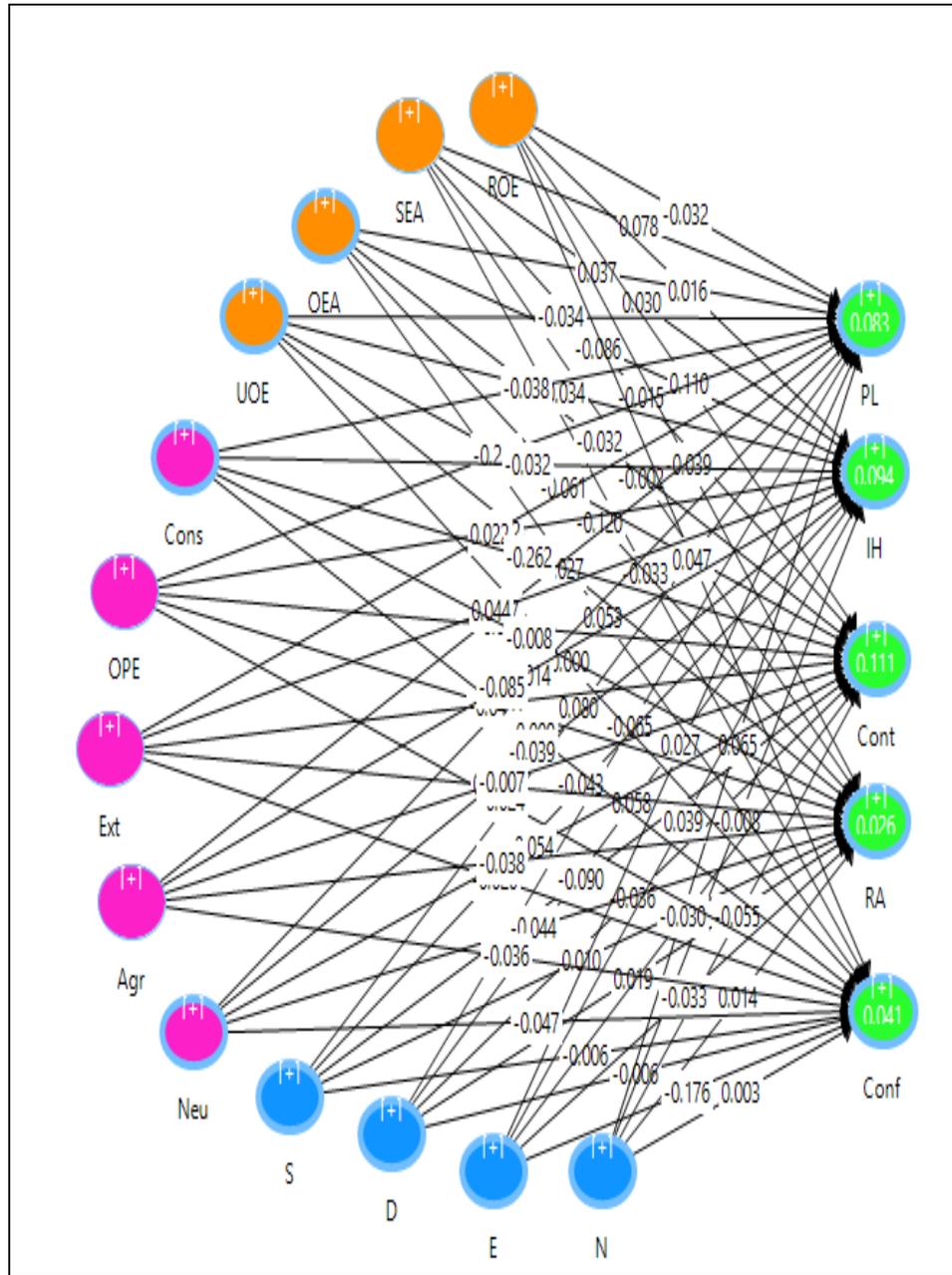
Figure 2: Reflective Measurement Model at Lower Order in First Stage

Table 3 indicates the outer loading, Cronbach's alpha, average variance extracted (AVE) and composite reliability (CR) of lower order latent constructs of investor behavior (IB) such as investment horizon, confidence, control, personalization of loss and risk attitude with their respective items as well as latent construct investment decisions.

Table 3: Assessment of Reflective Measurement Model at Lower Order

Constructs	Items	Loading	Cronbach's Alpha	CR	AVE
Investment Horizon (IH)	IH1	0.82	0.93	0.95	0.82
	IH2	0.94			
	IH3	0.93			
	IH4	0.93			
Confidence (Conf)	Conf1	0.90	0.92	0.95	0.86
	Conf2	0.96			
	Conf3	0.93			
Control (Cont)	Cont1	0.94	0.97	0.98	0.91
	Cont2	0.98			
	Cont3	0.97			
	Cont4	0.92			
Personalization of Loss (PL)	PL1	0.97	0.94	0.97	0.94
	PL2	0.97			
Risk Attitude (RA)	RA1	0.92	0.88	0.91	0.89
	RA2	0.91			
Investment Decisions (ID)	ID1	0.97	0.93	0.93	0.68
	ID2	0.92			
	ID3	0.91			
	ID4	0.49			
	ID5	0.63			
	ID6	0.93			

Similarly, Table 4 indicate the constructs of neurotransmitters (NT) such as dopamine, serotonin, epinephrine and norepinephrine with their respective items and lower order latent constructs of EI such as self-appraisal of emotions, regulation of emotion, use of emotion and other's emotion appraisal. In this study researchers removed those items which do not fulfill the threshold level of reliability, convergent validity of constructs of reflective nature because Hair et al. (2014b) suggested the range of values of Cronbach's alpha from 0.60 to 0.70 and proposed the deletion of every item having loading less as

compare to the recommended standard which is 0.40 because deletion of items will improve the average variance extracted (AVE).

Table 4: Assessment of Reflective Measurement Model at Lower Order

Constructs	Items	Loading	Cronbach's Alpha	CR	AVE
Dopamine	D1	0.74	0.84	0.88	0.64
	D2	0.81			
	D3	0.82			
	D4	0.83			
Serotonin	S1	0.98	0.97	0.98	0.93
	S2	0.97			
	S3	0.92			
	S4	0.98			
Norepinephrine	N1	0.83	0.90	0.93	0.83
	N2	0.92			
	N3	0.97			
Epinephrine	E1	0.98	0.99	0.99	0.96
	E2	0.99			
	E3	0.99			
	E4	0.96			
Self Appraisal of Emotions (SEA)	SEA1	0.76	0.83	0.88	0.65
	SEA2	0.91			
	SEA3	0.81			
	SEA4	0.74			
Regulation Of Emotion (ROE)	ROE1	0.96	0.89	0.88	0.66
	ROE2	0.93			
	ROE3	0.78			
	ROE4	0.49			
Use Of Emotion (UOE)	UOE1	0.98	0.87	0.88	0.71
	UOE2	0.93			
	UOE3	0.55			
Other's Emotion Appraisal (OEA)	OEA1	0.95	0.88	0.95	0.90
	OEA2	0.95			

Table 5 indicates the outer loading, Cronbach's alpha, AVE and (CR) of lower order latent constructs of personality (PR) such as openness, neuroticism, extroversion, conscientiousness and agreeableness with their respective items. However, In this study, researchers removed those items which do not fulfill the criteria of reliability, convergent validity of constructs of reflective nature because Hair et al. (2014b) suggested the range of values of Cronbach's alpha from 0.60 to 0.70 and proposed the deletion of every item

having loading less as compare to the recommended standard which is 0.40 because deletion of items will improve the average variance extracted (AVE).

Table 5: Assessment of Reflective Measurement Model at Lower Order

Constructs	Items	Loading	Cronbach's Alpha	CR	AVE
Openness (OPE)	OPE1	0.74	0.91	0.94	0.79
	OPE2	0.94			
	OPE3	0.96			
	OPE4	0.90			
Neuroticism (Neu)	Neu1	0.96	0.95	0.96	0.83
	Neu2	0.95			
	Neu3	0.95			
	Neu4	0.93			
	Neu5	0.76			
Extraversion (Ext)	Ext1	0.98	0.97	0.98	0.91
	Ext2	0.98			
	Ext3	0.97			
	Ext4	0.89			
Conscientiousness (Cons)	Cons1	0.95	0.95	0.97	0.88
	Cons2	0.97			
	Cons3	0.97			
	Cons4	0.85			
Agreeableness (Agr)	Agr1	0.98	0.95	0.97	0.91
	Agr2	0.94			
	Agr3	0.95			

There are three techniques to assess the discriminant validity of latent constructs such as one of them is Fornell-Lacker (1981) standard which is usually applied to evaluate the discriminant validity constructs. Whereas others two are Cross loading and Multitrait-Multimethod Matrix which is called as Heterotrait-Monotrait ratio (HTMT). Table 6 and 7 indicate the Fornell-Larcker Criterion for the assessment of discriminant validity of latent constructs.

Table 6: Fornell-Larcker Criterion

	Agr	Conf	Cons	Cont	D	E	Ext	IH	N
Agr	**0.955**								
Conf	0.001	**0.929**							
Cons	-0.005	-0.013	**0.937**						
Cont	-0.009	0.094	-0.276	**0.955**					
D	0.067	0.003	0.047	-0.040	**0.801**				
E	-0.171	-0.174	0.000	-0.020	-0.055	**0.980**			
Ext	0.000	-0.018	0.045	-0.062	0.003	-0.025	**0.955**		
IH	-0.109	-0.030	-0.039	0.068	0.060	0.040	0.045	**0.906**	
N	0.008	0.003	-0.178	-0.041	0.002	-0.029	0.031	-0.012	**0.910**

Table 7: Fornell-Larcker Criterion

	Neu	OEA	OPE	PL	RA	ROE	S	SEA	UOE
Neu	**0.914**								
OEA	-0.018	**0.947**							
OPE	0.007	-0.072	**0.889**						
PL	0.017	0.031	-0.230	**0.970**					
RA	-0.042	-0.116	-0.015	0.056	**0.999**				
ROE	-0.070	-0.007	-0.058	0.007	-0.043	**0.811**			
S	0.004	-0.282	0.046	0.050	0.037	0.063	**0.964**		
SEA	-0.019	0.008	-0.007	0.069	-0.005	0.026	-0.173	**0.807**	
UOE	0.059	0.233	-0.055	-0.032	-0.007	-0.024	-0.164	-0.122	**0.845**

Table 8: Heterotrait-Monotrait Ratio (HTMT)

	Agr	Conf	Cons	Cont	D	E	Ext	IH	N
Agr									
Conf	0.025								
Cons	0.022	0.031							
Cont	0.020	0.103	0.287						
D	0.075	0.019	0.048	0.049					
E	0.176	0.180	0.018	0.021	0.048				
Ext	0.017	0.027	0.052	0.065	0.026	0.026			
IH	0.115	0.047	0.041	0.070	0.051	0.042	0.050		
N	0.017	0.036	0.230	0.043	0.043	0.027	0.058	0.036	

Table 9: Heterotrait-Monotrait Ratio (HTMT)

	Neu	OEA	OPE	PL	RA	ROE	S	SEA	UOE
Neu	-								
OEA	0.030	-							
OPE	0.031	0.083	-						
PL	0.020	0.035	0.249	-					
RA	0.042	0.124	0.023	0.058	-				
ROE	0.201	0.027	0.090	0.013	0.047	-			
S	0.026	0.302	0.050	0.050	0.038	0.061	-		
SEA	0.062	0.154	0.032	0.066	0.016	0.047	0.186	-	
UOE	0.101	0.242	0.056	0.033	0.011	0.036	0.187	0.210	-

Table 8 and 9 indicates the discriminant validity of latent constructs with the help of correlations of Heterotrait-Monotrait Ratio (HTMT) of indicators across constructs. Henseler et al. (2015) recommended one more gauge to evaluate the discriminant validity which is on the base of Multitrait-Multimethod Matrix which is called as Heterotrait-Monotrait Ratio (HTMT) of correlation. Less than 0.90 are standardized values for Heterotrait-Monotrait Ratio (HTMT).

4.1.2 Second Stage: Evaluation of Formative Measurement Model at Higher Order

Measurement model for formative variable at higher order not be evaluated statistically like reflective variable at lower order. The single most fundamental criteria for the assessment of measurement model of formative variables are to judge with the help of its outer weight with the significance level. As Hair et al. (2013) reveals that the significance of external weights of the formative items of variables are judged with help of their t-value. Similarly, Hair et al. (2012) said that there is no need to test the convergent and discriminant validity measures for formative variables and items but their outer weight, level of significance with the help of t-values, p-values and should assess the multicollinearity. The table 10 shows the values of outer weights of all the items of higher order construct which are latent constructs at lower order at first stage.

Table 10: Assessment of Formative Measurement Model at Higher Order

Constructs	Items	VIF	Weight	t-value	P Values
Neurotransmitters (NT)	D	1.004	0.916	3.496	0.000
	S	1.011	-0.071	0.361	0.718
	E	1.014	0.455	1.833	0.067
	N	1.001	0.075	0.361	0.718
Emotional Intelligence (EI)	SEA	1.017	0.564	1.957	0.050
	ROE	1.001	0.645	2.412	0.016
	OEA	1.059	-0.229	1.011	0.312
	UOE	1.076	-0.325	1.365	0.172
Personality (PR)	OPE	1.005	0.874	3.731	0.000
	EXT	1.003	-0.056	0.484	0.629
	NEU	1.004	-0.021	0.187	0.852
	CONS	1.005	0.443	1.711	0.087
	AGR	1.006	0.061	0.514	0.607
Investor Behavior (IB)	IH	1.013	0.636	2.991	0.003
	CONT	1.033	0.444	1.630	0.103
	CONF	1.017	0.090	0.714	0.475
	PL	1.031	0.488	2.474	0.013
	RA	1.009	0.014	0.134	0.893

Here, in table 10 the values of outer weight of items of neurotransmitters such as dopamine, serotonin, epinephrine and norepinephrine. Here, only dopamine's outer weight is significant which can be seen with the help of t-value and p-value and rest of the items are insignificant but their VIF values are less than 5 which are indications of no multicollinearity. Similarly, emotional intelligence's items self-emotions appraisal, regulation of emotions, other's emotion appraisal and use of emotion have VIF values with in limit. Outer weights of self-emotions appraisal and regulation of emotions are significant at 95% confidence level because their t-values are 1.96, 2.41 and p-values are 0.05 and 0.016 respectively and outer weight of rest of the items of emotional intelligence are insignificant. So, the VIF values of all the items of mentioned construct are less than 5.00 indicates no problems of multicollinearity. However, outer weight of items of personality such as openness is significant at 100% confidence level but other items are insignificant but VIF of all items within the range. Similarly, outer weight of indicators of investor's behavior such as investment horizon and personalization of loss are significant at 99% and 95% confidence level and rest of items are insignificant but VIF of all items are as per the threshold.

4.1.3 Second Stage: Evaluation of Structural Model at Higher Order

Subsequent to the evaluation of measurement model in the first and second stage of hierarchical latent variable in reflective and formative type model by using the PLS-SEM, now the outcomes of second stage at higher order level of constructs can be observed in table 11 as it indicates the evaluation of structural model by using the path coefficients with their p and t-values and f^2 and comments related to the effect size which is small for each construct. Once, the decision of structural model on the base of values R-Square or R^2 has taken then researchers move toward the path coefficients which are deem to be considered for the assessment of structural model of the research. In structural model, the level of significance of path coefficient has indicates the association among the exogenous as well as endogenous constructs related to the study.

Table 11: Evaluation of Structural Model

	Path Coefficients	t-value	P Values	f^2	Effect Size
EI → IB	0.115	1.9279	0.05	0.02	Small
NT →IB	-0.012	0.206	0.84	0.02	Small
PR → IB	-0.339	7.683	0.000	0.041	Small
EI → ID	0.039	0.704	0.48	0.012	Small
NT →ID	0.192	2.957	0.003	0.024	Small
PR → ID	-0.045	0.970	0.33	0.01	Small

Table 11 and figure 3 indicates that neurotransmitters as independent latent construct at higher order does not explain the investor behavior in this study because investors of Pakistan have different characteristics as compare to investors belongs to the rest of world. However, robustness has been checked and has shown separate from model, when author observed the relationship of neurotransmitters with investor behavior found it significant which is as per the previous studies because Frydman & Camerer (2016) explored and found relationship of neurotransmitters measures and behavioral features of individual investor. In this research neurotransmitters as a latent construct at higher order explain the investment decisions at lower order with 95% level of significance so this is according to the literature. The emotional intelligence as an independent latent construct explain the investor behavior as a latent construct at higher order with 95% level of significance. This is as recommended by previous studies as mentioned chapter of literature review. But it also checked that path coefficient among the emotional intelligence and investment decisions are significant when author study the relation between them separately, which is also according the previous studies. Similarly, Rubaltelli et al. (2015) in their scholarly work establish the relatiosship among the emotiomal itelligence and investor behavior.

The path coefficient between personality and investor behavior is negatively significant 95% level of significance. This result is literature consistent as Sadi at al. (2011) performed the study in Iranian equity market and fond that personality features positive relation but in some situation negative relation with the behavioral characteristics of investor. Similarly, Zaidi & Tauni (2012) performed the investigation in Lahore Stock Exchange and found positive relation among the perssonality charachteristics and behavioral characteristic of investor but in some situation also have negative relation. The path coefficient between personality and investment decisions is insignificant; this may be due to the combination of neurological and behavioral facets and different background of investors of Pakistan as compare to the investors of other countries of developed world. But, when author perform the analysis separately, between personality and investment decisions, found the results as per the previous studies   Whereas, it has seen the values of path coefficients of neurotransmitters is positive significant with investment decisions and negative insignificant with investor behavior, emotional intelligence's path coefficient with investor behavior positive significant and insignificant with investment decisions. However, path coefficients of among the personality and investor behavior is positive significant but between investment decisions is insignificant in this research.

Similarly, it has been seen that path coefficients 0.56 and 0.65 of latent constructs, self-emotion appraisal and regulation of emotion, of latent construct of emotional intelligence (EI) are significant at 95% confidence level whereas path coefficients of latent constructs, use of emotion and other emotions appraisal are insignificant. The path coefficients 0.92 and 0.46 of latent constructs, dopamine and epinephrine, of latent construct of neurotransmitters (NT) are significant at 95% and 90% confidence level whereas path coefficients of latent constructs, serotonin and norepinephrine are insignificant because of dynamics of investors.
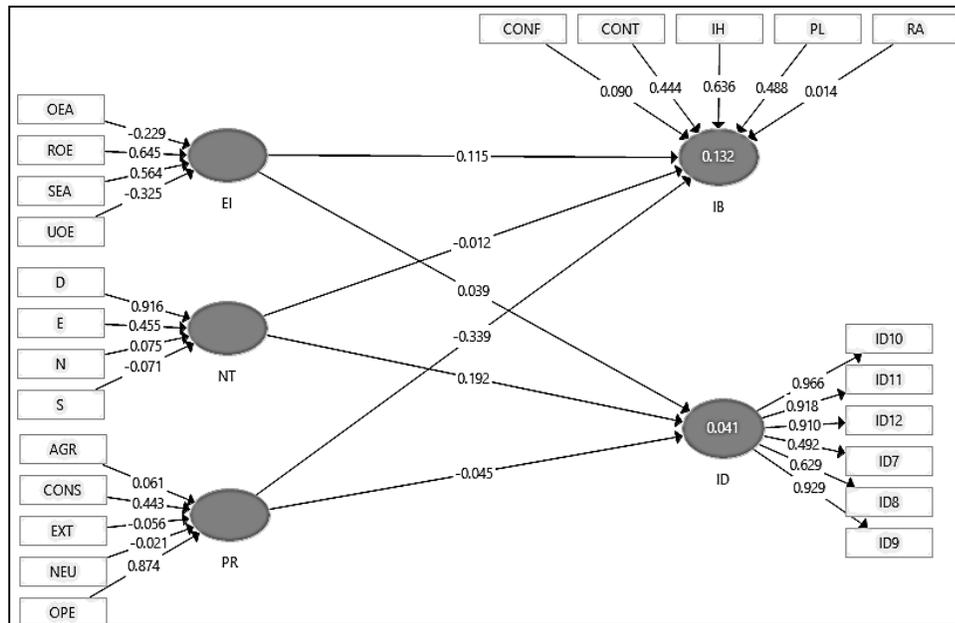
Figure 3: PLS-SEM Results of Structural Model (Second Stage)
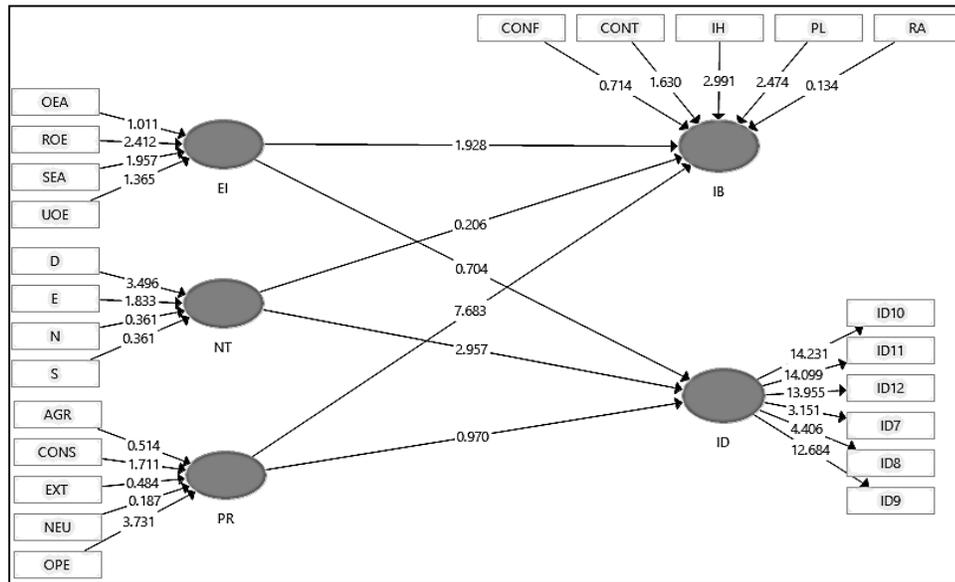

Figure 4: PLS-SEM Results of Bootstrapping of Structural Model (Second Stage)

The Bootstrapping method is used in PLS-SEM to check the significance level of the values of path coefficients in every category of structural model because; Hair et al. (2013) recommended this technique with sample of 500 to 5000. Here, author employed 5000 as sample size for bootstrapping to engender the outcomes which is pertinent to the real information. Particularly, during bootstrapping significance of path coefficients is gauged through significance level with the help of P-values at 90%, 95% and 99% and an concrete values with of t-statistics with two-tailed test are ± 1.64, ± 1.96 and ± 2.56 respectively.

Figure 3 indicates the path coefficients 0.87 and 0.44 of latent constructs openness and consciousness, of latent construct of personality (PR) are significant at 95% and 90% confidence level whereas path coefficients of latent constructs, agreeableness, neuroticism and extroversion are insignificant because of different demographics of investors. The path coefficients 0.64, 0.49 and 0.44 of latent constructs, investment horizon, personalization of loss and control, of latent construct of investment behavior (IB) are significant at 95% and 90% confidence level whereas path coefficients of latent constructs, confidence and risk attitude are insignificant. The figure 3 shows the weight of latent constructs whereas, figure 4 shows the result of bootstrapping.

Table 12: Overall Statistics of Structural Model

	R^2	Q^2
NT, EI and PR on IB	0.132	0.013
NT, EI and PR on ID	0.041	0.013

In PLS-SEM, the validity of structural model validity is also evaluated with the help of predictive relevance (Q^2). Normally, values of Q^2 should be more than zero for independent latent constructs in the structural model of PLS-SEM. Besides this, it is bickered that more the Q^2 values higher the prognostic relevance of the structural model otherwise vice versa. On the base of procedure recommended by Hair et al. (2013), the investigators depend on a blindfolding technique to get the cross-validated redundancy as a gauge to authenticate the predictive relevance of research model. Above given table 12 indicate the values of Q^2 which are as per the threshold. It is the assurance of the model fitness in this research. Table 12 also indicates the overall statistics of structural model of study.

5. Conclusion and Recommendation

In previous studies the impact of each dimension of neurotransmitters, emotional intelligence and personality on investor behavior were observed separately. However, literature related to impact of neurotransmitters, emotional intelligence and personality on investor behavior as latent constructs did not present a precise narrative that is why in this study re-examine and establish the H_1, H_2, H_3, H_4, H_5 and H_6. So, hypothesis 2 (H_2) foresee the impact of emotional intelligence (IE) on investor behavior (IB) in Pakistan Stock Exchange (PSX) and observed this significant and positive. The result of hypothesis 2 to some extent is consistent with the studies of (Chaarani, 2016; Mitroi, 2016). The hypothesis 3 (H_3) foresee the impact of personality (PR) on investor behavior (IB) in Pakistan Stock

Exchange (PSX) and observed this significant and negative. Generally, the result of H_3 is different from literature of developed world but, Sadi at al. (2011) found negative relationship among the personality features and behavioral characteristics of investor. Similarly, Zaidi & Tauni (2012) observed the negative realtion between perssonality charachteristics and behavioral characteristic of investor.

The hypothesis 4 (H4) observe the impact of neurotransmitters (NT) on investor behavior (IB) in Pakistan Stock Exchange (PSX) and observed this significant and positive. As author mentioned earlier most of studies in the developed world used dimensions of neurotransmitters as a latent construct but no single study found where neurotransmitters collectively used as latent construct collectively. However, Singh et al. (2017) and Lang et al. (2017) in their studies found that some facets of neurotransmitters have connection with investment decisions facets. The hypothesis 1 (H_1) predict the impact of neurotransmitters (NT) on investment decisions (ID) in Pakistan Stock Exchange (PSX) and observed this relation as an insignificant. Generally, literature reveals that neurotransmitters have significant relation with facet of investment decisions. Similarly, when H_1 is evaluate separate from the model of study found it significant at 100% confidence level as per recommendation of literature.

The hypothesis 5 (H_5) foresee the impact of emotional intelligence (EI) on investment decisions (ID) in Pakistan Stock Exchange (PSX) and observed this insignificant. The findings about this hypothesis are consistent to the study of Salehi & Mohammadi (2017). However, most of earlier studies point out that emotional intelligence (EI) has significant relation with latent constructs of investment decisions. Similarly, when H_1 is evaluate separate from the model of study found it significant at 100% confidence level as per recommendation of literature. The hypothesis 5 (H_5) foresee the impact of emotional intelligence (EI) on investment decisions (ID) in Pakistan Stock Exchange (PSX) and observed this insignificant and positive. Usually, previous studies indicate that emotional intelligence (EI) has significant relation with latent constructs of investment decisions. Similarly, when author test H_1 separate from the model of study found it significant at 100% confidence level. Similarly, Beadnell et al. (2017) reveals that emotional itelligence is effective when making decision about the long term financial benefit. Similarly, a research conducted by Tang et al. (2017) revealed that emotional intelligence is part of human good sense and this part has relation with decisions which leads toward the ups and downs of prices of stocks.

The hypothesis 6 (H_6) predict the impact of personality (PR) on investment decisions (ID) in Pakistan Stock Exchange (PSX) and viewed this insignificant. Generally, prior studies show that personality (PR) has significant relation with investment decisions. Earlier research reveals that personality characteristics persuade investment decisions of individuals (Crysel et al., 2013). According to Dhochak & Sharma (2016) personality dimensions have influence on investment decisions. Similarly, when relationship between personality and investment decision is tested separately as compare to the model of study, it is found significant at 100% confidence level. However, model of study describe that impact of neurotransmitters, emotional intelligence and personality on investor behavior is 13.2%. However, the impact of neurotransmitters, emotional intelligence and personality

on investment decisions is 4.1%, so these are indication of correctness of model. Similarly, the value of Q^2 is more than zero which confirm the primitive relevancy of model.

According to Olsen (2007), primitive side of human decisions is able deal with more complicated verdicts to achieve just ballpark correct answer of puzzle. Similarly, most of researchers have shown that "financial decision making has important roots in emotional process and cannot be understood fully as the expression of cognitive limitations" (Sjobreg & Engelberg, 2006). So, on the base of theses guideline, proposed combine model of neurofinance and behavioral finance in this dissertation is an achievement. Similarly, these sentences act as a brainwave to discover a suitable neurofinance and behavioral finance model which is residue to discover what is correct within this black box.

This study test the argument of Olsen (2007) and organize and test the upcoming research guidelines of Ameriks et al. (2009); Kuhnen et al. (2013); Mosher & Rudebeck (2015). So, these are not only advancement in the current boundaries of academic knowledge, but this also have wider pragmatic use for both individual investors and investment managers of brokerage houses because it is significant for them to know the connection of behavioral and neurofinance concepts with investor behavior of people and their investment decisions for their individual scheduling the economic decisions.

Similarly, after understanding the role of neural pleasure system and fight or flight situations in the presence of behavioral facets in the Pakistan Stock Exchange, it will be supportive for financial managers to design the strategies by highlighting investment consideration of individual investor. So, individual investor will make financial decision for their economic interests by understanding the relation of the neurotransmitters and investment decisions. This empirical research has numerous implications in favor of individual investors and academic researchers along with this, open latest prospects to investigate the dynamics of latent concepts of neurofinance and behavioral finance in Pakistan's stock Market. This research informs through an excellent written empirical finding that individual investors are prone to investment horizon and personalization of loss while making investment in Pakistan's stock Market. The results of this research give a latest viewpoint in current body of knowledge as of collectively practical a well as academic angle.

Limitation of study is that it does not analyze the performance evaluation of the current model beyond the current sample size for stock market of other region of the world because it is outside the range of this research. Criticism on reliability and validity of this research can be on the base of different dimensions of latent constructs of study because most of researchers in the different region of world use different personality dimensions. Similarly, researcher used different numbers of neurotransmitters of emotionally intelligent individual investors with different behavioral dimensions for investment and their decisions. However, credibility of this research is outstanding and on the base of participants symbolizing the more than 0.22 million investors of Pakistan Stock Exchange classified as secondary merging market by the Morgan Stanley Capital Investment (MSCI) and Financial Times Stock Exchange (FTSE). Similarly, data collected for this study is

limited and on the base empirical findings limitation is that findings may not be generalized for other participants of stock markets of world.

The empirically concluding remarks of research open new horizon for advancement in field of neurofinance and behavioral finance. Further, personality and behavioral latent constructs of investor for instance multidimensional personality traits and optimism with anchoring. Similarly, more research about neurofinance such as prefrontal cortex and anterior cingulated to make better investment decisions. So, these avenues will provide supplemented inner view of investor's behavior and their decision's in the stock market of Pakistan and demand more and more effort to determine universal latent constructs for combine model of neurofinance and behavioral finance. The most prominent and main defy for researchers of neurofinance is the measurement of neurotransmitters latent constructs specifically dopamine, serotonin, epinephrine, norepinephrine and other proxies which has been done in this study. So, there is need to test the validity and reliability of neurotransmitter's measures in the setting of other stock markets of region.

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