

# A study on different behavioral biases and its impact on Investor's Decision Making

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**ABSTRACT:** In the past Capital Asset Pricing Model, Efficient Market Hypothesis and Modern Portfolio Theory assume that market are perfect and all the investors behave clearly and sensibly. In other word, these theory explains that whatever new information comes into the market, it is instantly soaked up by the stock prices in the Indian market, in this way eliminating the possibility to earn more by taking into the consideration of company's insider information. This paper tries to identify the various behavioral biases like representative biases, over-confidence biases, regret aversion, mental accounting and herd behavior etc. on decision making process of investor's in the Indian stock market. Harry Markowitz formulated the first "Modern Portfolio Theory" which was the first systematic financial theory. The theory evaluates return and risk of assets, using mean, standard deviation and variances. The gap found is due to the abnormal events that create maximum harm in the financial markets, named as "market anomalies". Cognitive errors and extreme emotions were found to be the major causes for market anomalies which generate bad investment decisions. Hence an alternative approach named behavioral finance was developed to find out psychological and sociological issues in building the investor's portfolio. The data was collected from the major Vadodara city of Gujarat by developing questionnaire by asking open ended and close ended questions. Various statistical tools like Descriptive statistics, Parametric test, Factor analysis etc. have been applied to check the impact of different behavioral biases.

**Key Words:** Behavioral finance, decision making biases, over confidence, Representativeness, Gambler's fallacy, Regret Aversion, Mental behavior, heading behavior, Behavioral biases.

**JEL Classification:** G41

## 1. Introduction

The concept of behavioral finance is not a new concept at all. The concept of traditional finance purely based on market efficiency which believes that the price of the stock and its fundamental value are highly correlated, based on that the financial model was developed. It was purely based on rationality. While making any sort of decision relating to the investment in the different investment boulevard, emotion and perception plays a major role as information is abundant and so uncertainty is very high. Researcher has found out that, if the complexity of the decision is high on the same way the emotion and psychology also plays a major role in it. Because of this, in order to successfully deal with the thinking-related load which goes beyond people's data processing ability, people are forced to access experience-based thinking to help decision making, because of this leading to weird decision making. It has been observed that higher the anxiety level in the investor, higher the more financial blunder in the decision of the investors.

The study of demographic factors will help to identify the demographics and portfolio consumption pattern of the investors and decision pattern. it was observed under the study of Wharton survey (Blume& Friend, 1978). In this study two behavioral biases mainly, over confidence bias and Herd Behavior bias has been covered by generating structured Questionnaire in the Vadodara city of Gujarat, India. Demographic and Likert scale questions has been designed in the questionnaire to understand the behavioral pattern by considering over confidence and herd behavior bias.

Adaptive market hypothesis implies that individuals act in their own self-interest, make mistakes and, learn and adapt; competition motivates adaptation and innovation among the market players; and natural selection and evolution determine market dynamics.

It has come up with following implications:

- Risk and return relationship is unlikely to be stable over time
- Contrary to the efficient market hypothesis, arbitrage opportunities do arise fromtime to time in adaptive market hypothesis

- Investment strategies will perform well in certain environments and perform poorly in other environments.
- Innovation is the key to survival
- Survival is the only objective that matters

One of the major thrust in the field of behavioral finance is to understand the way owner take decisions. Analyzing the decision process of a firm is important for client relationship, which in turn can help clients to gain maximum in accordance to their requirement and knowledge, as well as, satisfying if not all, but many of the ways of thinking basic truths of standard finance. Standard finance has limited acceptability to investors given their varied personalities and life experiences.

Another contrast of behavioral finance with standard finance is based on utility theories. Where the worlds of standard finance strongly support in diminishing marginal utility of wealth and the traditional risk aversion suggests individuals are risk averse and have diminishing marginal utility of wealth with concave utility curves.

**Behavioral Finance as a Interdisciplinary Science**

**Appendix 1:** explains the different topics which is continuously examined and verified by various research scholars.

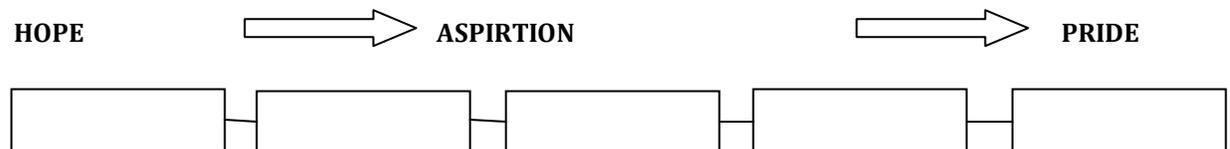
**Appendix. 1: Behavioral Finance Theoretical Fundamental**

Anchoring	Financial Psychology	Cascades
Over-reaction	Under-reaction	Framing
Anomalies	Market Inefficiency	Fads
Regret	Theory Economic Psychology	Manias
Prospect Theory	Behavioral Economics	Panics
Cognitive	Errors Contrarian Investing	Crashes
Mental Accounting	Irrational Behavior	Heuristics
Overconfidence	Hindsight Bias	Preferences
Group think Theory	Group Polarization	Risky Shift
Regret Theory	Economic Psychology	Manias
Risk Perception	Behavioral Economics	Gender Bias
Below Target Returns	Representative bias	Information Overload
Affect (Emotions)	Behavioral Accounting	Issues of Trust
Loss Aversion	Herd Behavior	Greed
Downside Risk	Experimental Familiarity	Bias
Chaos Theory	Cognitive Dissonance	Fear

(Source:Ricciardi& Simon, What is Behavioral Finance? 2000)

**Driving Forces of Investor Behavior**

Irrational behavior of investor builds the foundation for behavioral finance. According to Shefrin H.(2007)<sup>26</sup> “hope and fear” are two factors which lead people to behave irrationally. He puts forth the concept as “emotional time line” which is shown in Figure:



(Source:Shefrin, H. (2007). Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing. New York: Oxford University Press, page no 120.)

**2. Literature Review**

**Selden, (1912)**, It was a brilliant piece of literature which presented the idea that stock price movements were, to a very great extent dependent on the attitude of the investors and traders. This was the first book which applied behavioral concepts in the stock market investment

**Lewellen and Schlarbaum (1974)**, are the first to empirically examine the transaction data of individual investors in order to determine the transaction pattern of the investors, their decision methodology, the

demographics and their portfolio composition. The impact of demographics on the process of portfolio composition is examined by the Wharton survey (Blume& Friend, 1978).

**Simon (1996)**, that investors gather what they deem to be enough information, they process the information in ways they seem suitable, they have limited objectives while taking decisions and they stop when they feel that decision fits within parameters they deem satisfactory. This elaborates the bounded rationality which is quite different from assumptions of perfect rationality for a rational economic man.

**Kahneman&Tversky (1979)**, further elaborates how normal investors may take investment decisions. According to prospect theory, decisions are made in two phases: an early phase in which prospects are framed and then in which prospects are evaluated and chosen. During the framing or editing phase, investors use heuristics to do a preliminary analysis of the prospects. They identify the outcomes they see as economically identical and then establish a reference point to rate and rank the prospects. Possible outcomes below the reference point will be viewed as losses and those above the reference point as gains. Depending on the number of prospects, there may be up to six operations in the editing process: codification, combination, segregation, cancellation, simplification, and detection of dominance. The ultimate purpose behind editing is to simplify the evaluation of choices available by reducing the choices to be more thoroughly evaluated. People use editing when making choices because of cognitive constraints. In the second phase, the edited prospects are evaluated and the prospect of highest perceived value is chosen.

**Shleifer&Vishny (1997)**, present their interesting observations that textbook arbitrage in financial markets requires no capital and entails no risk, whereas in reality, almost all arbitrage is performed by specialized and sophisticated professionals using other people’s capital, and this is typically risky, there is possibility that arbitrage becomes ineffective in extreme circumstances. The model also suggests where anomalies in financial markets are likely to appear, and why arbitrage fails to eliminate them.

**3. RESEARCH METHODOLOGY**

**Research Problem:**

The literature reviews discussed were not indicating the most prominent behavioral biases that have significant impact on different demographic and other factors of the investors in the Vadodara City. The initiative has been made to make clear about the impact of different behavioral biases in the market and most prominent one which have the major impact on the mindset of the investors by considering different demographic and other factors.

**Objectives:**

1. To identify the most prominent behavioral biases those have significant impact on investor’s behavior.
2. To study the difference between demographic factors (Gender, Age, Income, Education and Occupation) and different behavioral biases in Vadodara city.

**Hypothesis of the Study:**

**H0<sub>1</sub>:** There is no significance impact of different behavioral biases on the behavior of the investors.

**H0<sub>2</sub>:** There is no significant impact of demographic factors(Gender, Age, Income, Education and Occupation) on different behavioral biases

**Sample Size & type:**

In this paper, structured questionnaire has been designed and collected the response from the investors who are investing in the market from last four to five years. 101 sample sizes have been collected from the investors in the stock market of Vadodara city. Investors are well known who are having knowledge of trading from last few years.

**3. DATA ANALYSIS AND INTERPRETATION**

MS Excel and IBM SPSS 21 software’s were used to interpret the data on behavioral biases. Various statistical tools like frequency distribution, Normality testing, Factor analysis, Independent sample t-test, one way ANOVA has been applied to measure the result of the study.

**Table 5.1 KMO and Bartlett’s Test**

Table KMO and Bartlett’s Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.743
Bartlett's Test of Sphericity	Approx. Chi-Square	779.358
	df	171
	Sig.	.000

*(Source: SPSS Output)*

From the above Table 5.1 of KMO and Bartlett's Test, it has been applied before applying Factor analysis. Its gives an idea of whether distribution of values is adequate for conducting factor analysis is considered. In this case the Sampling adequacy is 0.743 which shows middling adequacy to run the factor analysis.

**Table 5.2: Rotated Component Matrix (Factor Loading)**

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.588	29.410	29.410	2.805	14.765	14.765
2	2.653	13.965	43.375	2.286	12.032	26.798
3	1.384	7.285	50.659	2.159	11.361	38.158
4	1.259	6.627	57.287	2.141	11.269	49.427
5	1.194	6.282	63.568	1.981	10.428	59.855
6	1.010	5.316	68.884	1.716	9.029	<b>68.884</b>
7	.907	4.772	73.656			
8	.778	4.093	77.750			
9	.706	3.716	81.466			
10	.615	3.238	84.703			
11	.513	2.699	87.402			
12	.461	2.425	89.828			
13	.420	2.211	92.039			
14	.345	1.813	93.852			
15	.306	1.610	95.462			
16	.249	1.308	96.770			
17	.232	1.223	97.993			
18	.215	1.130	99.123			
19	.167	.877	100.000			

(Source: SPSS Output)

Here from the above Table 5.2, it has been interpreted that, total six factors have been generated for analysis of different behavioral biases with together summated score of 68.884 of total variances. On the other hand, it has been indicating that 31.116% information was not extracted.

**Table 5.3: Factor wise Component score**

	Rotated Component Matrix <sup>a</sup>						Behavioral Biases (Factors wise)
	Component						
	1	2	3	4	5	6	
When you see others gaining from a particular stock, you immediately buy that following them	.792						<b>Factor 1: Heading Bias</b>
Your friends and colleagues influence you to choose a particular broker	.678						
Others investors' decision of buying and selling stocks influences my investment decisions	.665						
Other investors' decision of the stock volume influences my investment decisions	.621						
You trade as per the trade of others out of reputational concern	.556						
When market crashes , you obey the stock analysts suggestions blindly		.823					<b>Factor 2: Disposition Bias</b>

You immediately respond to variations in investment decisions made by others in the stock market		.740					
You invest more depending upon investment by your friends or colleagues		.703					
When the stock volume of a particular stock went up, you see the others preference towards it		.795					<b>Factor 3: Familiarity Biases</b>
Your investment decision is influenced by other investors stock volume		.714					
Investment based on that made by close family members or friends makes you visible in the group		.656					
Market stress compels you sometimes to follow others opinin for investment		.509					
In uncertain times, I usually behave optimistic.				.866			
Even if uncertainty arises, I expect the good to happen.				.843			
I am always optimistic about my future.				.636			
You follow people view while doing selection of stocks					.848		<b>Factor 5: Worry Bias</b>
You follow investment approaches of others for your own investment					.614		
I believe in my decision to investment and trade accordingly						.826	<b>Factor 6: Over Confidence Bias</b>
I am always optimistic of my selection of stocks.						.825	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 7 iterations.							

(Sources: SPSS Output)

**Table 5.4: Normality Test of Factors**

	Tests of Normality					
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
<b>HB</b>	.066	100	.200*	.968	100	.015
<b>DB</b>	.076	100	.159	.985	100	.300
<b>FB</b>	.081	100	.108	.944	100	.000
<b>ACB</b>	.067	100	.200*	.975	100	.056
<b>WB</b>	.075	100	.176	.983	100	.220
<b>OB</b>	.088	100	.052	.983	100	.226

(Source: SPSS Output)

H0: Data are normally distributed.

H1: Data are not normally distributed.

From the above table 5.4, it has been noticed that out of all the six behavioral biases are showing normal distribution as the P value of all the behavioral biases are above 0.05. So we fail to reject the Null Hypothesis and interpret that data are normal so we can go for parametric test.

Further analysis carried out to satisfy the above mentioned objectives in methodology. Taking factor score as a ratio variable and independent groups as gender, age, income and education. For gender, study has performed independent sample t test and rest of all variables ANOVA.

**Table 5.5: Independent Sample T test with Gender**

Independent Samples Test (Gender)								
		Levene's Test		t-test for Equality of Means				
		F	Sig.	t	Sig.	Mean	95% Confidence Interval	
						Difference	Lower	Upper
<b>HB</b>	Equal variances assumed	0.015	0.903	1.704	0.092	0.34955296	-0.05758214	0.75668806
	Equal variances not assumed			1.78	0.079	0.34955296	-0.04082188	0.7399278
<b>DB</b>	Equal variances assumed	9.618	0.003	2.427	0.017	0.49062071	0.08937736	0.89186407
	Equal variances not assumed			2.69	0.008	0.49062071	0.12864624	0.85259519
<b>ACB</b>	Equal variances assumed	0.24	0.625	1.028	0.306	0.21293174	-0.19797833	0.62384182
	Equal variances not assumed			1.057	0.294	0.21293174	-0.18795078	0.61381426
<b>FB</b>	Equal variances assumed	0.001	0.979	0.764	0.447	0.15864435	-0.2532509	0.57053959
	Equal variances not assumed			0.787	0.434	0.15864435	-0.24249834	0.55978703
<b>WB</b>	Equal variances assumed	0.061	0.805	-0.397	0.692	-0.08266625	-0.49545488	0.33012238
	Equal variances not assumed			-0.398	0.692	-0.08266625	-0.49674151	0.33140901
<b>OB</b>	Equal variances assumed	0	0.998	1.937	0.056	0.39571034	-0.00972358	0.80114425
	Equal variances not assumed			1.919	0.059	0.39571034	-0.01514938	0.80657006

(Source: SPSS Output)

**Interpretation:**

The table number 5.5 represents the independent t test statistics for grouping variable as gender and behavioral factors as ratio data. Looking to the Levene’s test statistics for each factor, all the probability values are greater than 0.05 and study fail to reject the null hypothesis and interpret that equal variances assumed. So further study has interpreted the t calculated and related probability value from equal variance assumed row. All t calculated values are very less and further its probability values are greater than 0.05 (At 5% Significance Level) except factor 2 (Disposition Bias). So we again fail to reject the null and interpret that there is no significant difference between male and female regarding all the behavioral biases except disposition bias.

Further study can interpret that at 10% significance level there is some significant difference found between mean of factor 1 (Herding Bias) and Factor 6 (Observation Bias). 95% confidence interval of variance column indicates the upper and lower values within which mean difference will be found if another study carry out with the same number of sample size from the same population.

**Table 5.6: ANOVA for Age and Behavioral Factors**

	Levene Statistics	Prob. Value	Groups	Sum of Squares	Mean Square	F	Sig.
<b>HB</b>	.567	.569	Between Groups	1.185	0.593	0.588	0.558
			Within Groups	97.815	1.008		
<b>ACB</b>	.307	.737	Between Groups	0.659	0.33	0.325	0.723
			Within Groups	98.341	1.014		
<b>FB</b>	1.102	.336	Between Groups	0.74	0.37	0.365	0.695

			Within Groups	98.26	1.013		
<b>WB</b>	1.037	.358	Between Groups	5.297	2.649	2.742	0.069
			Within Groups	93.703	0.966		
<b>OB</b>	1.810	.169	Between Groups	2.398	1.199	1.204	0.304
			Within Groups	96.602	0.996		
<b>DB</b>	3.079	.051	Between Groups	2.781	1.39	1.402	0.251
			Within Groups	96.219	0.992		

(Source: SPSS Output)

The table number 5.6 indicates the test statistics for analysis of variance as factor score being ratio data and age groups are considered to be independent variables. Looking to the Levene’s test statistics for each factor, all the probability values are greater than 0.05 and study fail to reject the null hypothesis and interpret that equal variances assumed. So further study has interpreted the t calculated and related probability value from equal variance assumed row. All F statistics values are very less and its related probability values are greater than 0.05. So we fail to reject the null and interpret that there is no significance difference among any age group and behavioral biases.

**Table 5.7: ANOVA for Income and Behavioral Factors**

ANOVA								
Biases	Levene Statistics	Prob. Value		Sum of Squares	df	Mean Square	F	Sig.
<b>HB</b>	.969	.412	Between Groups	3.617	3	1.206	1.2	0.315
			Within Groups	85.373	85	1.004		
<b>ACB</b>	1.102	.353	Between Groups	5.68	3	1.893	1.833	0.147
			Within Groups	87.781	85	1.033		
<b>FB</b>	.945	.423	Between Groups	9.537	3	3.179	4.104	0.009
			Within Groups	65.843	85	0.775		
<b>WB</b>	0.056	.982	Between Groups	1.408	3	0.469	0.469	0.705
			Within Groups	85.155	85	1.002		
<b>OB</b>	.698	.556	Between Groups	0.701	3	0.234	0.247	0.863
			Within Groups	80.324	85	0.945		
<b>DB</b>	1.498	.221	Between Groups	1.126	3	0.375	0.355	0.786
			Within Groups	89.839	85	1.057		

(Source: SPSS Output)

The table number 5.7 indicates the test statistics for analysis of variance as factor score being ratio data and Income groups are considered to be independent variables. Looking to the Levene’s test statistics for each factor, all the probability values are greater than 0.05 except Familiarity bias (0.009) and study fail to reject the null hypothesis for all other biases at 5% significance level and interpret that equal variances assumed for them. So further study has interpreted the analysis of variances calculated and related probability value from equal variance assumed row. All F statistics values are very less and its related probability values are greater than 0.05. So we fail to reject the null and interpret that there is no significance difference among all income group and other behavioral biases except familiarity bias.

**Table 5.8: ANOVA for Occupation and Behavioral Factors**

ANOVA								
Biases	Levene Statistics	Prob. Value		Sum of Squares	df	Mean Square	F	Sig.
<b>HB</b>	1.349	.248	Between Groups	.120	1	0.12	0.119	0.731
			Within Groups	98.88	98	1.009		

<b>ACB</b>	.475	.492	Between Groups	2.416	1	2.416	2.451	0.121
			Within Groups	96.584	98	0.986		
<b>FB</b>	2.723	.102	Between Groups	.419	1	0.419	0.417	0.52
			Within Groups	98.581	98	1.006		
<b>WB</b>	1.123	0.262	Between Groups	1.971	1	1.971	1.991	0.161
			Within Groups	97.029	98	0.99		
<b>OB</b>	.471	.494	Between Groups	.431	1	0.431	0.429	0.514
			Within Groups	98.569	98	1.006		
<b>DB</b>	.613	.436	Between Groups	.451	1	0.451	0.449	0.505
			Within Groups	98.549	98	1.006		

(Source: SPSS Output)

The table number 5.8 indicates the test statistics for analysis of variance as factor score being ratio data and Occupation groups are considered to be independent variables. Looking to the Levene's test statistics for each factor, all the probability values are greater than 0.05 and study fail to reject the null hypothesis for all other biases at 5% significance level and interpret that equal variances assumed for them. So further study has interpreted the analysis of variances calculated and related probability value from equal variance assumed row. All F statistics values are very less and its related probability values are greater than 0.05. So we fail to reject the null and interpret that there is no significance difference among all occupation group and other behavioral biases.

**Table 5.9: Relationship of Demographic variables with Behavioral Biases**

Variable	Relationship with Bias	Levene's Test	P value/ Test applied	Sig. Level	Inferences
Gender	Disposition Bias	9.618 (0.003)	0.008 (Independent Sample t Test)	0.05	Significance difference between Gender and Disposition Bias. Male are having higher with Disposition bias.
Income Group	Anchoring & Confirmation Bias	0.945 (0.423)	0.009 (One Way Anova)	0.05	Higher Income groups are highly influenced by ACB. (Income having >Rs. 40000)
Age Group	Worry Bias	1.037 (.358)	0.069 (One Way Anova)	0.05	Age Groups are highly influenced by Worry Bias

(Source: SPSS Output)

### Conclusion:

As a part of identifying various investor biases, authors extracted six different behavioral biases viz. Herding Bias, Anchoring and Confirmation bias, Family Bias, Worry Bias and Overconfident Bias which are having good amount of relevance with the prevalent literature in behavioral Finance theories. Also authors established the relationship between Income group and anchoring & confirmation bias and found that higher income groups are highly influenced by ACB. Also authors have identified the relationship between Male Investors and Disposition bias as they are highly driven by disposition bias while taking decision regarding investment. Age Groups are highly affected by Worry Bias as the risk bearing capacity is going to vary from different age period of life.

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