



Application of Artificial Intelligence on Behavioral Finance

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Abstract. Nowadays there is a concern in everyone's mind regarding the changes that are going to happen very soon or we can say the changes that are already happening in today's world. Yes, I am talking about the 4th industrial revolution that is going to take place very soon due to which many new jobs will be created whereas, on the other hand many existing jobs will get disappeared. Everyone is talking about Artificial Intelligence and its pros and cons but we wanted to think in other aspects too regarding artificial intelligence. So, in this research paper, we put the spotlight on Application of Artificial Intelligence on Behavioral Finance. By this we not only get to know about artificial intelligence and its merits and demerits but also, get to know about its applications on behavioral finance.

In this paper we tried to explain the meaning of artificial intelligence as well as its advantages and disadvantages and thereafter, the meaning of behavioral finance is considered so as to put clarity over the topic. Artificial intelligence is also known as machine learning as it is related to work which is going to be done by the machines rather than manually by human beings.

Further, we included the interaction of behavioral finance and artificial intelligence (AI) in the future when AI will be full-fledged used for the working and its working for the economy and future developments. With the use of artificial intelligence in behavioral finance, the outcomes will be more accurate as with the use of machines the psychological biasness can be reduced and accuracy will be increased. This paper helps to understand the working of artificial intelligence with behavioral finance and its applications so as to get ready for the future beforehand.

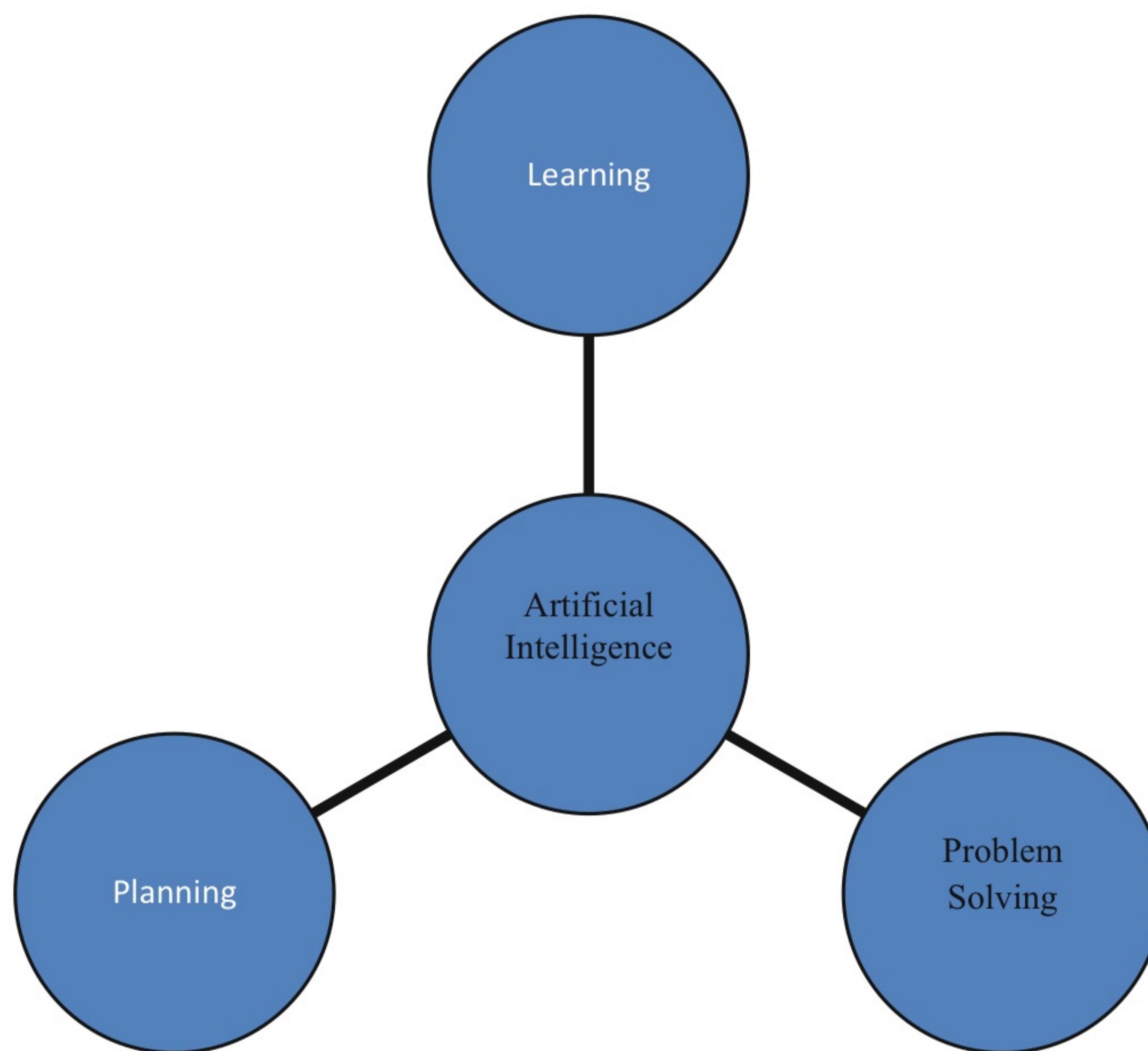
Keywords: Behavioral finance · Artificial Intelligence (AI) · Industrial revolution · Economical effects · Customer investing behaviour

1 Introduction

In present dynamic world, the concept of artificial intelligence is gained the attention of many people, i.e., AI, is not only the topic of interest among the employed people but it is a matter of concern and interest among the future leaders of the world. All the people across the world have their own concern about the growing perspective of AI, concerns of some individuals are concerned their existing jobs, on the other hand some

have concern regarding their future jobs So, it can be inferred that AI has become a topic of great concern. In a way it is a future and we have to accommodate according to it.

The main focus of this research paper is not confined about the discussion of pros and cons of AI, but authors are curious to explore the unexplored dimension of artificial intelligence. Many researches are conducted in the domain of artificial intelligence but very less research is conducted to understand the impact of AI on behavioural finance and understanding its application in behavioural finance. Initially, we need to understand the concept of Artificial Intelligence; it's a kind of replacement of human beings not in each and every aspect but in few aspects. Artificial Intelligence is a development of computer systems which are able to perform all activities or tasks which require human intelligence and can act as a replacement of human beings and the tasks which involve human touch. Artificial area is an area of computer science that emphasis the creation of intelligent machines that work and react like humans.



Behavioral political economy includes behavioral finance as its sub domain. It initiates various theories which are based on psychology; these theories are based on the clarification of stock exchange anomalies. The objective is to highlight and identify the role of folks in financial decisions. Under the behavioural finance, we have perceived the information flow and the attributes of intermediaries are constantly stimulating the investor's decisions and as well as market results. It is the combination of different concepts like, mental accounting, herd behaviour, anchoring, and high self-rating. Mental accounting we can say that it is a mind exercise to find the best options for our investment specifically. Herd behaviour explains that folks mean to copy the money behaviours of the bulk, or herd. Anchoring defines that enclosing a disbursement level to an exact reference, like disbursement extra money on what's gave the impression to be a stronger item of consumer goods. At the end, high- self rating define as an ability of one person based on personality to rank him/herself higher as compared to others. For instance,

an investor might appreciate himself as an investment leader or best investment advisor when its investment decision proves to be good however can revoke his contribution to an investment not proves good.

The impact of artificial intelligence on finance can be observed in various ways:

Personalized financial services- Artificial Intelligence expands the gamut money services by suggesting square measure known as client financial services. Client monetary services keep the customers and their distinctive demands at the core of their extremely optimized offerings.

The reduced cost of Artificial Intelligence in finance- AI in finance is a machine-driven processes and this has drastically reduced the value of serving customers. Whereas AI, on one hand, has reduced the value of economic services, on the contrary, it has created finance extraordinarily convenient to avail.

Business acceleration- Business acceleration refers to the different ways a company is using AI to expedite knowledge-based activities to boost potency and performance, like monetary establishments making investment methods for his or her investors. Whereas this kind of activity is usually viewed as a chance to scale back prices through the automation of internal processes, it ought to even be thought-about in terms of the firm's ability to remodel the client expertise.

The Future- AI in finance is all concerning continuous learning and re-learning of patterns, data, and developments within the money world. AI offers the pliability to create upon this system or line of monetary product and services. It implies that company needs to focus and they have to improvise upon their offerings. Once introduced, AI can keep the money services updated and prepared to face the market. AI in finance is, therefore, invaluable causative to the money trade. Over time, AI isn't solely reaching to revolutionize the money trade however it is slowly and gradually becoming the trade itself.

Over all Artificial intelligence is beneficial for the economy and has brought a new and easy work structure for people engaged in finance with various options available to them. Behavioral Finance and artificial intelligence both work side by side with each other providing advantages to each other.

The best example of Artificial intelligence is "mobile keypad". In mobile keypad if the similar word is used frequently by the individual than automatically the word is saved for the future correspondence which makes it easy to type or quickly respond. Artificial intelligence derives value based on business outcomes around customer experience, cost reduction and revenue generation. AI is simply the latest advanced analytical technology that might help achieve the desired outcomes.

2 Literature Review

Geetha and Vimala (2012) in their paper explored the role of AI in asset valuation, risk management securities trading and monitoring and customer relationship management (CRM). They also explored the pros and cons of AI in asset valuation and risk management. The study identified the benefits of AI techniques that they are helpful in reducing the risk of frauds and they techniques are knowledge-based, machine learning, and natural language processing.

Divya (2015) in their paper proposed an Artificial Intelligence design for classifying Big Data and also explored the uses of AI in data management and decision making.

Russell and Dewey (2015) in their study explored the benefits of Artificial Intelligence (AI) and the various uses in which this technology can be put to use. They also explored the AI's economic impact.

Vempati (2016) in their study identified the challenges faced by AI technology as well as the future scope of AI technology in Indian scenario. Researcher also recommended ways to improve AI adoption in India by developing a deliberate strategy by Government of India.

Kashiwagi (2015) in their study explored the use of Artificial Intelligence (AI) in finance sector. Researcher in their study identified uses of AI like Text mining, voice recognition of financial reports, Anomaly detection through pattern recognition, Market analysis through data mining, Formulation of investment strategies.

Bentley and Brundage (2018) in their study clarified the myths regarding the threats of Artificial Intelligence and promoted the bright future of AI technology in various fields.

Hammond (2015) in their study explored the history and future scope of Behavioral Finance. Researcher also explored the sentiment shift in investment behaviour of people since 1980s as well as explained the sub topics of behaviour finance.

Smith and McGuire (2006) in their study explored the history of Artificial Intelligence (AI). Researcher explored the Turing Test, History of AI applied to Chess, Expert Systems AI Winter and its lessons, Japan's Fifth Generation Computer System project in detail to examine the evolution of Artificial Intelligence.

Camerer (2017) in their research describes the interaction between Artificial Intelligence (AI) and behavioral economics. Researcher also explored the differences in machine learning and AI as well as ways in which AI can overcome the human limitations. Researcher used examples of various exploratory researches to describe the interaction between Artificial Intelligence (AI) and behavioral economics.

Barbara and Grosz (2016) in their report explored the history of Artificial Intelligence (AI) for over hundred years as well as report explored the future of AI technology in changing the lives of people in future. The report explored the uses of AI in year 2030.

Kowalski he was explain the various benefits of Artificial intelligence in his research. And also the tools and techniques of artificial intelligence give the contribution in different domains like theory for decision making, philosophy etc.

Chella and Ignazio (2006) in their study has studied the interaction between AI and robotics including the history of uses of AI in robotics and future scope of AI in robotics.

To understand the meaning of behaviour finance, you should understand the origin of behaviour finance. Shiller (2003) guide the new comers in the field and give a detail explanation related to evolution of behavioral finance. There were number of theories formed to explain the fluctuation in stock prices and these theories also explain the issue related to volatility in stock prices.

Chen and Lai (2013), they give more focus on that expected return affected by company structure. They took 352 sample of Taiwanese companies, these companies were introduced a change in their standard industrial classification because of their

business nature redesign. So they were found the impact of reclassification had negligible impact on the stock prices.

Doviak (2015) they took financial planner view to explain the term behavioral finance. They were explaining in their study that application of behavioral strategies not for every individual. They suggest before implementing the strategies, you should carefully analyze the client's capabilities or tendencies it would help to increase success in planning field.

3 Research Methodology

3.1 Type of Research

The focus of this research paper is to understand and explore the linkage and application of artificial intelligence on behavioral finance. To conduct the study descriptive research was done.

3.2 Objectives of Study

1. To find the impact of application of artificial intelligence on Behavioural Finance.
2. To Measure future impact of interaction between artificial intelligence and behavioral finance.
3. To find out impact of artificial intelligence on future jobs.

4 Rationale of Study

1. Firstly, this study will help to explore the area which is still unexplored and not much research is conducted in this area. For example much discussion has been done to understand the uses of artificial intelligence and how it makes the life easy and comfortable for many individuals. Instead, the challenges that will be faced by many individuals and companies in future are still less discussed and researched.
2. Moreover, there is a myth among the individuals that "Artificial Intelligence kills the future jobs". This is in fact not true as we have to upgrade as an individual according to the changing dynamics of the market. Upgrading the individual will make sure that we will be able to survive and retain ourselves in changing technological environment.
3. Thirdly, Artificial intelligence creates lot of jobs opportunities in future but only for those who will be able to serve in highly technological environment.

4.1 Data Collection Tool

To conduct the study both primary and secondary data has been used. Data has been analyzed by the help of ANOVA, Regression Analysis, Correlation.

4.2 Area of the Study

To conduct the study the target respondents were randomly selected from the area of National Capital Region (NCR).

4.3 Research Approach

To conduct the study primary method is used and questionnaire has been used to collect the data.

4.4 Sampling Technique and Sample Size

Convenience sampling method is be used and sample size is 200.

4.5 Research Instrument

Data is collected through structured questionnaire. Secondary data is collected from, web sites, E-book, Journals etc.

4.6 Hypothesis

H1: Awareness level about AI is positively related with the demographics (such as age, gender, qualification, occupation and marital status) of the respondents.

H2: Opinion about need of AI in investing behaviour is positively related to the demographics (such as age, gender, qualification, occupation and marital status) of the respondents.

H3: Usefulness of AI for B2B companies are positively linked to the demographics (such as age, gender, qualification, occupation and marital status) of the respondent.

5 Data Collection and Analysis

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.411	5	3.482	3.753	.003 ^b
	Residual	180.009	194	.928		
	Total	197.420	199			

a. Dependent Variable: Do you find the need of AI in customer investing behavior ?

b. Predictors:(Constant), QUALIFICATION, OCCUPATION, AGE, MARITAL STATUS, GENDER

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
1 (Constant)	1.575	.537		2.934	.004
AGE	-.107	.081	-.098	-1.315	.190
GENDER	.397	.175	.195	2.273	.024
MARITAL STATUS	.439	.160	.218	2.743	.007
OCCUPATION	-.080	.064	-.095	-1.241	.216
QUALIFICATION	.162	.094	.143	1.719	.087

a. Dependent Variable: Do you find the need of AI in customer investing behavior ?

The above table shows that there exists significant difference between respondent's opinion about need of AI in customer investing behaviour and demographics of respondents. Thus, the H2 is accepted.

Correlations						
	Do you find the need of AI in customer investing behavior ?	AGE	GENDER	MARITAL STATUS	OCCUPATION	QUALIFICATION
Pearson Correlation	Do you find the need of AI in customer investing behavior ?	1.000	-.137	.039	.217	-.057
	AGE	-.137	1.000	-.160	-.136	.144
	GENDER	.039	-.160	1.000	-.388	.296
	MARITAL STATUS	.217	-.136	-.388	1.000	-.129
	OCCUPATION	-.057	.144	.296	-.129	1.000
	QUALIFICATION	.100	.248	-.406	.344	.159
Sig. (1-tailed)	Do you find the need of AI in customer investing behavior ?	.	.027	.291	.001	.211
	AGE	.027	.	.012	.028	.021
	GENDER	.291	.012	.	.000	.000
	MARITAL STATUS	.001	.028	.000	.	.034
	OCCUPATION	.211	.021	.000	.034	.
	QUALIFICATION	.079	.000	.000	.000	.012
N	Do you find the need of AI in customer investing behavior ?	200	200	200	200	200
	AGE	200	200	200	200	200
	GENDER	200	200	200	200	200
	MARITAL STATUS	200	200	200	200	200
	OCCUPATION	200	200	200	200	200
	QUALIFICATION	200	200	200	200	200

The above table shows that there exists a negative correlation between opinion of respondents about need of AI in investing behaviour and age of respondents.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.653	5	5.131	2.786	.019 ^b
	Residual	357.222	194	1.841		
	Total	382.875	199			

a. Dependent Variable: Is AI useful for B2B companies ?

b. Predictors: (Constant), QUALIFICATION, OCCUPATION, AGE, MARITAL STATUS, GENDER

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	2.945	.756		3.894	.000
	AGE	-.155	.114	-.102	-1.354	.177
	GENDER	.552	.246	.194	2.239	.026
	MARITAL STATUS	.122	.225	.044	.541	.589
	OCCUPATION	-.251	.090	-.216	-2.780	.006
	QUALIFICATION	.239	.133	.152	1.801	.073

a. Dependent Variable: Is AI useful for B2B companies ?

The above table shows that there exists significant difference between respondent's opinion about usefulness of AI for B2B companies and demographics of respondents. Thus, we accept H1 hypothesis and reject H0.

Correlations

	Is AI useful for B2B companies ?	AGE	GENDER	MARITAL STATUS	OCCUPATION	QUALIFICATION
Pearson Correlation	Is AI useful for B2B companies ?	1.000	-.132	.068	.062	-.154
	AGE	-.132	1.000	-.160	-.136	.144
	GENDER	.068	-.160	1.000	-.388	.296
	MARITAL STATUS	.062	-.136	-.388	1.000	-.129
	OCCUPATION	-.154	.144	.296	-.129	1.000
	QUALIFICATION	.029	.248	-.406	.344	.159
Sig. (1-tailed)	Is AI useful for B2B companies ?	.	.031	.170	.191	.014
	AGE	.031	.	.012	.028	.021
	GENDER	.170	.012	.	.000	.000
	MARITAL STATUS	.191	.028	.000	.	.034
	OCCUPATION	.014	.021	.000	.034	.
	QUALIFICATION	.343	.000	.000	.000	.012
N	Is AI useful for B2B companies ?	200	200	200	200	200
	AGE	200	200	200	200	200
	GENDER	200	200	200	200	200
	MARITAL STATUS	200	200	200	200	200
	OCCUPATION	200	200	200	200	200
	QUALIFICATION	200	200	200	200	200

The above table shows that there exists a negative correlation between respondent's opinion about usefulness of AI for B2B companies and age of respondents.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.708	5	1.142	6.860	.000 ^b
	Residual	32.287	194	.166		
	Total	37.995	199			

a. Dependent Variable: Do you hear this terminology "Artificial Intelligence" ?

b. Predictors: (Constant), QUALIFICATION, OCCUPATION, AGE, MARITAL STATUS, GENDER

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	1.495	.227		6.575	.000
	AGE	-.058	.034	-.121	-1.691	.093
	GENDER	-.114	.074	-.128	-1.542	.125
	MARITAL STATUS	.036	.068	.041	.532	.595
	OCCUPATION	.031	.027	.085	1.151	.251
	QUALIFICATION	.149	.040	.301	3.737	.000

a. Dependent Variable: Do you hear this terminology "Artificial Intelligence" ?

The above table shows that there exists significant difference between respondent's awareness about AI and demographics of respondents. Thus, we accept H1 hypothesis and reject H0.

Correlations

	Do you hear this terminology "Artificial Intelligence" ?	AGE	GENDER	MARITAL STATUS	OCCUPATION	QUALIFICATION
Pearson Correlation	Do you hear this terminology "Artificial Intelligence" ?	1.000	-.020	-.221	.199	.073
	AGE	-.020	1.000	-.160	-.136	.144
	GENDER	-.221	-.160	1.000	-.388	.296
	MARITAL STATUS	.199	-.136	-.388	1.000	-.129
	OCCUPATION	.073	.144	.296	-.129	1.000
	QUALIFICATION	.350	.248	-.406	.344	.159
Sig. (1-tailed)	Do you hear this terminology "Artificial Intelligence" ?	.	.392	.001	.002	.154
	AGE	.392	.	.012	.028	.021
	GENDER	.001	.012	.	.000	.000
	MARITAL STATUS	.002	.028	.000	.	.034
	OCCUPATION	.154	.021	.000	.034	.
	QUALIFICATION	.000	.000	.000	.000	.012
N	Do you hear this terminology "Artificial Intelligence" ?	200	200	200	200	200
	AGE	200	200	200	200	200
	GENDER	200	200	200	200	200
	MARITAL STATUS	200	200	200	200	200
	OCCUPATION	200	200	200	200	200
	QUALIFICATION	200	200	200	200	200

The above table shows that there exists a negative correlation between respondent's awareness about AI and age of respondents.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.011	5	7.802	6.765	.000 ^b
	Residual	223.744	194	1.153		
	Total	262.755	199			

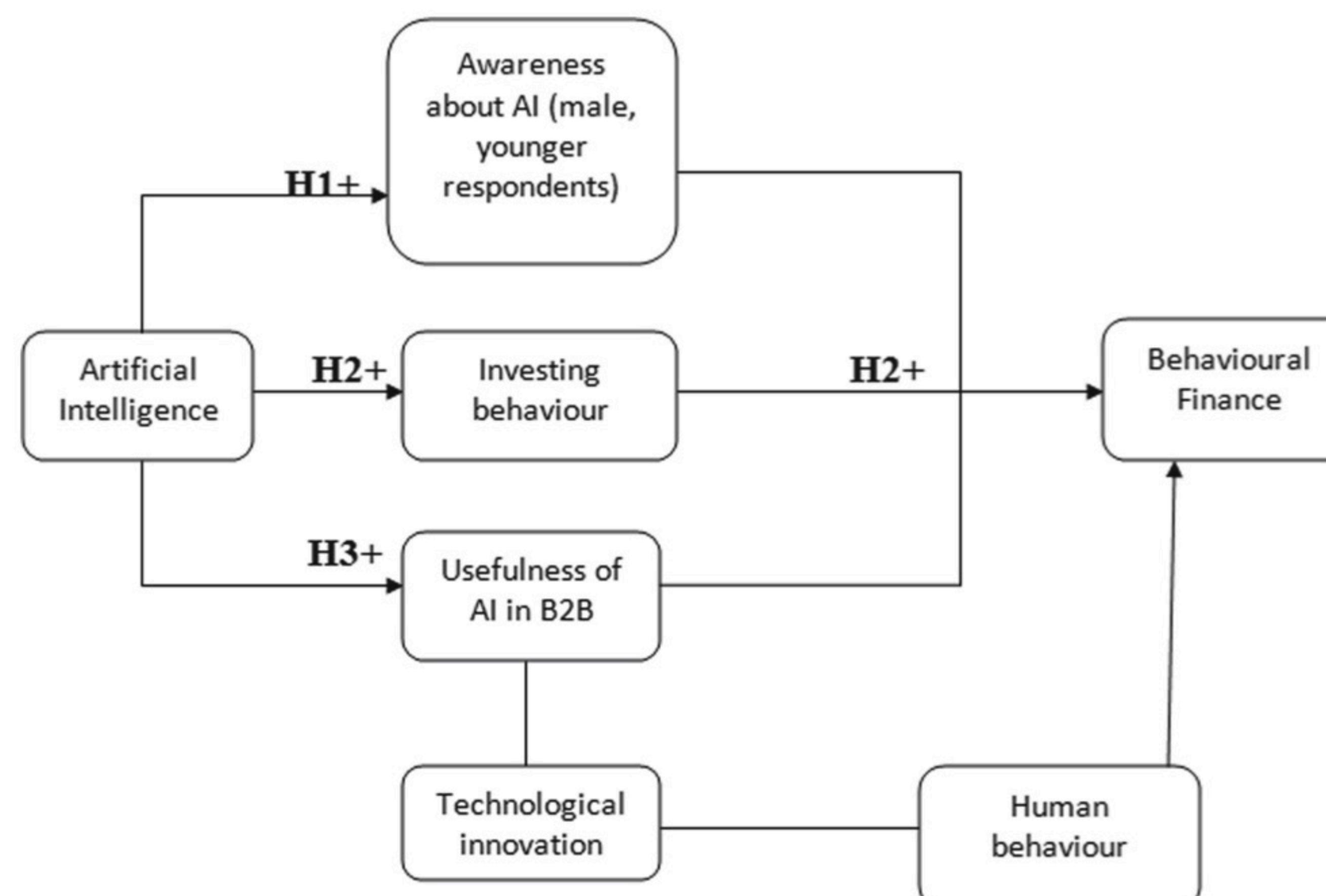
a. Dependent Variable: Human behavior is affected by any technological changes or innovations ?

b. Predictors: (Constant), QUALIFICATION, OCCUPATION, AGE, MARITAL STATUS, GENDER

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.526	.598		.879	.381
	AGE	.031	.091	.025	.342	.733
	GENDER	.226	.195	.096	1.158	.248
	MARITAL STATUS	.751	.178	.323	4.209	.000
	OCCUPATION	.081	.072	.084	1.128	.261
	QUALIFICATION	.210	.105	.162	2.004	.046

a. Dependent Variable: Human behavior is affected by any technological changes or innovations ?

The above table shows that there exists significant difference between respondent's opinion about technological innovations and its impact on human behaviour and demographics of respondents.



Proposed Model for Application of AI in Behavioural Finance

6 Conclusions and Recommendations

- Results indicate a positive relation between respondent's opinion about need of AI in customer investing behaviour and demographics of respondents.
- Results shows that the males have more positive opinion about need of AI in customer investing behaviour.
- There exists significant difference between respondent's opinion about technological innovations and its impact on human behaviour and demographics of respondents.
- There exists significant difference between respondent's awareness about AI and demographics of respondents.
- The result shows that young respondents are more aware about Artificial Intelligence than elder respondents.
- There exists a negative correlation between respondent's opinion about usefulness of AI for B2B companies and age of respondents.
- There exists a negative correlation between respondent's awareness about AI and age of respondents.
- There exists significant difference between respondent's opinion about usefulness of AI for B2B companies and demographics of respondents.
- There is need to spread more awareness about uses of AI in investing behaviour assistance.

Limitations of study & future scope of study

- The sample size could be increased to give more realistic view.
- Researcher has used ANOVA as a tool of analysis which has its own limitations.
- Data collection methods like interview method can be used to make response more accurate.

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