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APPLICATION OF BEHAVIOURAL FINANCE IN RISK MANAGEMENT: A REVIEW BY USING PRISMA FRAMEWORK

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ABSTRACT

The risk management in financial industry has been evolved in past two decades. The financial industry translated it from a return driven industry to a robust risk management industry. The scope of risk management has been widened from controlling to measuring and determining its limits. The factors which affect the risk in financial industry are broadly classified into systematic risk, market risk, credit risk, liquidity risk, and operational risk. Generally financial institutions are more exposed to credit risks in comparison of other risks. There are certain models which help in ascertaining the credit risk in a financial institution in order to identify the risk taking ability of particular financial institution and management thereof. The mostly used techniques for risk management are GAP (Groupe d'Analyse Pratique) analysis, VaR (Value at Risk), RAROC (Risk Adjusted Rate of Return or Capital), Securitization, Sensitivity Analysis, and Internal Risk Based Rating. These all models of risk management are based on the assumption that individuals are rational and free from the social and behavioral biases. The present paper is an attempt to do systematic literature review (SLR) of existing published work on behavioral finance's applications in risk management. The various studies conducted on behavioral finance in risk management across the globe have been considered in the present paper to explain concepts and to highlight the limitations of rational risk models.

Keywords: *Behavioral Finance, Financial Literacy, Risk Management, Risk Analysis.*

JEL Classification: *G2, G4, G53*

Introduction

In recent times financial service industry has been evolved as a more challenging business as compared to it was in 1960s and 1970s. The managers are aggressively working for profits and performance; however, this should be earned without sacrificing safety. The managers must maintain adequate liquidity and cushion to absorb the unforeseen losses. This unforeseen probability of loss is known as "risk" in financial sector. So, it is essential for the financial institutions to manage the risk to mitigate such losses. The risk in financial institutions is broadly classified into market risk, credit risk, liquidity risk and operational risk. Generally financial institutions are more exposed to credit risks as compared to any other risks. Win (2018) defined credit risk of a bank as the result of failure of bank's borrower or counterparty to meet the obligations as per the agreed terms and conditions. The credit risk propels other risks, like operation risk, liquidity risk and market risk.

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The process of managing risk is divided into two parts (i) Risk Assessment (ii) Risk Management. There are certain models on risk management those helps in assessing risk aptitude in the financial institutions. The widely used techniques for risk management are GAP (Groupe d'Analyse Pratique*)* analysis, VaR (Value at Risk), RAROC (Risk Adjusted Rate of Return or Capital), Securitization, Sensitivity Analysis, and Internal Risk Based Rating. The common assumption of all these risk models is that individuals are rational and free from social & behavioral biases. Bazerman and Messick (1998) have explained the term rationality as "the decision making process that is logically expected to lead to the optimal results given an accurate assessment of the decision maker's values and risk preferences". However, individuals change their risk preferences as and when new opportunity occurs to learn and correct their past risk preferences. These risk preferences are depending upon situation where decision making takes place (Herne, 2011). Thus, individual's risk preferences are situational, not static. This happens due to individual's limited cognitive capabilities, information processing capacity, time and cost constraints of individual to obtain the complete information.

Review of behavioral Finance in Risk Management

The discussion on behavioral finance in risk management started with the definition of risk and risk management. The risk is defined as the "probability of default" and risk management includes all the necessary strategies or practices to mitigate, assess and manage this probability. There is an ongoing debate about rational models to compute and manage this probability of default accurately. The rational models are primarily based on rationality assumption and discard the role of social and behavioral aspects in assessment of risk in financial institutions, on contrary many researchers are justifying the role of human behavior, psychological biases and non-financial factors in accurate risk assessment. The gap, arose due to different research outcomes, can be mitigated by considering human psychology's effect into financial risk management practices. The behavioral finance deals with the psychology of risk. The psychological approach for assessment of risk is very complex process because it has multiple dimensions due to large variability in human emotions. Primarily these human emotions are driving force behind these risks or probability of default. So it is necessary to do the mapping of human emotions for accurate analysis of risk management practices.

Moosa and Ramiah (2020) have explained the utility of behavioral finance and stated that behavioral finance has discarded the general assumptions of rationality and fair pricing; they observed individual's behavior in financial market by using the principles of psychology, irrationality can be attributed to behavioral biases, which are either cognitive or emotional, both of which can lead to poor and irrational financial decisions. Kahneman and Tversky (1979) advocated the early psychological theories those constitute the foundation of behavioral finance, and they also developed prospect theory that explains loss aversion.

Irrationality is readily observable when, for example, people gamble against the odds or accept higher risk for lower return. Behavioral finance aims to explain irrationality and the presence of market anomalies. (Shiller 2003) argued that only rational understanding about risk does not provoke the appropriate action rather it require emotional response too. (Kurz, 1999) pointed out that change in asset prices is caused by the change in fundamentals vis-à-vis investor's belief. Statman, (1999) said that there is sizable difference between standard finance theories and behavioral finance theories. The standard finance is based on the central theme of market efficiency, which has two meanings (i) investors cannot systematically beat the market and (ii) security prices are rational. The rational prices of asset reflect only utilitarian aspect like increase or decrease in asset prices only it does not incorporate value-expressive aspects like sentiment. In behavioral finance, it is considered that value expressive characteristics i.e. behavioral / psychological attributes do matter in investor's choices and asset prices along the risk. Sobehart (2014) mentioned that sometimes asset price moments are the result of behavioral patterns and cognitive biases that may lead to under-reaction and overreaction situations where investors seem to stray from rational decision making. Thus, a Behavioral Asset Pricing Model (BAPM) can be developed as robust measure to determine asset prices (Statman, 1999).

The Behavioral finance theories play significant role in asset allocation, portfolio selection, stock prices and determining the factors of financial loss (David and Lleo,2020). The demographic factors, behavioral biases and financial literacy help the market or firm to recover from the financial losses, the key behavioral biases which play important role in managing the financial losses are overconfidence,

self-serving bias, loss-aversion bias, representativeness bias, hindsight bias (Asbi et al, 2020). The future expectations of returns or growth are affected by risk (Moutzouris and Nomikos, 2019). The risk taking behavior of market agents are significantly affected by personal risk aversion combined with individual personality traits. It's found that risk-averse executives are more conservative in estimation of risk exposure (Bodnar et al, 2019).

Methodology

The keyword "Behavioral Finance" searched on Scopus database. This paper is an attempt to organize the literature review available on the Scopus Index. The paper has followed the steps involved in organized literature review recommended by (Keathley-Herring et al., 2016). The processes to develop the scope of study has started by assessing papers on behavioral finance and risk management in order to narrow down the choices, identifying the characteristics and classify the possible search keywords (Keathley-Herring et al., 2016). The initial search incorporated all types of research articles published in various journals, book chapters, lecture notes and conference proceedings later on for final literature review analysis the paper focused only on research articles published in English language in multiple journals.

The behavioral finance and risk management area is very wide, because of the extensiveness a complete literature review was made, and the Scopus data use to find the relevant scientific journals. There are no additional sources incorporated for this paper. The keyword "Behavioral Finance" searched on the Scopus database showed total 2052 studies. Further the scope of study narrowed down to "behavioral finance's application in risk management" and search criteria "Risk Management" applied, total 153 studies were shown by Scopus database. The filters are used to find relevant studies and time frame is used for post-global financial crisis time period i.e. from year 2008 to year 2020 on Scopus database. Finally 145 papers in post-crisis period related to behavioral finance applications in risk management got shortlisted for further analysis. These 145 papers include review papers, qualitative, quantitative and experimental studies.

For further analysis the Inclusion-Exclusion Criteria applied on these 145 Papers, as mentioned in Table-1 given below:

Table 1: Inclusion-Exclusion Criteria

Criteria	Inclusion	Exclusion
Scope of study	Behavioral finance, Risk management, financial decision making, investment decisions, Financial institutions	Marketing, Consumer behavior, Human resources
Time-period	2008 to 2020 Post-Crisis time period	Pre-crisis time period
Subject-area	• Economics, Econometrics and Finance • Business Management and Accounting • Psychology • Decision Sciences • Social Sciences	All others
Publication stage	Only finally published papers	Pending in process
Type of papers	Review and Research Articles	Lecture notes, conference presentations, panel discussions
Language	English Language	Non-English

Source: Synthesized by the authors

After applying the inclusion-exclusion criteria 73 papers found eligible to carry out further analysis and 79 papers excluded from the study. These all 73 papers exported in excel sheet for continuing with systematic literature review. The information related to these papers e.g. Cited by, Journals, Authors, years of publication etc., are arranged in MS-Excel file in a described format. Further 17 papers were also dropped from final literature review analysis due to their type and irrelevancy to present study.

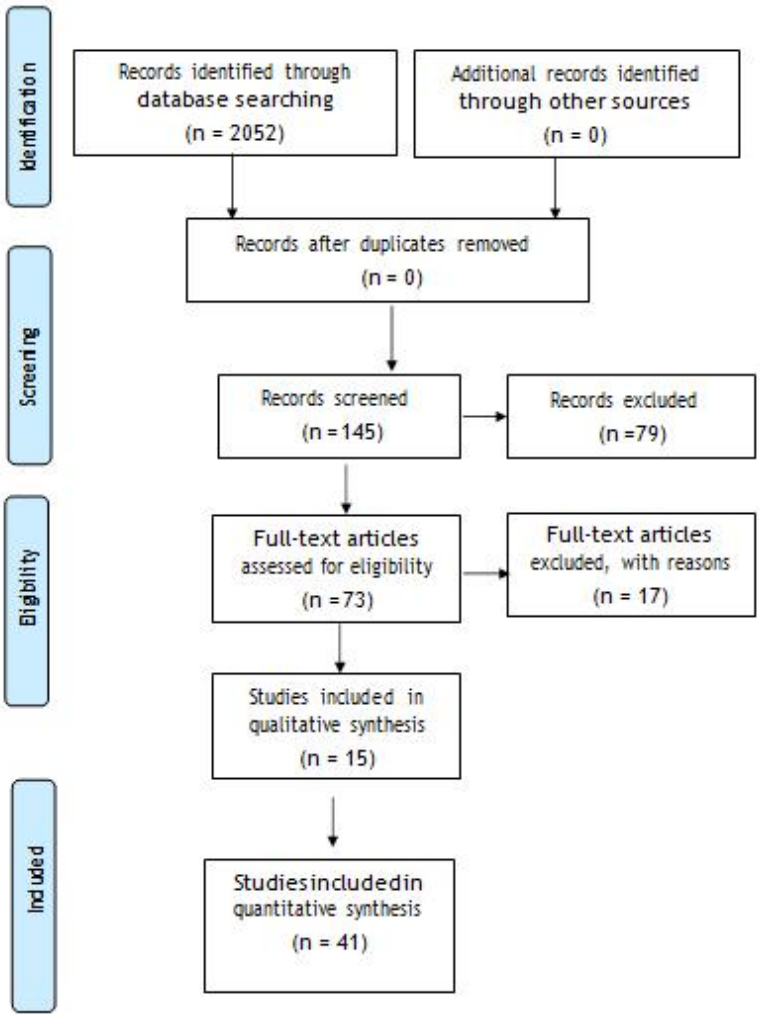

Figure 1: PRISMA Framework

(Preferred Items for Systematic Reviews and Meta-Analyses (PRISMA)

(From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097, www.prisma-statement.org)

Quality Assessment

The present study considered original publications to get the better outcomes and excellence overview of the earlier data available on the Scopus database. Followed by, separating abstracts and conclusions to narrow down the archives.

In addition, the references cited in the selected papers were also checked, as well as the articles citing sampled papers. The records were check many times to avoid duplication and for improvement in results the irrelevant studies were also removed.

Eligibility and Inclusion

Criteria Among the identified pieces of literature, papers went through a stricter and more accurate selection according to the following criteria: To assure the high quality of selected papers, articles in English were chosen only if they were published in the Scopus database. This paper reviews the Behavioral Finance literature and overview the past studies conducted in its application in financial risk management domain to improve the risk assessment, risk predication and modeling. Most studies included quantitative results and some articles with qualitative analysis of high value were included as well as a few studies are based on review papers.

Studies Included in Quality Synthesis

After selecting the 73 papers, the procedure involved two different consecutive steps. In the first step, the consistent metadata was imported into Microsoft Excel to experience a descriptive analysis of the literature on behavioral finance in the field of risk management such as the qualitative and quantitative work done in financial institutions/ market. Further 5 irrelevant studies were removed so finally 68 research articles were available for further In-depth analysis. In the following step, an in-depth content analysis was undertaken to classify and examine main investigation streams, reporting the state of the art of research across diverse themes and highlighting the conceivable challenges and opportunities for future research. Content analysis is a research approach to make analysis of documents and texts that seek to describe and quantify the obvious content of communication in terms of prearranged groups, following a systematic method, permitting replicable and valid implications from texts.

Analysis

The Results of the review of literature are observed as mentioned below:

- Descriptive Analysis: Year Base (on the basis of publication year)
- Geographical Analysis (on the basis of country-wise distribution of publications)
- Document-type
- Citation Report
- Journal Base (Journal-wise publications)
- **Descriptive Analysis: Year-wise Publications**

Figure-2 demonstrates the number of publications per year in the area of behavioral finance. In present study main idea is to identify the role of behavioral biases, psychological features, demographic attributes and personality traits explored by the researchers.

It is to reiterate that the risk management practices are very much keen to reduce the probability of failure of business or market, but with passage of time, the limitations of existing studies were highlighted and research in the application of behavioral finance in risk management surged. The research has grown steadily between 2017 to 2019, reaching a peak in 2019. It can be noted that after 2017 the behavioral finance domain has emerged as an alternative to former risk modeling techniques, and give future directions to financial risk modeling. Richard Thaler got Nobel Prize in year 2017 which gave a positive boost to the field of behavioral finance and its application in various domains. Specifically mapping of behavioral biases and incorporating it with existing rational models can enhance the accuracy in decision making related to risk management practices.

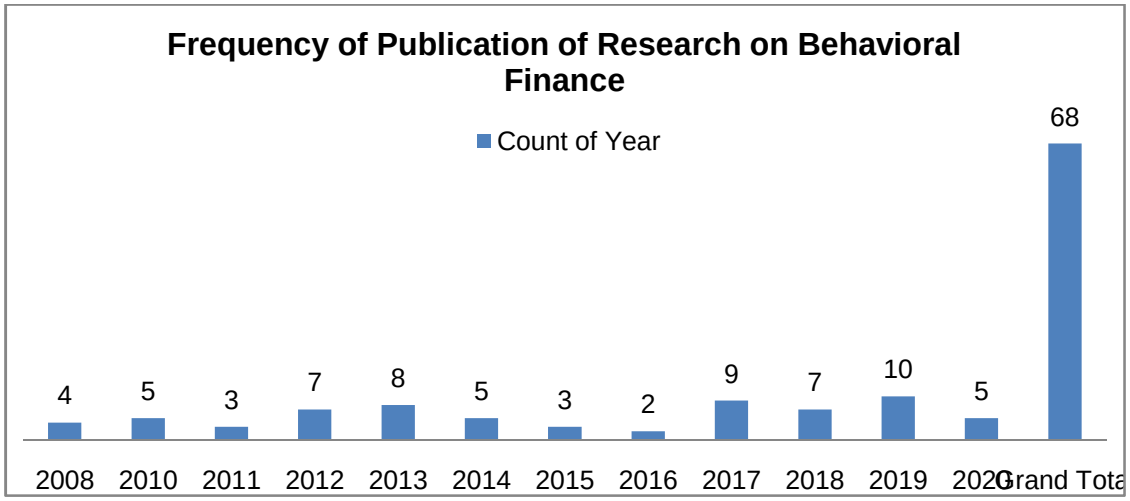

Figure 2: Year-wise Publications in behavioral Finance in Risk Management

Source: Scopus Database

This trend indicates that the study on behavioral finance perspective has increased significantly in last five years in order to develop a predictive model for accuracy in risk assessment, risk predication and formulation of risk mitigating strategies. The year base graph of behavioral finance is showing results

very differently. The highest numbers of publications are in year 2019 followed by 2017, 2013 and 2018. The graph shows that the number of publications is divided in two phases one is 2017 to 2020 and other is 2012-2013. In year 2013 Prof. Robert Shiller received the Nobel Prize for his work on Asset Pricing, and in year 2017 Prof. Richard Thaler received the Nobel Prize for his work on "Nudge". The graph shows a rise in number of publication in the said years. There are 8 and 9 publications in the year 2013 and 2017 respectively on the research area "application of behavioral finance in risk management". The number of publication relating to behavioral finance in risk management area are above average in year 2018, 2019 and further 2020, which advocates increasing significance of behavioral finance field and its application in the area of risk management.

- **Geographical Analysis: Country-wise Publications**

The studies analyses on country base work done during the post-crisis period 2008 to 2020. The highest publications 16 research papers are produced by United States on behavioral finance applications in risk management of financial institutions/ market. The research on behavioral finance conducted in United States is more acknowledgeable as compared to other countries. The second most work is undertaken in China and India with 9 studies from each country on behavioral finance application in risk management practices. The France, Netherlands, South Africa and Brazil have lesser number of studies on behavioral finance in risk management during the post crisis period from 2008 to 2020.

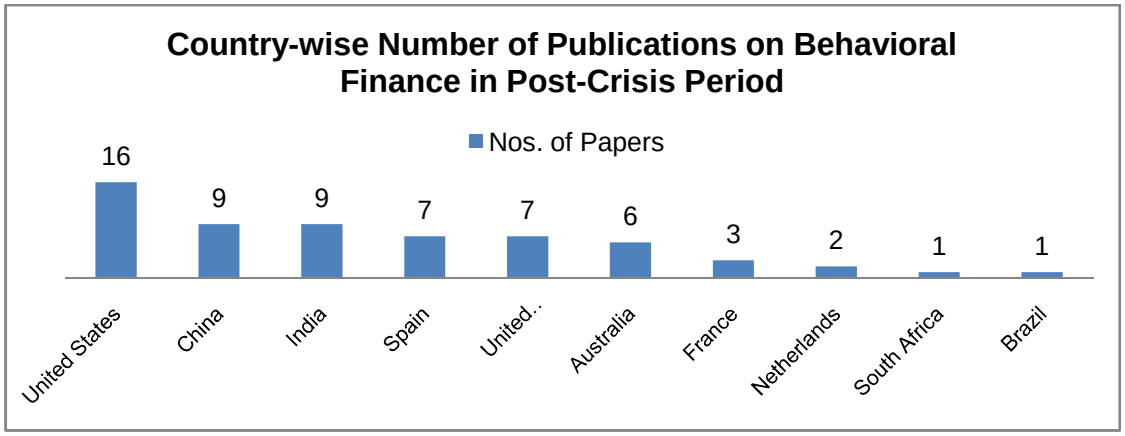

Figure 3: Country-wise Publications on behavioral Finance in Post-Crisis Period
Source: Scopus Database

Document-Type-wise Publications

The total numbers of eligible studies are 68 papers, out of which most of the papers got published in Scopus indexed journals. The bar-graph, Figure-4, shows 55 papers (81%) are published in academic journals, 7 (10%) papers published in conference proceedings, 5 (8%) research articles are review paper and rest 1 (1%) is published in book chapter.

The paper published in the journals and review papers are used for further analysis.

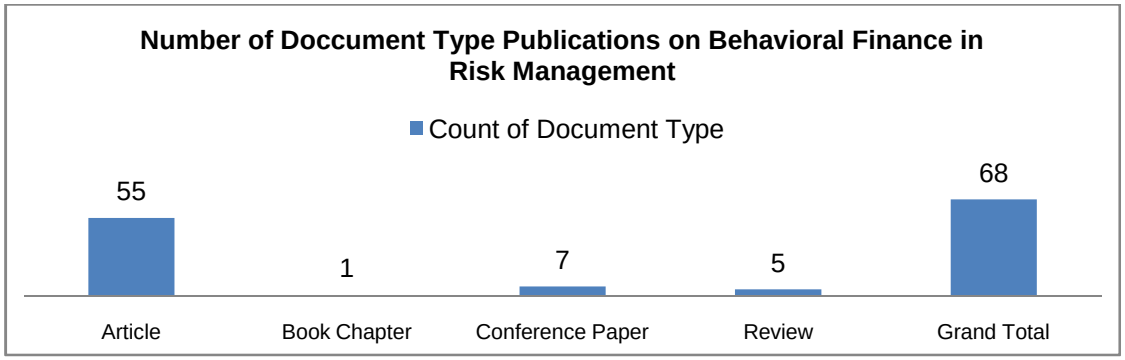

Figure 4: Document type Publications
Source: Scopus Database

- **Citation Report**

The citation report of the studies in post crisis period from 2008 to 2020 is shown in the Table-2. The highest cited journal is Journal of Financial Economics with 155 times and article name is Sentiment and stock prices: The case of aviation disasters. After that the second most cited study is Derivative usage and firm value: The influence of agency costs and monitoring problems is cited 31 times in ten years. The study is published in Journal of Corporate Finance in year 2010. The 30 times citation of the article name Corporate social responsibility and CEO confidence is 3rd most cited study in last three years & published in Journal of Banking and Finance. The study named Uncertainty and industry structure effects on managerial intuition about information technology real options published in the Journal of Management Information Systems and cited 28 time since year of 2008. The list of top cited papers (no. of citation > 8) is mentioned in a table 2 below.

Table 2: Most Cited Research Papers

S. No.	Year	Title of Paper	Journal	Nos. of Citation
1.	2011	Cost of capital, discounting and relational contracting: Endogenous optimal return and duration for joint investment projects	Applied Economics	8
2.	2011	A profitable trading and risk management strategy despite transaction costs	Quantitative Finance	8
3.	2013	Development and validation of the Perceived Investment Value (PIV) scale	Journal of Economic Psychology	9
4.	2013	Freshwater, saltwater and deep-water: Efficient market hypothesis versus behavioural finance	Journal of Economic Geography	9
5.	2019	The ABCs of financial education: Experimental evidence on attitudes, behaviour, and cognitive biases	Management Science	11
6.	2012	Investor sophistication and risk taking	Journal of Banking and Finance	14
7.	2012	Household behaviour and boom/bust cycles	Journal of Financial Stability	18
8.	2008	Uncertainty and industry structure effects on managerial intuition about information technology real options	Journal of Management Information Systems	28
9.	2017	Corporate social responsibility and CEO confidence	Journal of Banking and Finance	30
10.	2010	Derivative usage and firm value: The influence of agency costs and monitoring problems	Journal of Corporate Finance	31
11.	2010	Sentiment and stock prices: The case of aviation disasters	Journal of Financial Economics	155

Source: Synthesized by the authors

- **Journal-Wise Publications**

The journal base report on behavioral finance application in risk management is shown in the bar-graph, figure-5. The top journals in table-3 shows The Journal of Behavioral Finance, Journal of Banking and Finance and Management Science have 3 publications from each journal. The Journal of Accounting and Finance, Journal of Applied Economics, Journal of Quantitative Finance, Research in International Business and Finance are the second largest in the list with 2 studies and remaining list is also shown in the bar-graph figure-5 in which all the journals name is mention. The list is covering the complete publishing journal during the post-crisis period from 2008 to 2020.

Table 3: Top Journals for Publications on behavioral Finance in Risk Management

S. No.	Name of Journal	No. of Publications
1.	Journal of Behavioural Finance	3
2.	Journal of Banking and Finance	3
3.	Journal of Management Science	3
4.	Journal of Accounting and Finance	2
5.	Journal of Applied Economics	2
6.	Journal of Quantitative Finance	2
7.	Research in International Business and Finance	2

Source: Synthesized by the authors

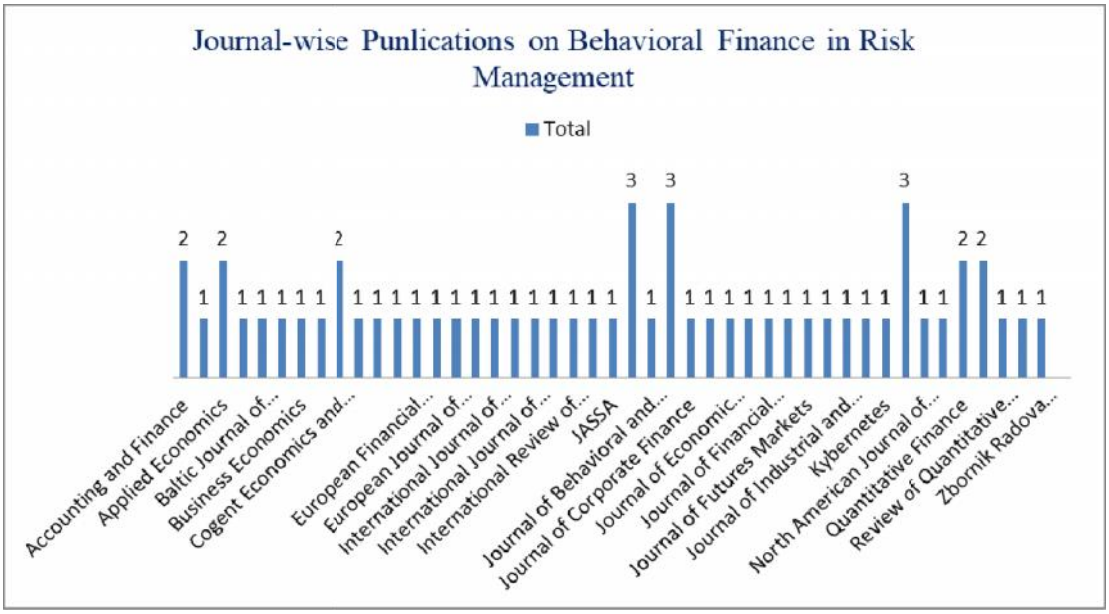

Figure 5: Journal-wise Publications
Source: Scopus Database

Literature Classification

The total 56 studies are classified after analyzing on the excel sheet as per the methods employed. The studies are divided into two broad categories (i) Quantitative Methods (ii) Qualitative Methods to understand the past work done on particular research area. The papers based on experiments, mixed methods and literature review are classified under qualitative methods for writing purpose. Each category is explained in detail to find the required methods, key research questions, factors, findings and future scope of the research in the field of behavioral finance applications. The outcomes of literature classification are shown in Table-4 below:

Table 4: Literature Classification

Literature Classification (56)	
Quantitative Methods (41)	Qualitative / Non-Quantitative Methods (15)

Source: Synthesized by the authors

There are 41 papers from quantitative methods and 15 papers are from non-quantitative methods which include 11 literature review based publications, one mixed methods based publications and three from experimental based studies as shown in figure-6 below:

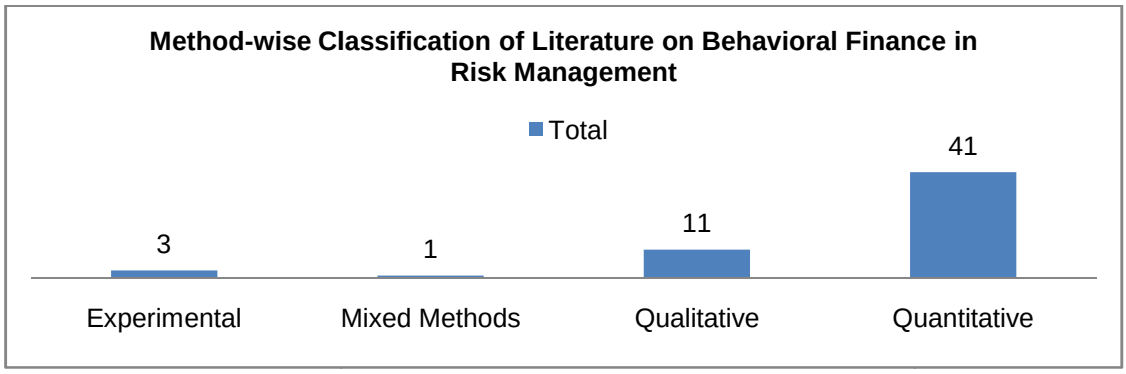

Figure 6: Method-wise Literature Classification
Source: Scopus Database

- **Quantitative Method**

The category of researchers who apply statistical evidence based methods where they used to test their assumptions by using quantitative measures (Hoepfl, 2000), and to test these assumptions they analyze the causal relationship between variables. These researchers define any social problem into rational statements which can be explained into quantitative terms for further analysis to develop theories by use of mathematical models (Bogdan and Biklen, 1998).

In quantitative methods:

- The emphasize on rational logics and evidences (Bogdan & Biklen, 1998).
- The collected reasons are presented or summarized in the form of numerical data
- The standard mathematical models are applied to test the numerical data
- The final results and conclusion also explained in arithmetic terms.

The forty one studies out of fifty six studies are based on quantitative methods. These papers have used various quantitative measures as presented in table-6, to analyze the reasons, arguments related to the field of behavioral finance and its application in risk related decisions in financial institutions, financial markets and government.

Most of the quantitative studies have covered the behavioral biases and their direct or indirect relation with risk related issues. The portfolio selection is significantly influenced by behavioral biases. (Davis & Lleo, 2020) The portfolio selection model has incorporated five behavioral biases Overconfidence, Excessive-Optimism, Conservatism, Confirmation Bias, and Group-think. The returns on these investments are affected by psychopathic characteristics of the top management team of the companies (Omar et al, 2019). In many business firms the decision like internal financing of any company and investment efficiency are affected by the managerial overconfidence (He et al, 2019). The general argument about the market participant is that they are informationally efficient and rational decision maker but it's observed during the merger and acquisition of firms that these market participants behave irrationally and their decisions are influenced by their cognitive biases. These cognitive biases further affect the personal risk taking appetite which forms a certain type of attitude which affects the final risk pricing of any financial asset (Homan and Van Vuuren, 2019).

The quantitative methods are broadly applied in the area of banking risk, commercial banking, credit crisis, asset returns, asset pricing, asset management, investment behavior, investment risk, investment sentiment and financial behavior related studies.

Table 5: Most focused Research Areas

S.No.	Major focus areas for study	No. of Research Articles
1.	Banking : Banking Risk, Commercial Banking, Credit Crisis	7
2.	Assets : Asset Returns, Asset Pricing, Asset Management	5
3.	Investment : Investment Behaviour, Investment Risk, Investment Decision Making, Investor Sentiment	8
4.	Financial Behaviour related studies	7

Source: Synthesized by the authors

- **Qualitative / Non-Quantitative Method**

The qualitative studies usually focuses on the realistic tactic that explains the context-specific features, as real world poses them where researchers need not to put any effort to manipulate the reality (Patton, 2001). Qualitative research means "any sympathetic of research that produces results not arrived at by means of statistical procedures or other means of qualification" (Ozanne, Strauss and Corbin, 1992) instead of this qualitative research concluded the real world features in a logical manner (Patton, 2001).

The 15 papers from 56 papers classified under non-quantitative research method based approach. The papers included eleven papers are based on literature review and one paper has mixed method approach. Three research papers among these papers are based on field experiments.

The statistical tools and techniques used in these 56 papers have been highlighted in the table-6 presented below:

Table 6: Tools / Statistical Techniques

S.No.	Tools Statistical Techniques	No. of Papers	Research Articles
1.	Descriptive Statistics	4	(Asbi et al, 2020), (Bodnar et al, 2019), (Omar et al, 2019), (He et al, 2019), (DeDreu and Bikker, 2012)
2.	ANOVA	4	(Fauver and Naranjo, 2010), (Lankton and Luft, 2008), (Asbi et al, 2020), (Bodnar et al, 2019), (Omar et al, 2019), (Chandra et al, 2017)
3.	Correlational Analysis	9	(Ferreira and Dickason-Koekemoer, 2019), (Ferreira et al, 2019), (Paraboni et al, 2018), (McCarthy et al, 2017)
4.	Regression Analysis	18	(Blajer et al, 2018), (Paraboni et al, 2018), (Palao and Pardo, 2017), (McCarthy et al, 2017), (Ahmed and Safdar, 2017), (Chandra et al, 2017), (Moutzouns and Nomikos, 2019), (He et al, 2019), (Carpena et al, 2019), (Homan and Van Vuuren, 2019), (Blasco et al, 2018), (Molchanov and Stangl, 2018)
5.	Structural Equation Modelling (SEM)	4	(Fauver and Naranjo, 2010), (Acharya et al, 2017), (Dinc and Aren, 2017), (Lakshmi et al, 2013)
6.	ARMA, GARCH	3	(Low, 2018), (Horta and Lobao, 2018), (Shim et al, 2017)
7.	Literature Review	11	(Königstorfer and Thalmann, 2020), (Veermani et al, 2020), (Woo et al, 2020), (Sharma and Kumar, 2020), (Taffler, 2018), (Kumari and Sar, 2017), (Grosse, 2017),(Prorokowski and Roszkowska, 2014), (Wójcik et al, 2013)
8.	Experiments	3	(Gomez et al, 2016), (Kantsukov and Linnas, 2013), (Ko and Huang, 2012)

Source: Synthesized by the authors

The behavioral/psychological biases used in these 56 papers have been highlighted in the table-7 presented below:

Table 7: Behavioral / Psychological Biases

S.No.	Key behavioural Biases / Psychological Biases	No. of Papers	Research Articles
1.	Overconfidence	9	(Asbi et al, 2020), (Davis and Lleo, 2020), (He et al, 2019), (Grosse,2017), (McCarthy et al, 2017), (Chandra et al,2017), (Han et al, 2015), (Lakshmi et al, 2013), (Fromlet, 2012)
2.	Narcissism	1	McCarthy et al, 2017
3.	Emotional Intelligence	1	Dinc and Aren, 2017
4.	Locus of Control	2	(Blajer et al, 2018), (Dinc and Aren, 2017)
5.	Risk Aversion	6	(Bodnar et al, 2019), (Dinc and Aren, 2017), (Gomez et al, 2016), (Lakshmi et al, 2013), (Kantsukov and Linnas, 2013), (Puustinen et al, 2013)
6.	Nudge	2	(Carpena et al, 2019), (Gomez et al, 2016)
7.	Representativeness Bias	3	(Asbi et al, 2020), (Ahmed and Safdar, 2017), (Lakshmi et al, 2013)
8.	Herd Behaviour	6	(Woo et al, 2020), (Blasco et al, 2018), (Palao and Pardo, 2017), (Dehghani and Sapian, 2014), (Lakshmi et al, 2013), (Fromlet, 2012)
9.	Over optimism	1	Blasco et al, 2018
10.	Disposition effect	1	(Woo et al, 2020), (Lakshmi et al, 2013),
11.	Anchoring	1	(Woo et al, 2020)
12.	Cognitive dissonance	1	(Lakshmi et al, 2013)
13.	Loss aversion	2	(Asbi et al, 2020), (Han et al, 2015)
14.	Overaggressive behaviour	1	Lankton and Luft, 2008
15.	Anxiety	2	(Taffler, 2018), (Kaplanski and Levy, 2010)
16.	Control illusion	1	Fromlet, 2012
17.	Regret Aversion	2	(Lankton and Luft, 2008), (Chan at al , 2019)
18.	Hindsight Bias	1	Asbi et al, 2020
19.	Self-serving bias	1	Asbi et al, 2020
20.	Heuristics	2	(Forbes at al, 2015), (Theobold, 2015)

Source: Synthesized by the authors

Conclusion

Most of the previous studies focused on incorporating the behavioral biases in exiting rational risk models for predicting the risk-returns on assets, investments, portfolios and business growth. Number of the review articles was focused on investment related risk and stock prices related risk-return

paradox. There was a need to review the application of behavioral biases in banking industry related risk management practices in order to strengthen the risk assessment and management in banks. Moreover, based on current developments, it was also needed to highlight the major trends and difficulties related behavioral finance's application in risk management. The present paper finds out the direction of the past studies in the field of behavioral finance and concepts which are widely and narrowly working in the risk management domain to formalize the risk management framework in financial institutions. This paper reviewed the recent behavioral finance studies during the post crisis period from 2008 to 2020 in risk management in financial institutions to fill the mentioned research gap. An attempt was made to differentiate the behavioral finance application based on different industry and financial decisions.

In order to make better understanding on the topic, the key focused areas and statistical tools used in earlier studies are also summarized. From the above results it can be concluded that most of the behavioral finance studies were focused on investment related risk, financial behavior influence on decision making. In case of banking risk major focus is on operation risk, besides other risks. The present study gives a future scope for application of behavioral finance in credit risk management in banking industry. This paper has reviewed various statistical tools used to analyze the impact of behavioral biases on risk management practices and how behavioral risk models are differ from rational risk models in risk assessment ? The regression analysis and correlational analysis were widely used in most of the studies, apart from this there was application of few specific tools too so, this review paper give a scope to explore the other possible ways to analyze the existing risk models. Due to data and other resources requirements, there is uneven geographical distribution of research work observed. Majority research work is done in United States during the year 2013 then from year 2017 to 2020. The focus of studies was financial behavior of American investors and decision makers. More efforts are required to get financial institutions from the other part of the world preferably India and China. The present paper has reviewed the existing literature where 9 studies were India based, where most of the studies were focused on influence of behavioral biases on investment decisions and portfolio selection. India has a wide scope for application of behavioral finance in risk management in banking industry. An attempt is made to cover all possible aspects on the said topic available in the literature, and expected that it will make contribution to the existing literature on behavioral finance's application in risk management.

Declaration of Conflict of Interest

There is no potential conflict of interest with respect to the research, authorship and publication of this research article.

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