Print : ISSN : 0019-512X | Online : ISSN : 2454-6801

THE INDIAN JOURNAL OF COMMERCE

Quarterly Publication of the Indian Commerce Association

Vol. 74 **No. 4** **October-December, 2021**

The Indian Journal of Commerce
A Quarterly Refereed Journal

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The Indian Journal of Commerce is published four times in a year i.e., March, June, September and December. The Indian Journal of Commerce is freely distributed to all members.

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Lasertypeset by: Tessa Media & Computers, C-206, A.F.E-II, Jamia Nagar, New Delhi-25

Printed by: KIIT Deemed to be University, Bhubaneswar, Odissa

Published by Prof. Nawal Kishor on behalf of the Indian Commerce Association.

The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Do Investors Exhibit Behavioral Biases During News Announcements? An Evidence from the Indian Capital Market

NEENU C AND T MOHAMED NISHAD

Abstract: The purpose of this paper is to examine the impact of the type of news and source of news announcements on investor biases, namely herd behavior, overconfidence, loss aversion, and the disposition effect and to evaluate the role of investor demographic and sophistication factors on those biases during the news announcements. Primary data for the study has been collected through a structured questionnaire. The survey evidence supports a good fit of the structural model for the collected data as all values fit the recommended value. The study found that type of news and news sources have a significant impact on investor herd behavior, overconfidence, loss aversion, and the disposition effect. The demographic variables positively correlate with investor biases. Most of the investors prefer online source for information acquisition and they are more concerned about negative news announcements than positive news announcements.

Keywords: News announcement, Herd behavior, Overconfidence, Loss aversion, Disposition effect, Structural Equation Modelling

Introduction

Behavioural finance is a new paradigm of finance, which provides an explanation to investor behavior, which cannot be explained by standard theories of finance (Johnson, et al, 2002). Classical theories of finance do not predict any role of investor sentiments in shaping the stock's price volatility (Januz, 2015). Prospect theory developed by Kahneman and Tversky (1979) explains psychological factors known as a behavioral bias which influence investor decision making under uncertainty, which leads to irrational investment decision (S & N , 2016). In an uncertain and volatile market environment, psychology goes a step further than statistics in dealing with decision-making (Aggarwal, 2018). In such a market,

Neenu C is Research Scholar, Research Department of Commerce and Management Studies, Farook College (Autonomous) Kozhikode; and Dr. T Mohamed Nishad is Associate Professor, Research Department of Commerce and Management Studies, Farook College (Autonomous) Kozhikode

information plays a major role in investor's decision-making. The main reason for that is, the more informed investor's either receive more signals or perceive those signals more precisely (Zubair , et al, 2016). A piece of news from a reliable source may lead to more trading than from a less trustworthy source, so the quality of the information source has a greater impact on investor trading behavior. By analyzing how do different types of investors react to new earning information (Ekholm, 2006), found that majority of investors are more likely to sell stocks in a company after a positive earnings surprise, buy stocks after negative earnings surprise.

At the same time, instead of gathering accurate information, investors make decisions based on their experiences and intuitions (Shah et al, 2018). The investors' decisions are also subject to various beliefs and preferences. Such beliefs may induce investors to take investment decisions which the individual believes more favorable to them (Sahi & Arora, 2012). It is not only because of informational limitations, but also because of an individual's cognitive limitations as there is uncertainty with quality and quantity of information (Fernandez et al, 2011). So, it is important to understand the beliefs, attitudes, preferences, and judgment of investors as they are more concerned about their feelings, emotions, and experiences. By incorporating the information search and behavioral finance, (Zubair et al, 2016) demonstrate that the impact of various sources of market information on asset allocation is influenced by the personality of investors. Biases in information processing cause investors to under-react to some types of events and over-react to others (Fama, 1998).

The question, "Why investors behave the way that they do?" is still not solved, it uses insight from psychology and other disciplines to answer this question (Mittal, 2018). Behavioral finance provides an explanation for this question. As investors are human beings and have a wide range of emotions they may induce to behave irrationally. It explains the impact of diverse emotional, social and psychological behavior of investors (Zahera & Bansal, 2018). The major reason that investors tend to do worse is that they have behavioral or psychological biases that affect their ability to act objectively when investing. In such a situation emotions and feelings overtake logical thinking (Baker & Puttonen, 2017). Many researchers attempted to capture the effect of behavioral biases in the investment decision. Shefrin & Statman (1985) examined the decisions to realize gains and losses in a market setting by dealing with the question that whether investors in the financial market exhibit reluctance to realize losses. The tendency of people to underweight outcomes than merely probable in comparison with the outcome that is obtained with certainty is called the certainty effect. Under which investors become risk-averse in choice involving sure gain and become risk-seeking in choice involving sure losses (Kahneman & Tversky, 1979). (Kahneman & Tversky, 1974) concerned with cognitive biases, such as representativeness, Availability, and Adjustment,

and Anchoring, that stem from the reliance on judgemental heuristics. By investigating the presence of behavioral biases, namely Overconfidence, Excessive Optimism, Herd behavior and Disposition effect, and the role of demographic and investor sophistication characteristics in influencing those biases among investors in Delhi-NCR region (Prosad et al, 2015), found the presence of behavioral biases and investor demographic characteristics have an influential role in behavioral biases. For controlling such irrational acts, firstly an investor should be aware of these biases (Baker & Puttonen, 2017).

It is impossible to make financial decisions about complicated investment avenues and extremely difficult to mitigate the behavioral biases faced by investors with financial literacy (Rasool & Ullah, 2020). Many studies added to the existing literature on mediating role of financial literacy in behavioral biases (Baker, Kumar et al, 2019; Adil et al, 2021 Ahmad & Ali Shah, 2020; Ozen & Ersoy, 2019 and Katper, et al, 2019). Further, the mediating role of demographic, investor sophistication, personality traits, and risk perception were taken into consideration by many researchers (Kumari et al, 2020; Baker et al, 2019), Ahmad F., 2020, and Isidore & Christie, 2019). In the Indian scenario, many researchers (Mushinada & Sarma 2019), (Mushinada & Sarma, 2018), (Mushinada, 2020) and (Prosad & Sengupta, 2015) have investigated the different type of behavioral biases and its effect on investment decision. By using Structural Equation Modeling , Dasgupta & Singh (2019), Chang (2020), and Ritika & Kishor (2020) provided evidence-based support to investor bias in the financial market.

Objectives

The objectives of the study are:

- To investigate the impact of the type of news and source of news announcements on behavioral biases (namely herding, loss aversion, disposition, and overconfidence) among individual investors in the Indian stock market.
- To evaluate the role of demographic and investor sophistication factors on behavioral biases during the arrival of news announcements.
- To test whether all the measures fit the recommended value, indicating a good fit of the structural model for the collected data.

Literature Review

In recent times, there have been significant contributions in the field of Behavioral finance through qualitative and quantitative research. The review of literature is focused on the theoretical and empirical research studies on news announcement and four behavioral biases, namely overconfidence, loss aversion, herd behavior,

and disposition effect also deals with the influence of demographic and investor sophistication characteristics on behavioral biases.

News Announcement and Investors Reaction

In contraction to the traditional view that securities are rationally priced to reflect all publicly available information, many researchers provide evidence of stock prices appear to drift after major corporate news announcements (Frazzini, 2017). By investigating the behavior of investors and return around news announcements Kaniel et al, (2012), found that informed investors should be especially active during earnings news announcements and pre-event trading by individuals does predict the return on and after earnings announcement dates. The press release has an influential role in the trading behavior of investors. Klibanoff et al, (1998) proposed that prices react much stronger in weeks with news appearing on the front page of "The New York Times". Negative market reaction (negative price drift) followed by a negative news announcement and positive market reaction (positive price drift) followed by a positive news announcement (Frazzini, 2017), so the price drift is depending upon the type of news announcement in the market. By testing the previous explanation that limited investor attention causes underreaction to the news while they neglect information signals it will lead to mispricing of securities in the market. Hirshleifer et al (2009), provides new insight into the validity of the attention hypothesis. It is consistent with the investor distraction hypothesis, they proposed that trading volume would be affected by extraneous earnings news and market price react apathetically to relevant news about the firm. As positive shocks are anticipated, the market reaction to good news announcements is relatively small as compared to negative news announcements (Conrad et al, 2002). The degree of incomplete market reaction to good and bad news depends upon information uncertainty (Zhang, 2006).

As investors cannot directly observe the current state of the economy, they will infer about the market from the past performance, so they respond much stronger to bad news than good news in good times (Conrad, et al, 2002). Investors would be less surprised upon the arrival of news when they have been exposed to such news in the past (Azuma et al, 2014). Peterson, (2002) demonstrated the relationship between investor psychology security pricing around anticipated events. Further, the role source of information source and information demand around news announcement. Drake et al (2012) found that abnormal google search increases about two weeks before the earnings announcement and continued to spike during and after the announcement. By analyzing the interaction between information availability and investors' herd behavior Ferna´ndez et al (2011) provided the evidence to support the strong dependence between information, behavioral biases, and the herding phenomenon.

H_0: There is no significant effect of news announcement on herd behavior

H_0: There is no significant effect of news announcement on overconfidence

H_0: There is no significant effect of news announcement on loss aversion

H_0: There is no significant effect of news announcement on the disposition effect

Demographic and Investor sophistication variable and behavioral bias

Several studies examined the role of investor demographic and sophistication factors on their biased investment decision and provide reliable evidence for the same. By investigating the role of financial literacy and demographic variables on investor bias in the Indian stock market Baker et al, (2019), found that the most significant demographic factors that affect investor bias are age, occupation, and investment experience and financial literacy has a negative influence on behavior bias. A new paradigm for the practical implication of behavior finance provide an insight into behavioral finance by providing practical implication of the same (Pompian & Longo, 2004). They recommended that males and females are differently disposed to numerous behavioral bias and at the same time females are more risk-averse than male respondents (Feng & Seasholes (2005; and Nivolosi et al, (2007) proposed that individual investors learn from their trading experience and it would help them to minimize the effect of investment biases.

H_0: There is no significant relationship between demographic variables and herd behavior

H_0: There is no significant relationship between demographic variables and overconfidence

H_0: There is no significant relationship between demographic variables and loss aversion

H_0: There is no significant relationship between demographic variables and the disposition effect

H_0: There is no significant relationship between investor sophistication variables and herd behavior

H_0: There is no significant relationship between investor sophistication variables and overconfidence

H_0: There is no significant relationship between investor sophistication variables and loss aversion

H_0: There is no significant relationship between investor sophistication variables and disposition effect

Literature on Behavioral Biases

Over Confidence Bias

Overconfident investors believe that they know more than they do, so they overestimate their abilities and ignore the risk involved in their decision. It may lead to excessive trading and overestimating their upside potential and underestimating the downside potentials of their investment (Baker & Puttonen, 2017). An overconfident investor may place more validity on his private information and less on the market valuation. Such investors are more prone to sensation seeking and trade more frequently (Grinblatt & Keloharju, 2009). By investigating the influence of overconfidence on the trading behavior of investors in the Taiwan market (Ming Ho, (2011) found Taiwan investors are affected by overconfidence and they tend to show a higher degree of the disposition effect. Boussaidi (2020) provided evidence of overconfident investors attribute past market gains to their talent and trading activity becomes more excessive as the level of private information increases. By supporting this result, Glaser & Weber (2010) provide evidence of overconfident investors estimate the variance of the risky asset or underestimates, its precision and they trade aggressively. It is the degree of overestimation of the precision of private information is a function of past investment success (Glaser & Weber, 2010).

An investor with superior information and trading skills will utilize this ability in trading often to capture high returns (Chen et al, 2007). So, people with actual high ability and people who wrongly believe they have the high ability will both trade excessively. (Mishra & Metilda, 2015) analyzed the impact of gender, investment experience, and level of education on overconfidence, and found that overconfidence is higher among men than women and it increases with investment experience and level of education. Daniel et al, (1998) focuses on building a new theory to the security market based on investor confidence and variation in confidence arising from self-attribution. Overconfident investors overreact to private information signals and under-react to public signals. Further Peng & Xiong, (2006) evaluated the investors' attention and their biased reaction to information by giving special consideration to overconfidence bias. They modeled overconfidence as the investors' exaggeration of their ability to process information. Such investors would nevertheless trade aggressively and such neglect can influence the price (Daniel & Hirshleifer, 2015). The relationship between investor demographic variables and its influence on overconfidence (Bhandari & Deavas, 2010; Daniel & Hirshleifer, 2015; Tekce & Yilmaz, 2015) concluded that age, gender, level of income trading experience, and education level have an influential role in investors' overconfidence.

Loss Aversion

Loss aversion proposed by Kahneman & Tversky, (1979) in the framework of Prospect theory, is an important psychological concept that receives increasing attention in economic analysis (Schmidt & Zank, 2005). Certainty effect, that is people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty, will contribute to risk aversion in choices involving sure gain and to risk seeking in choices involving sure losses (Kahneman & Tversky, 1979). Inconsistent with Prospect theory, Novemsky & Kahneman (2005) examined risky and riskless loss aversion simultaneously to understand the boundaries of loss aversion. By investigating the relationship between availability and loss aversion bias on investment decision through moderating role of risk perception Ullah (2017) found that there is no significant difference between the responses of male and female decision-making regarding loss aversion bias. They also suggest that moderation of risk perception strengthens the relationship between loss aversion and investment decision making, whereas it weakens the relationship between availability bias and investment decision making. In contradiction to that Arora & Kumari (2015) found that female shows more loss aversion than male investors. Further Berkelaar & Kouwenberg (2009) proposed a model of loss aversion with the reference point of wealth, and found that when wealth drops below the reference point, the investors become risk-seeking and when wealth is above the reference point, they become risk-averse.

The combination of a greater sensitivity to losses than to gain a tendency to evaluate outcomes frequently known as Myopic loss aversion (Thaler et al, 1997). An investor who is myopic loss averse evaluates gains and losses separately as soon as the information is consumed, rather than pooling the returns into a lifetime portfolio (Haigh & List, 2005). By evaluating the myopic loss aversion and equity premium puzzle Benartzi & Thaler, (1995) showed that loss aversion and a short evaluation period are the two factors that contribute to an investor being unwilling to bear the risks associated with holding equities. Investors' who display myopic loss aversion will be more willing to accept risks if they evaluate their investment often less (Thaler et al, 1997). An immediate consequence of loss aversion is that the loss of utility associated with giving up a valued good is greater than the utility gain associated with receiving it (Tversky & Kahneman, 1991).

Herd Behavior

An individuals' thoughts, feelings, and actions can be influenced by other individuals by several means: by words, by observation of actions, by observation of the consequence of actions (Hirshleifer & Teoh, 2001). In finance with the term

herding or herd behavior means, the process where economic agents are imitating each other actions and/or base their decisions upon the actions of others (Spyrou, 2013). It is said to occur when many people take the same actions, perhaps because some mimic the actions of others (Graham, 1999). They added to the existing literature by developing and testing a model that examines whether incentive investment advisers' herd when they make decisions. Boyd et al, (2015) provide the evidence of herding decreases with a greater number of traders in the market. Greater participation of traders in the market leads to a higher competition which makes the participants drive away opportunities to profits from simply mimicking the actions of others.

Informational waterfalls are a type of behavior that emerges through the convergence of investor beliefs (Yilmaz et.al, 2019), investors who exhibit herd behavior tend to get their behavior close to the general behaviors of the market regardless of the private information that they receive. When the investors have inadequate knowledge of the environment or lack of accurate information they grouped to feel more secure (Capparrelli et.al, 2004). There is a strong connection between investor personality traits and herd mentality. Inconsistent with this fact, Kumari et al (2020) proposed that expect complaint personality shows a strong influence on the herd behavior of market participants. There are innumerable social and economic situations where individuals are influenced in their decision-making by what others around us are doing (Benerjee, 1992). But, an informed and rational investors do not follow the crowd, therefore herding indicates an inefficient market situation (Capparrelli et.al, 2004).

Disposition Effect

The disposition effect was introduced in to finance literature by (Shefrin & Statman, 1985). It is the most significant and unique feature of Prospect theory by (Kahneman & Tversky, 1979), which is the tendency of investors to sell winners too early and hold losers too long. It is based on the perception of investors that, today's losers will outperform today's winners and that today's winners are tomorrow's losers (Hens & Vlcek, 2011). The "S" shaped value function is concave in the domain of gains and convex in the domain of losses, and which is steeper for losses than gain as people are generally risk-averse (Odean, 1998). Further, Jagadeesh & Titman (1993) documented the contrarian strategies which buy stocks that have performed well in the past and sell stocks that have performed poorly in the past.

By adding to the literature, Ferris et al, (1998) provided the empirical evidence by comparing two models of trading in equities, that is tax-loss-selling hypothesis and disposition effect by examining the relationship between the volume at a given point in time and volume that took place in the past. Investors should

postpone taxable gain by continuing to hold their portfolio called tax-loss-selling. By using the brokerage account data from China, Chen et al, (2007) analyzed investment decisions making in an emerging market. They produced the empirical evidence of Chinese investors exhibit more overconfidence than U.S investors and they are prone to three biases namely disposition effect, overconfidence, and representativeness bias.

Data and Methodology

Survey Instrument and Sampling

Primary data for the study has been collected through a structured questionnaire. The questionnaire has been administered online mode for period of 6 months from December 2020 to May 2021. The questionnaire concerns the issues involving demographic variables, investor sophistication characteristics, type and source of news announcements, and behavioral biases. A total of 33 items were included in the questionnaire. The survey instrument is divided into 3 sections, section 1 deals with the demographic profile of respondents. Section 2 focuses on questions related to source and type of news announcement, for which closed-ended questions were used. Section 3 describes respondents' behavior during news announcements using a five-point Likert scale, where 1 signifies Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= Strongly Agree.

During the pilot study, six statements were included under each category of biases. After making Confirmatory Factor Analysis (CFA), the statements which show a high degree of correlation and less reliability were eliminated, and finally, herd behavior and overconfidence contain five statements each and loss aversion and disposition effect contain four statements each.

The target population of the study consists of individual investors in the Indian capital market. A total of 500 questionnaires were sent electronically. Out of which 370 respondents returned the questionnaire. From that inaccurate and incomplete responses were removed and the final sample consists of 357 respondents.

Description of items in each Bias

The description of items that are used to detect the behavior of Indian investors during news announcements where summarized in Table 1.

Variables and Measurement

To analyze the relationship between type and source of news on behavioral biases of individual investors in the Indian capital market. This paper considered Type of news (Negative and positive)and Source of news (Media source, online

Table 1: Description of measurement items under herd beahvior, overconfidence, Disposition effect and loss aversion bias

Variables		Measuring items	Code
1. Herd Behaviour	1.	I have the tendency to follow the advice of others when there is uncertain news about the market	HB1
	2.	Other investors decision of the choosing of stock volume/type during news announcement have impact on my trading decision	HB2
	3.	I believe I can earn better when there is favourable market while I follow the advice of group	HB3
	4.	Other investor's decision on buying/selling of stocks during news announcement have impact on my trading decision	HB4
	5.	I believe I can escape from loss while there is unfavourable market by following the decision of others	HB5
2. Over Confidence	1.	Iam confident in my ability to pick better stocks than others even there is adverse market situation	OC1
	2.	Iam able to anticipate the outcome of the positive and/ or negative news announcement	OC2
	3.	I believe my skill and knowledge about the market can help me to outperform the market even the market is not favourable to you	OC3
	4.	I believe news about the market will not affect my portfolio return	OC4
3. Disposition Effect	1.	I have the tendency to sell winning stocks immediately after positive news announcements	DS1
	2.	I have the tendency to hold losing stocks even after the negative news announcement about the market	DS2
	3.	I change or revise my portfolio after first news announcement	DS3
	4.	I have the tendency of holding losings stocks too long even after negative news than about selling winning stocks soon after positive news	DS4
5. Loss Aversion	1.	When there is negative news about the market, iam more concerned a large loss in my portfolio than missing a substantial gain	LA1
	2.	Iam more concerned about capital loss than current return during poor market condition	LA2
	3.	I will not make or increase my portfolio when there is negative news about the market	LA3
	4.	I will quickly revise/ change my portfolio by adding safe heaven securities (like gold) to make me safe from adverse market situation.	LA4

source, press release, information from peers, Market Watch, and Own intuition) as the independent variable and behavioural biases, namely herd behavior, overconfidence, loss aversion and disposition as the dependent variable.

The study analysed six investor demographic variables: such as age, gender, marital status, educational qualification, occupation, and annual income, and two investor sophistication characteristics: such as trading experience and trading frequency independent variables and behavioral biases as dependent variable.

Respondents profile analysis

Table 2 summarises the demographic and investor sophistication characteristics of sample respondents. The sample consists of 70% male respondents and 30% female respondents, which provide the evidence that still investment in the financial market is dominated by male in the Indian economy 68% were married and the remaining were single. 30% of respondents fall within the age category of 20-30 and 62% in the age limit of 31-60 and the remaining respondents are above 60 years. The largest portion of the sample consists of graduate, post-graduate and professional, which indicates the majority of the respondents are well educated. Most of the respondents are working in the private sector (33.6%), and at the same time same level of respondents doing their own business (33.8%). The annual income group of 1-5 lakhs and 7-12 lakhs accounts for the largest portion of the sample. By evaluating the trading experience and trading frequency of sample respondents, more than half of the respondents (54.4%) having experience of less than 1 year, which indicates that most of the respondents started to invest in the stock market between 2020 and 2021, as we know this period is witnessed by global pandemic COVID 19, even though new investors are steps into the stock market with the hope that Indian economy will overcome this pandemic. The average holding period of 35.6% of respondents is 1-6 months and only 18.4% of respondents hold the stock for more than 1 year. Investors are preferring online sources for information gathering even when there is negative news announcements (20.7 %), positive news announcements (58.0 %), and surprise news announcements (55.7%).The survey reveals that investors are more concerned about negative news announcements than positive news announcements with the frequency of 67.2%.

Reliability and Validity

Confirmatory Factor Analysis (CFA) technique is used to examine the proposed measurement model. The output shown in Table 3 by the measurement model examination predicted that data are a good fit for the model.

Table 2: Respondents profile

	Variables	Category		Frequency	Percentage
Demographic Factors	Gender	1.	Male	250	70
		2.	Female	107	30
	Marital Status	1.	Married	244	68.3
		2.	Single	113	31.7
	Age (in Years)	1.	20-30	108	30.3
		2.	31-40	80	22.4
		3.	41-50	84	23.5
		4.	51-60	57	16.0
		5.	Above 60	28	7.8
	Educational Qualification	1.	Under-Graduate	164	45.9
		2.	Graduate	98	27.5
		3.	Post-Graduate	67	18.8
		4.	Professional	28	7.8
	Occupation	1.	Self-employed	10	2.8
		2.	Private sector employee	120	33.6
		3.	Govt employee	106	29.7
		4.	Business	121	33.8
	Annual Income (in Lakhs)	1.	1-5	120	33.62
		2.	7-12	100	28.01
		3.	13-18	85	23.80
		4.	18-23	30	8.40
		5.	Above 23	22	6.17
Investor Sophistication Factors	Trading Experience	1.	Less than 1 year	193	54.4
		2.	1-6 years	127	35.57
		3.	7-12 years	29	8.1
		4.	More than 12 years	8	2.2
	Trading Frequency	1.	Intraday	61	17.1
		2.	1-6 Months	127	35.6
		3.	7-12 months	103	28.9
		4.	1-2 years	43	12.0
		5.	Above 2 years	23	6.4

Contd...

Source of News	a) When positive news announcement	1.	Information from peers	25	7
		2.	Press release	74	20.7
		3.	Online source	131	36.7
		4.	Media source	69	19.3
		5.	Market watch	58	16.3
		6.	Own institution	-	-
	b) When negative news announcement	1.	Information from peers	20	5.6
		2.	Press release	28	7.8
		3.	Online source	207	58
		4.	Media source	31	8.7
		5.	Market watch	47	13.2
		6.	Own institution	24	6.7
Type of news investors more concerned		1.	Negative news	263	73.7
		2.	Positive news	94	26.3

Table 3: Model fit summary of confirmatory factor analysis of behavioral biases

Sl.No.	Indices of Common Fit	Value	Value of Good Fit
12	CMIN/DFP value	1.2210.082	<5>0.05
3	RMR	0.042	<0.05
4	Goodness of Fit Index (GFI)	0.996	>0.90
5	Comparative Fit Index (CFI	0.928	>0.90
6	Adjusted Goodness of Fit Index (AGFI)	0.997	>0.90
7	Incremental Fit Index (IFI)	0.930	>0.90
8	Tucker Lewis Index (TLI)	0.978	>0.90
9	Normated Fit Index (NFI)	0.911	>0.90
10	Root Mean Square Error of Approximation (RMSEA)	0.049	<0.08

From the above model fit summary of Confirmatory Factor Analysis of behavioral biases, it is found that CFA is a good fit with a P-value >0.05 (0.082), CMIN/DF is 1.221, which is <5, RMR 0.042, Goodness of Fit Index (GFI) 0.996, Comparative Fit Index (CFI) 0.928, Adjusted Goodness of Fit Index (AGFI) 0.997, Incremental Fit Index (IFI) 0.930, Tucker Lewis Index (TLI) 0.978, Normated Fit Index (NFI) 0.911, which indicate good fit as all values is >0.90. and Root Mean Square Error of Approximation (RMSEA) is 0.049 (<0.08). The present scale developed for the study was supported by the result of CFA.

Further, the reliability of the scale developed for the study was tested using Cronbach's alpha value method and the value is found to be significant (0.842).

Apart from Cronbach's alpha, Validity was also tested using three parameters as Average Variance Extracted (AVE), Construct Reliability (CR), and Discriminant Validity (DV). The results shown in Table 4 and Table 5 indicate adequate validity to the proposed measurement model.

Table 4: Average variance extracted and construct reliability

Construct				Factor Loading (FL)	AVE	CR
Herd behavior	HB1	<—	HB	0.825		
	HB2	<—	HB	0.887		
	HB3	<—	HB	0.871		
	HB4	<—	HB	0.784		
	HB5	<—	HB	0.818	0.702	0.922
Loss aversion	LA1	<—	LA	0.854		
	LA2	<—	LA	0.881		
	LA3	<—	LA	0.984		
	LA4	<—	LA	0.813	0.883	0.922
Disposition effect	DS1	<—	DS	0.871		
	DS2	<—	DS	0.838		
	DS3	<—	DS	0.806		
	DS4	<—	DS	0.852	0.842	0.907
Over confidence	OC1	<—	OC	0.935		
	OC2	<—	OC	0.846		
	OC3	<—	OC	0.839		
	OC4	<—	OC	0.850		
	OC5	<—	OC	0.958	0.886	0.948

A good rule of thumb for AVE is a value of 0.5 and higher indicate adequate convergent validity. It is reliable from the above table, the value of AVE for each bias is higher than 0.5 (Herd behavior 0.702, Loss Aversion 0.883, Disposition effect 0.842, Over Confidence 0.886), it indicates there is a higher degree of convergent validity for the items. For construct reliability estimate is the value of 0.7 or higher indicates a higher degree of reliability. In Table, it is adequately justified with the values greater than 0.7 (Herd Behavior 0.922, Loss Aversion 0.922, Disposition effect 0.907, Over Confidence 0.948). It indicates the existence of high internal consistency.

Table 5: Discriminant validity of behavioral biases

Factors	AVE	Squared interconstruct correlation SIC			
		HB	LA	DS	OC
HB	0.702	-	0.623	0.368	0.267
LA	0.883	0.623	-	0.430	0.587
DS	0.842	0.368	0.430	-	0.510
OC	0.886	0.267	0.587	0.510	-

From Table 5, it is found that all values of the Average Variance Extracted (AVE) estimate are greater than corresponding Squared Interconstruct Correlation (SIC) estimates. It represents the indicators have more in common with the construct they are associated with than they do with another construct. Therefore, the CFA of behavioral biases demonstrate Discriminant Validity.

Results and Discussion

Goodness of fit Indices of SEM

Further, the study used Structural Equation Modelling (SEM) to estimate and test the theoretical framework of the study. This indicates the relationship between type of news, source of news, investors demographic and sophistication factors, and behavioral biases. The structural Equation Model is useful for evaluating the causal relationship between variables. It evaluates whether the data is fit for the theoretical model of the study.

To evaluate the model fit, we consider CMIN/DF, P-value, Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Tucker Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), Parsimony Goodness of Fit Index (PGFI). The results presented in Table 4 indicate the proposed structural model has a good fit with the values of CMIN/DF 1.834, Comparative Fit Index (CFI) 0.997, Goodness of Fit Index (GFI) 0.994, Adjusted Goodness of Fit Index (AGFI) 0.054, Normed Fit Index (NFI) 0.993, Incremental Fit Index (IFI) 0.997, Tucker Lewis Index (TLI) 0.982, Root Mean Square Error of Approximation (RMSEA) 0.039, Parsimony Goodness of Fit Index (PGFI) 0.428.

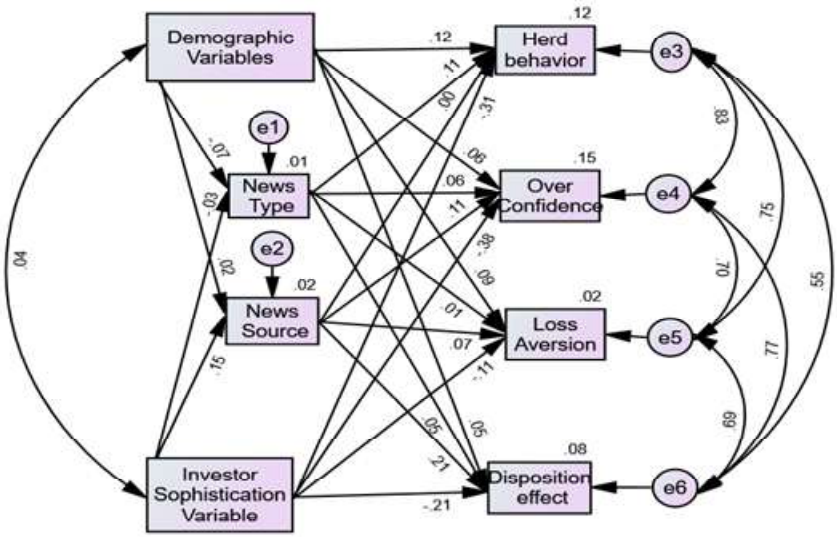

Figure1: Structure Equation Modelling of the relationship between type and source of news announcement on Behavioral biases and the role of demographic and investor sophistication variables.

Table 6: Fit Indices of SEM

Sl.No.	Fit Indices	Value	Suggested Value
1	CMIN/DF	1.834	<5
2	Comparative Fit Index (CFI)	0.997	>0.90
3	Goodness of Fit Index (GFI)	0.994	>0.90
4	Adjusted Goodness of Fit Index (AGFI)	0.054	>0.90
5	Normed Fit Index (NFI)	0.993	>0.90
6	Incremental Fit Index (IFI)	0.997	>0.90
7	Tucker Lewis Index (TLI)	0.982	>0.90
8	Root Mean Square Error of Approximation (RMSEA)	0.039	<0.08
9	Parsimony Goodness of Fit Index (PGFI)	0.428	Within .5

Estimation of path parameters

Table 7 summarises the result of the estimation of path analysis. Type of news has a significant impact on herd behavior (â=.111 and P<0.05), overconfidence (â= .059 and P<0.05), loss aversion (â=.090 and P<0.05), and disposition effect (â=.052 and P<0.05). At the same time, there is a significant relationship between the source of news and herd behavior (â=.081 and P<0.05), overconfidence (â=.111

and P<0.05), loss aversion (â=.073 and P<0.05), and disposition effect (â=.211 and P<0.05).

Whereas investor sophistication variables, such as trading experience and trading frequency shows a significant negative impact on herd behavior (â= -.306 and P<0.05), overconfidence (â= -.375 and P<0.05), loss aversion (â = -.114 and P<0.05) and disposition effect (â= -.212 and P<0.05) during news announcements. This indicates investor herd behavior, overconfidence, loss aversion, and disposition effect during news announcements decreases as trading experience and frequency increases. The demographic variables show a significant positive effect on investor biases during news announcements with the values of, herd behavior (â= .121 and P<0.05), loss aversion (â= .055 and P<0.05), loss aversion (â= .093 and P<0.05) and disposition effect (â= .052 and P<0.05). The result of the hypothesis used in the model is shown in Table 8. It is clear from that entire hypotheses are rejected. All the paths have a significant relationship.

Conclusion

The Indian stock market has been in turbulent times in recent times. It has been witnessed by a series of ups and downs. Investor sentiments have a strong influence on the Indian stock market and such sentiments and emotions are led by several factors. One of the important drivers of investor sentiments is news announcements (Frazzini, 2017). Information availability has a significant role in the investment decision (Drake, et al, 2012). The source from which investors obtained such news and the nature of news is very important for investors to take their investment decisions. It becomes relevant and interesting to investigate the role and impact of news announcements on investor bias in the Indian stock market.

By using Structural Equation Modeling (SEM), it is observed that, in consistent with the work of (Drake et al, 2012), the source of information has a significant impact on investor response to the news announcements. At the same time, the type of news has also significantly affected investor herd behavior, overconfidence, loss aversion, and the disposition effect. Some evidence confirms what is already known from previous researches. As trading experience increases, the investor would be less surprised upon the arrival of news because they were already exposed to such news in the past (Azuma, et al, 2014). The present study confirms this evidence by showing a negative relationship between investor sophistication factors (trading experience and trading frequency) and investor bias during news announcements. This evidence contradicts the result of (Prosad, et al, 2015), who proposed that even the investors having high trading experience and high trading frequency, are prone to behavioral bias. The demographic variables, such as age, gender, marital status, educational qualification, occupation,

Table 7: Estimation of path parameters

S/N		Factor	Non standardised Estimate	S.E.	Standardised Estimate	C.R.	P
News Source	<—-	DemographicVariables	.000	.001	.017	.328	***
News Source	<—-	Investor Sophistication factors	.204	.072	.149	2.83	.005
News Type	<—-	DemographicVariables	.000	.000	-.069	-1.301	***
News Type	<—-	Investor Sophistication factors	-.012	.019	-.033	-.627	***
Herd Behavior	<—-	News Type	.648	.292	.111	2.219	.026
Over Confidence	<—-	News Type	.387	.322	.059	1.203	***
Loss Aversion	<—-	News Type	.040	.249	.090	.162	***
Disposition Effect	<—-	News Type	.289	.282	.052	1.025	***
Herd Behavior	<—-	News Source	.001	.077	.081	.007	***
Over Confidence	<—-	News Source	.191	.085	.111	2.241	.025
Loss Aversion	<—-	News Source	.091	.066	.073	1.377	***
Disposition Effect	<—-	News Source	.307	.075	.211	4.106	***
Herd Behavior	<—-	Demographic Variables	.004	.002	.121	2.41	***
Over Confidence	<—-	DemographicVariables	.002	.002	.055	1.120	0.021
Loss Aversion	<—-	DemographicVariables	.003	.002	.093	1.771	***
Disposition Effect	<—-	DemographicVariables	.002	.002	.052	1.011	***
Herd Behavior	<—-	Investor Sophistication factors	-.644	.106	-.306	-6.06	***
Over Confidence	<—-	Investor Sophistication factors	-.885	.117	-.375	-7.56	***
Loss Aversion	<—-	Investor Sophistication factors	-.195	.091	-.114	-2.152	***
Disposition Effect	<—-	Investor Sophistication factors	-.422	.102	-.212	-4.115	***

Table 8: Result of hypotheses testing – Research model

Sl.No	Hypotheses	β value	P value	Result
1	H_0: There is no significant effect of news type on herd behavior	.111	.026	Reject H_0
2	H_0: There is no significant effect of news type on overconfidence	.059	.000	Reject H_0
3	H_0: There is no significant effect of news type on loss aversion	.090	.000	Reject H_0
4	H_0: There is no significant effect of news type on disposition effect	.052	.000	Reject H_0
5	H_0: There is no significant effect of news source on herd behavior	.081	.000	Reject H_0
6	H_0: There is no significant effect of news source on overconfidence	.111	.025	Reject H_0
7	H_0: There is no significant effect of news source on loss aversion	.073	.000	Reject H_0
8	H_0: There is no significant effect of news source on disposition effect	.211	.000	Reject H_0
9	H_0: There is no significant relationship demographic variable and herd behavior	.121	.000	Reject H_0
10	H_0: There is no significant relationship between demographic variables and overconfidence	.055	0.021	Reject H_0
11	H_0: There is no significant relationship between demographic variables and loss aversion	.093	.000	Reject H_0
12	H_0: There is no significant relationship between demographic variables and disposition effect	.052	.000	Reject H_0
13	H_0: There is no significant relationship between investor sophistication variables and herd behavior	-.306	.000	Reject H_0
14	H_0: There is no significant relationship between investor sophistication variables and overconfidence	-.375	.000	Reject H_0
15	H_0: There is no significant relationship between investor sophistication variables and loss aversion	-.114	.000	Reject H_0
16	H_0: There is no significant relationship between investor sophistication variables and disposition effect	-.212	.000	Reject H_0

and annual income show a positive relationship with investor biases during news announcement. This result confirms the findings of (Baker K. H., Kumar, Goyal, & Gaur, 2019). The Structural model of the study has a good fit as all the values fit the recommended value. The study reveals that Indian investors are more concerned about negative news announcements in the market than positive news announcements and they are preferring online sources for information gathering over any other mode.

This study has certain relevant implications for individual investors, portfolio managers, and financial advisers in the Indian stock market while taking investment decisions during the arrival of news announcements. It will help the investors to become aware of their bias and this will lead to control such biases during news announcements and it will definitely reflect in their sensible and rational decision making. The study will help the portfolio managers to develop a behaviorally modified portfolio for investors. It assists financial advisers to provide better financial advice to investors by making better forecasts and analysis during news announcements.

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The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Modelling and Assessment of Volatility in Stock Market in India during Covid-19 Pandemic period using ARCH/ GARCH Model

K.MALLIKARJUNA RAO

Abstract: This study has investigated the volatility in the Indian Stock Market during the pre and during the Covid-19 period by using closing daily values for Nifty 50, Nifty 500, and BSE Sensex before and during the COVID 19 pandemic period. This paper used secondary data for all the three indices over the period 1st January 2019 to 31st December 2020. The total study period is divided into two sub periods, the pre-COVID-19 (1st January 2019 to 31st December 2019)and during the COVID-19 pandemic era (1st January 2020 to 31st December 2020). The study used the GARCH family models. The result states that the sum of ARCH and GARCH coefficients in the model of Nifty pre-covid-19 is 61.17% but during the Covid-19 period is 95.4%, Sensex pre-Covid-19 is 60.3 %, during the covid-19 pandemic period is 95.7 % and Nifty 500 is 67.91 %, and 94.02 % pre and during Covid-19 period which is positive and also statistically significant.It further highlights that the news impact is asymmetric in Indian stock market return. To capture the accessibility of asymmetric behavior and the existence of leverage effect in the financial return of NSE Nifty, Nifty 500, and BSE Sensex indices, the study applies the EGARCH model to detect the leverage effect (asymmetric).

Introduction

In 2019, most of the rallies in Sensex and Nifty were led by a handful of stocks while themajority of them, especially in the Mid-cap and Small-cap Indices, saw value erosion. Though, the poor performance of the Small-cap and Mid-cap stocks declined the total market performance that leaves the Indian market capitalization growth at the lowest in the top most ten markets worldwide.

The financial market of India has observed sharp volatility as a result of the disruption of the world market. As a result of fall out in the global financial market, the Indian stock market also observer sharp volatility.

Dr.K.Mallikarjuna Rao is Assistant Professor of Commerce, Govt. City College (Autonomous), Hyderabad, Telangana, India

In spite of the severe impact of COVID-19 pandemic on the stock market of the entire economy, there is limited study on it particularly in the case of an emerging economy in India. To shed light on this aspect, this paper attempts to investigate the impact of COVID-19 on the three important stock market indices of India. GARCH family models are used to make the study more significant in terms of volatility in stock index values due to the outburst of the pandemic and lockdown policy adopted by the Government of India.

Review of Literature

Ozili and Arun (2020) have conducted a study on the effect of social distancing policy that was adopted to prevent the spread of the coronavirus (SARS-CoV-2),based on four continents of North America, Africa, Asia, and Europe. The study emphasises to those 30 days of social distancing policy or lockdown hurts the economy through its negative impact on stock prices.

Azimili (2020) studid the impact of covid-19 on the degree and structure of risk-return dependence in the US by using quantile regression. The results show that the COVID-19 occurrence the degree of dependence between returns and market portfolio has raised in the higher quantiles, lowering the benefits of diversification. Osagie et al. (2020) by applying Quadratic GARCH and EGARCH models with dummy variables found that the coronavirus (SARS-CoV-2), hurts the stock returns in Nigeria and mentioned that a stable political environment, incentive to native companies, diversification of economy, flexible exchange rate regime be instigated to improve the financial market. Shezad et al. (2020) conducted a study to analyze the nonlinear behavior of the financial market of the US, Italy, Japan, and China market return by using the Asymmetric Power GARCH model. The study confirmed that coronavirus (SARS-CoV-2) harms the stock returns of the S&P 500. However, the study showns an insignificant impact on the Nasdaq Composite index.

Liu et al, (2020) evaluated the effect of covid-19 pandemic on 21 stock market indices in severely affected countries like Korea, Singapore, Japan, USA Italy, UK and Germany, etc. with the help of event study and found that stock markets in these countries fell very quickly after the COVID-19 outbreak. Asian countries had more negative abnormal returns than in other countries.

Data and Methodology

The study is purely based on secondary data. Data on daily closing prices of indices Nifty, Sensex and Nifty 500 have been collected from the site of www.bseindia.org and www.nseindia.org. Data are collected from 1st January 2019 to 31st December 2020 including both the period of before and during COVID-

19. This study has been divided into, the pre-COVID-19 (1st January 2019 to 31st December 2019)and during the COVID-19 era (1st January 2020 to 31st December 2020).Firstly, returns for currency were calculated as following:

Rt = 100 * ln(St / St-1) Where, St = Spot exchange rate at time't'

Augmented Dickey-Fuller (ADF) test, Philips-Perron (PP) test, Autoregressive Conditional Heteroscedasticity - Lagrange Multiplier (ARCH-LM) tests and GARCH family of models were applied for the present research. The study has employed the E-views 11 package for investigation. Volatility is estimated on daily returns of NSE Nifty, BSE Sensex and Nifty 500 indices.

Unit Root Tests

Augmented Dickey-Fuller (ADF) Test

The standard DF test is carried out by estimating the following Equation after subtracting yt-1 from both sides of the equation:

Dyt = ayt – 1 + xt ¢d + et,

Where a = r – 1. The null and alternative hypotheses may be written as,

H0: a = 0

H1: a < 0

The Phillips – Perron Test

The Phillips – Perron test is carried out by estimating the following equation

$$\nabla y_t = \nabla y_{t-1} + u_t$$

Where yt is the time series data under consideration.

Null Hypothesis: H_0: There is a unit root; the time series is non-stationary.

Alternate hypothesis: H_a: There is no unit root; the time series is stationary

Heteroscedasticity Test

It is extremely vital to first examine the residuals for the existence of heteroscedasticity before applying the GARCH model.

The presence of heteroscedasticity in residuals of the return is confirmed by applying the Lagrange Multiplier (LM) test.

Tools for Measuring Volatility

In general, it is observed that escalating movement in the share market is followed by minor variances when compared to the downward movements with alike nature. This asymmetric moment is termed as the leverage effect. Hence, the GeneralizedARCH (GARCH) methodology which is symmetrical will not be suitable to evaluate the unsteadiness in time series.

To capture the asymmetrical data, the Exponential GARCH (EGARCH) methodology advocated by Nelson (1991) and Threshold GARCH (TARCH) advocated by Glosten, et al, Runkle (1993) and Zakonian (1994) are applied.

GARCH (1, 1)

The GARCH model in which the conditional variance rest on the former lags; specifies the conditional variance equation as:

mean equation : rt = μ + εt and

variance equation: σ^2

t = ω + $\alpha\varepsilon$2 t–1 + $\beta\sigma$2 t–1,

Where rt is the return of the asset at time t, ì is the average return and åt is the residual return and where ω>0, $\alpha \geq 0$, $\beta \geq 0$. The degree of factors á and â denote the variability in time series. If (á + â) is close to unity, it states that distress at time t will carry on for future periods.

TGARCH (1, 1)

The equation of the TGARCH for the conditional variance is:

σ^2t = ω + $\alpha\varepsilon^2$ t–1 + γd t–1 ε 2 t–1 + $\beta\sigma$2 t–1,

Where γ is termed as the asymmetry or leverage factor. Here, positive facts (εt–1 > 0) and the adverse data (εt–1 < 0) have variance outcomes. αi connotes positive facts while αi + γi connotes adverse information. Thus, in the position where γ is substantial and positive, negative information has more consequence on σ2 t compared to the positive information.

EGARCH (1, 1)

The volatility that happens to decline when returns rise and volatility happens to rise when the returns fall is often called the leverage effect (Enders 2004). EGARCH method captures the asymmetric reaction of the time changing variance where variance is constantly affirmative. It was developed by Nelson (1991) that υ is the asymmetric response parameter or leverage parameter. If it is below zero it specifies that unfavourable information boosts forthcoming fluctuation

while favourable information mitigates the consequence on forthcoming doubts (Kalu 2010).

EGARCH (1, 1) is defined as,

$$\ln\left(\sigma_t^2\right) = \omega + \beta \ln\left(\sigma_{t-1}^2\right) + \gamma \frac{\mu_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \alpha \left[\frac{\mu_{t-1}}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right]$$

Empirical Results

Descriptive Statistics Results

This study uses the daily close values and returns of major stock indices of India, BSE Sensex, NSE nifty and NSE S&P500. Table 1 shows the mean return which is a major indicator of profit and shows a negative value, indicating a loss in stock. Negatively skewed return with high kurtosis value indicates chances of high losses in the selected indices in the stock markets. As the higher level of standard deviation than mean for the three indices pre and post covid-19 indicates variability is more. Kurtosis value of during the covid-19 period of three indices returns specifies excess peakedness than normal. The higher Jarque-Bera (JB) value inNSE nifty and Nifty500 denotes that the distribution is not normal. Thus the null hypothesis of normality is rejected as the probability value is less than 0.05 levels.

Table 1: Descriptive Statistics of Niffy, Sensex and NIFTY 500 Indices daily Returns from 2019 to 2020

Descriptive Statistics	Nifty		Sensex		NIFTY 500	
	Pre Covid-19	During Covid-19 era	Pre Covid-19	During Covid-19 era	Pre Covid-19	During Covid-19 era
Mean	0.000447	0.000551	0.000529	0.000578	0.000290	0.000619
Median	0.000390	0.002563	0.000438	0.002711	0.000591	0.002821
Std. Dev	0.008659	0.020056	0.008625	0.020434	0.008563	0.018919
SKewness	1.111753	-1.745883	1.155355	-1.685014	1.078269	-2.109239
Kurtosis	8.409955	15.35416	8.534625	15.20435	8.633020	16.95690
Jarque-Bera	347.8178	1716.851	365.7098	1676.504	369.8793	2223.344
Probability	0.00000	0.000000	0.00000	0.00000	0.00000	0.00000

The present study employs the Augmented Dickey-Fuller test and Philip Perron Test (PP) to examine whether the three selected indices' time series properties are stationary or not. The results are presented in Table 2.All series of Nifty, Nifty 500 and Sensex are stationary at 1 percent, 5 percent, and 10 percent level

of significance. The main result based on this test is that; ADF test and Philip Perron Test (PP) are statistically significant at a 1% level. This indicates to reject the null hypothesis and accept that the returns are stationery of the three indices of pre and during Covid-19 period.

Table 2: Augmented Dickey-Fuller Test (ADF) andPhilip Perron Test (PP) for Nifty, Sensex & Nifty 500 from January2019 to December 2020

Indices		Augmented Dickey-Fuller Test (ADF)Level with Intercept		Philip Perron Test (PP) Level with Intercept	
		T-Statistics	Prob. Value	T-Statistics	Prob. Value
Nifty	Pre Covid-19	-14.51531	0.00000	-14.48238	0.00000
	DuringCovid-19 era	-5.674814	0.00000	-17.87649	0.00000
Sensex	Pre Covid-19	14.66250	0.00000	-14.63939	0.00000
	During Covid-19 era	-18.00945	0.00000	-17.85643	0.00000
Nifty 500	Pre Covid-19	-14.06149	0.00000	-14.00361	0.00000
	During Covid-19 era	-4.421149	0.00000	-17.51214	0.00000

Note: PP Test critical values: 5% level-2.88,
Data: Computed of Data

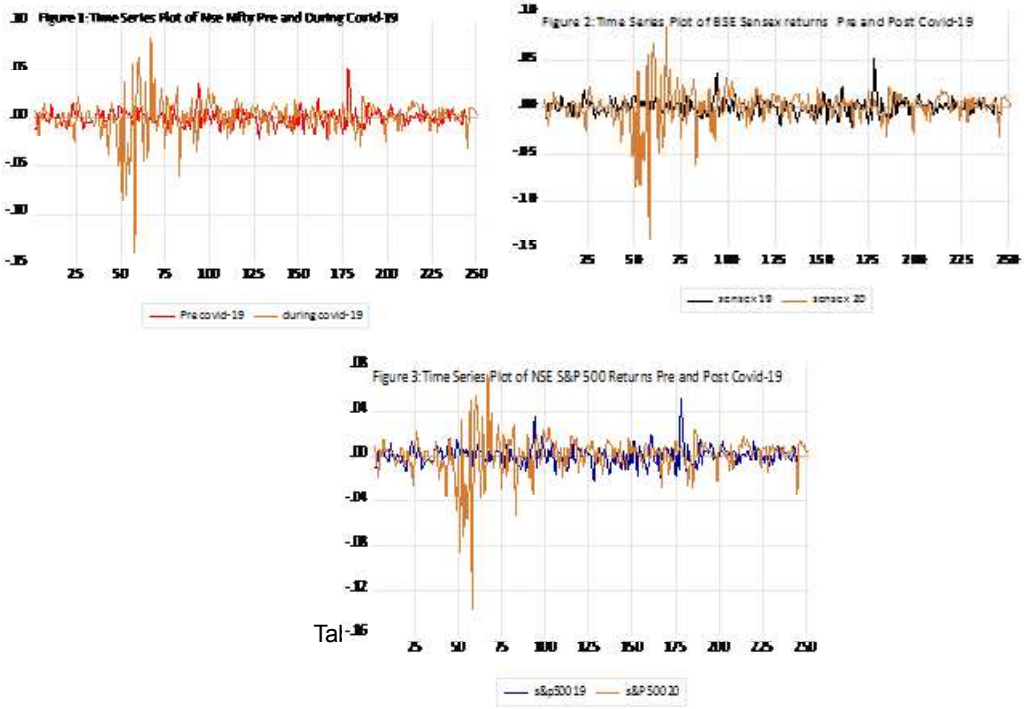

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Table 3: ARCH test

		Nifty		
Pre Covid-19	F-Statistic	11.99758	Prob.F (1,241)	0.0006
	Obs.*R-squared	11.52347	Prob. Chi.-Square(1)	0.0007
During Covid-19 era	F-Statistic	6.070753	Prob.F(1,247)	0.0144
	Obs.*R-squared	5.973102	Prob. Chi-Square(1)	0.0145
		Sensex		
Pre Covid-19	F-Statistic	11.18315	Prob. F(1,241)	0.0010
	Obs.*R-squared	10.77592	Prob. Chi-Square(1)	0.0010
During Covid-19 era	F-Statistic	6.328904	Prob. F(1,241)	0.0125
	Obs.*R-squared	6.221181	Prob.Chi-Square(1)	0.0126
		Nifty 500		
Pre Covid-19	F-Statistic	10.87102	Prob. F(1,241)	0.0011
	Obs.*R-squared	10.48814	Prob. Chi-Square(1)	0.0012
During Covid-19 era	F-Statistic	3.926856	Prob. F(1,241)	0.0486
	Obs.*R-squared	3.896821	Prob. Chi-Square(1)	0.0484

The ARCH test reveals (table 3) that the residuals of the estimation are heteroscedasticity in nature. The presence of heteroscedasticity in residuals warrant applying ARCH family models in studying the relationship between the three selected indices i.e NSE Nifty, Nifty 500 and BSE Sensex returns of Pre and during Covid-19 period. Among all the ARCH family models, GARCH (1, 1) model is found to be superior as its conditional variances are significant with a lower Akaike Information Criterion (AIC) value.

Table 4 reveals that result states the sum of ARCH and GARCH coefficients in the model of Nifty pre-covid-19 is 61.17% but during Covid-19 period is 95.4%, Sensex pre-Covid-19 is 60.3 %, during the covid-19 period is 95.7 % and Nifty 500 is 67.91 % and 94.02 % pre and during Covid-19 period which is positive and also statistically significant. The higher coefficient of ARCH and GARCH terms specify that the model selected is stable and good. RESID (-1)^2 is the ARCH term which is significant at 1% level. This specifies the recent past information is making a substantial positive impact on the volatility of all the three indices during the Covid-19 period. GARCH(-1) term is also having a significant positive impact on all the three indices during the Covid-19 period of volatility. The higher GARCH coefficient than the ARCH coefficient discloses that conditional variance is highly dependent on the previous period's forecast variance rather than information about prior period volatility. The entire three indices coefficient is positive and significantly different from zero.

Table 4: GARCH (1, 1) model for volatility forecasting

GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH (-1)

	Nifty				Sensex				Nifty 500			
	Pre Covid-19		During Covid-19 era		Pre Covid-19		During Covid-19 era		Pre Covid-19		During Covid-19 era	
Variance Equation	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.
Constant C(3)	3.36E-	0.0336	1.23E	0.012	3.38E	0.02	1.19E	0.011	3.01E-	0.012	1.41E-05	0.003
RESID(-1)^2 ((4)	0.3969	0.0000*	0.164	0.000*	0.392	0.000*	0.163	0.000*	0.4821	0.000*	0.15967	0.000*
GARCH(-1) (5)	0.2147	0.3524	0.790	0.000	0.213	0.324	0.794	0.000	0.1970	0.261	0.78056	0.000
Durbin – Watson Statistics	1.84725		2.270497		1.866772		2.263965		1.787732		2.206549	
Akaike Info Criterion	-6.717189		-5.630969		-6.724102		-5.611483		-6.747392		-5.720638	
Schwarz criterion	-6.674191		-5.588712		-6.681104		-5.569346		-6.690061		-5.698028	

Table 5: TGARCH (1, 1) model for volatility forecasting

	Nifty				Sensex				Nifty 500			
	Pre Covid-19		During Covid-19 era		Pre Covid-19		During Covid-19 era		Pre Covid-19		During Covid-19 era	
Variance Equation	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.	Coeffi cient	Prob.
Constant C(1)	1.96E	0.3726	6.70E	0.000	2.66E	0.0230	7.63E	0.000	1.36E	0.325	7.28E	0.000
RESID(-1)^2 ((2)	-0.0078	0.6147	-0.1793	0.000	0.172	0.0019	-0.153	0.000	-0.010	0.474	-0.2038	0.000
	0.2160	0.0129	0.2850	0.000	0.570	0.0008	0.270	0.000	0.1816	0.0024	0.30428	0.000
GARCH(-1) (4)	0.8969	0.0000	0.9828	0.000	0.2889	0.1017	0.9641	0.000	0.9164	0.000	0.98461	0.000
Durbin – Watson Statistics	1.847249		2.270497		1.866772		2.263965		1.788297		2.207185	
Akaike Info Criterion	-6.765377		-5.723118		-6.749871		-5.698091		-6.793079		-5.819498	
Schwarz criterion	-6.708047		-5.666774		-6.692540		-5.641909		-6.735749		-5.763315	

Table 6: EGARCH (1, 1) model for volatility forecasting

	Nifty				Sensex				Nifty 500			
	Pre Covid-19		During Covid-19 era		Pre Covid-19		During Covid-19 era		Pre Covid-19		During Covid-19 era	
Variance Equation	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Constant C(1)	-0.4282	0.1531	-0.3196	0.0001	-0.384	0.1483	-0.3255	0.000	-11.32	0.0000	-0.3376	0.0.0003
ARCH (C2)	0.13021	0.0469	0.0579	0.2305	0.1086	0.0856	0.0707	0.1426	0.6473	0.0000	0.0281	0.5424
EACH(C3)	-0.1601	0.0008	-0.1628	0.0000	-0.1639	0.0003	-0.1658	0.000	-0.146	0.0555	-0.1617	0.0000
GRACH (C4)	0.96545	0.0000	0.9666	0.0000	0.9681	0.0000	0.9670	0.000	-0.122	0.5132	0.9619	0.0000
Durbin Watson Statistics	1.847249		2.270497		1.866772		2.263965		1.788297		2.207185	
Akaike Info Criterion	-6.772257		-5.680560		-6.784825		-5.665000		-6.780837		-5.761229	
Schwarz criterion	-6.714927		-5.624216		-6.727495		-5.608817		-6.723506		-5.705047	

The leverage effect is measured through the TARCH (1, 1) model and the outcome of the model is shown in Table 5. The C (3)*(RESID (-1) ^2*(RESID (-1) <0) is positive in all the three indices pre and during the covid-19 period and statistically significant. This supports the statement that there is a leverage effect in the model and unfavourable information produces more volatility as compared to positive news or positive and adverse shocks have a diverse shock on the volatility of Nifty, Nifty 500, and BSE Sensex returns. It further highlights that the news impact is asymmetric in Indian stock market return.

EGARCH model helps to explain the volatility of the financial market when some degree of asymmetric and leverage effect is present in the price series. If the bad news has a greater impact on volatility than good news, a leverage effect exists. Table 6 presents the results of the EGARCH model. To capture the availability of asymmetric behavior and the existence of leverage effect in the financial return of NSE Nifty, Nifty 500 and BSE Sensex indices, the study applies the EGARCH model to detect the leverage effect (asymmetric). It is expected that the sign of gamma (ã) in the EGARCH model must be negative and significant in pre and during the Covid-19 pandemic period. The leverage effect refers to the observed tendency of an asset's volatility to be negatively correlated with the asset's returns. The coefficient gamma (ã) is negative and highly significant which indicates a strong presence of asymmetry effect in volatility, i.e., volatility increases disproportionately with negative shocks in all the three indices. So it is evident that the Indian stock market return is affected by negative shocks in both the periods of the study. Therefore, EGARCH(1,1) model estimates a downward-sloping volatility term structure.

Conclusion

The study investigated the effect of COVID-19 on the performance of NSE nifty, Nifty 500 and BSE Sensex these are the three major indices in the stock markets of India. GARCH family models are used to test the volatility in the stock market by taking the two time periods the pre-COVID-19 (1st January 2019 to 31st December 2019) and the period after this date is considered as during the COVID-19 era (1st January 2020 to 31st December 2020). The result shows that the stock market of all the three indices become volatile during the Covid-19 period. The results of the GARCH(1,1) model revealed that the market was good for investors since most of the stocks recorded positive mean returns (gains) than negative mean returns (losses). There was a high probability of making gains than losses by investors. ARCH and GARCH summations mostly less than one i.e. ensuring the validityof the model, be able to capture leverage effect and itsability to eliminate ARCH effects. The sum of ARCH and GARCH coefficients in the model of Nifty pre-covid-19 is 61.17% but during Covid-19 period is 95.4%, Sensex pre-Covid-19 is 60.3 %, during the covid-19 period is 95.7 % and Nifty 500 is 67.91 %

and 94.02 % pre and during Covid-19 period which is positive and also statistically significant. The higher coefficient of ARCH and GARCH terms specify that the model selected is stable and good. The EGARCH(1,1) indicated the existence of leverage effect on the market implying bad news has much more effect on next period volatility than the good news of the same magnitude.

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The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Stock Market Volatility by Using GARCH Model

A. KOTISHWAR

Abstract: The study aimed at knowing the Stock market volatility by using the GARCH model. The secondary data has been taken for the period of 2010-2021.The study focused on the NIFTY and SENSEX to understand the growth of these indices. The volatility of the stock market indices has been examined and found that Sensex is having more volatility than the Nifty. There is an uptrend from the year 2015 to 2018 Nifty and Sensex are observed to be having a significant impact on the volatility index. It also implies that the Nifty is having a higher impact on the volatility index than Sensex.

Key words: Stock returns; volatility; GARCH, Volatility index

Introduction

The Indian economy is considered a growth engine of the global economy as an ever-growing and expanding economy. The stock market of such a strong economy is the face of the market's and firms' expansion. The Bombay Stock Exchange is one of the world's oldest and fastest stock exchange platforms (BSE). The stock market is an electronic marketplace where companies' shares are listed and traded. Companies may raise funds from the general public more efficiently and effectively to this smart platform. Stock exchanges have increased tremendously in terms of foreign institutional investment and transaction turnover as a result of the country's economic reforms.This rise is primarily due to the government's liberalised and supportive roles, as well as its regulatory role. The share prices of publicly traded companies fluctuate due to a variety of factors that influence and shape market and investor sentiment.

The stock market has played an important role in financing the Indian corporate sector in the context of the process of economic liberalisation. The main function of the stock markets is to mobilise investment resources directly from the investors, provide the investors with liquidity, and supervise and discipline company management. The main attraction of stock markets is that they offer business people and governments directly to investors and investors to mobilise their

A. Kotishwar is Professor & Head, Department of Master of Business Administration, CMR College of Engineering & Technology, Medchal Road, Hyderabad, Telangana. 501 401.

own resources. Furthermore, liquid markets are proposed to improve resource allocation and improve long-term economic growth prospects

In India, as well as in South Asia, the Bombay Stock Exchange (BSE) was established in 1875 as the leading exchange. Bombay stock exchange is the 11th-largest stock market in the world by capitalization (The Exchange Federation). The BSE list contains over 5,000 companies. The principal index of Sensex, which comprises 30 stocks, is the Bombay bourse.

Based on the Securities Contracts (Regulation) Act 1956, the national Stock Exchange has been established in 1992 as tax paying company and recognised as the stock market in 1993. NSE is the twelfth biggest bond in the world with more than one market capitalisation.

The NIFTY 50 is the flagship index and tracks the behaviour of the largest and most liquid Indian securities portfolio of Blue Chip companies. It covers 50 of the approximately 1600 NSE traded companies, covers about 65 per cent of their floating-adjusted capital and is the genuine reflection of the Indian stock market.

The S&P BSE SENSEX is intended to measure the performance of BSE Ltd's 30 largest, most liquid and financially sound businesses across important sectors of the Indian economy.

Review of Literature

Lim & Sek (2013) analysed the volatility of stock market in Malaysia and found results that exchange rate and crude oil price have significant impacts on the Malaysia stock market volatility in the pre-crisis and post-crisis periods but the impact is not significant in the crisis period. Ismail (2016) showed that the newly proposed MODWT-GARCH(1,1) model best fits returns series for these African countries and the proposed MODWT-GARCH should be applied on other context to further verify its validity.

Cheteni, (2017) showed evidence of high volatility in both the JSE market, and the Shanghai Stock Exchange and the analysis reveals that volatility is persistent in both exchange markets and resembles the same movement in returns. Kumar, & Khanna, (2018) found that previous volatility had more impact on the current volatility in comparison to the shocks or news coming to the markets. Paramanik & Singhal (2020) suggested that dominant impact of negative market sentiment over positive one and it also provides evidence of noise trading in financially immature Indian stock market. Bhowmik & Wang (2020) found that there has been a significant change in research work within the past 10 years and most of researchers have worked for developing stock markets.

Objectives of the Study

- To assess the volatility effect of select stock market indices
- To examine the volatility effect of select stock market indices on VIX (India Volatility Index)

Hypotheses of the Study

H_{01} There is no GARCH effect in select stock market indices

H_1 There is no impact of volatility effect of select stock market indices on VIX

Research Methodology

The present study will be exploratory in nature, The information was gathered from the official websites of the NSE India and the BSE India. Economic magazines, books, and journals, among other things, are taken into account. The daily data of select indices were used for the analysis, which spanned a ten-year period from 2010 to 2021. The study applies the following statistical tools for the framed objectives. One of the models in the ARCH family is generalised auto regression conditional heteroscedasticity. The analysis used GARCH to determine the volatility effect in stocks.

Data Analysis

This study has been focused on the impact of macro and micro economic factors on Nifty. The study applied the stationary test before the application of objective related statistics. The following is the output of the stationary test, which has been derived with the ADF in E-Views software.

Stationary Test

Unit Root Rest: The Unit Root Test is used generally to check the accuracy of the data collected; in case the probability value of the Unit Root Test is less than 0.05 then we can consider that corresponding data is accurate. In the table, the unit root test is done. If the probability value is not less than 0.05, we need to make the 1st difference for the corresponding variables to get the probability value less than 0.05.

Normal Level: The test resulted that PMI and rupee vs dollar had the stationerised data in the normal level only as the probability value is less than 0.05.To examine the impact of economic factors (Global and National) on Nifty, the stationery test is conducted to analyse the data stability. As it is the time series data Augmented Dickey Fuller Test is attempted to check the stationarity of the data in the Unit Root Test.

Table 1: Unit root test for Nifty,Sensex,VIX

	Level		First difference		Second difference	
Factors	t-Test	Probability	t-Test	Probability	t-Test	Probability
Nifty 50	0.2825	0.5262	-26.146	0.0000	-	-
Sensex	0.163	0.9702	-24.711	0.0000	-	-
VIX(Volatility Index)	-9.231	0.0000	0.0000	0.0000	-	-

First Difference: The test results that the factors like Global GDP, Dollar Index, Global Inflation, Indian GDP, rupee vs dollar, Indian Inflation, IIP and even nifty have got significance (i.e.,<0.05) in the first difference.

Table 2: Growth rate of Nifty and Sensex

Years	Nifty	Sensex
2012	-6.13166	-6.40169
2013	5.410076	4.685413
2014	9.17923	10.897
2015	33.09892	32.33392
2016	-0.93189	-2.0095
2017	6.596473	4.936734
2018	18.60333	18.18775
2019	8.741896	11.46516
2020	4.112012	6.056796
2021	5.812294	6.377668

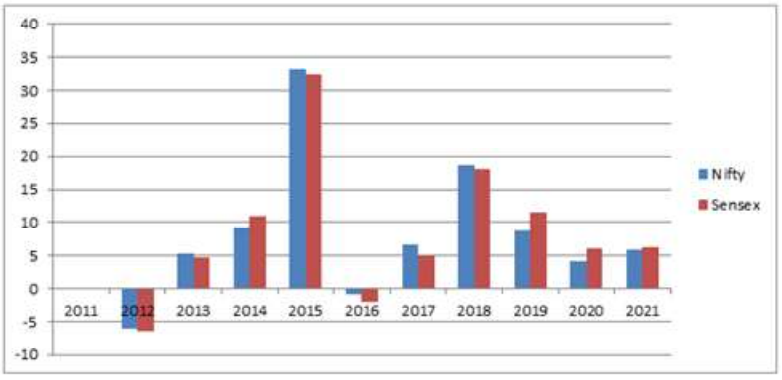

Fig : 1Growth rate of stock market indices

The Table 2 represents the growth analysis of stock market indices i.e.Nifty and Sensex from the period of 2011 to 2021. Initially growth rate of Nifty in the year 2012 is -6.13% and the same as well in the case of Sensex is -6.40% there is a drastic fall of the growth rate in stock market prices in this particular year. While coming to the next year(2013) there is a rise of growth rate in both Nifty and Sensex with the increase in values 5.41%,4.69%. In the 2015 the growth rate has reached the peak in case of Nifty it has been increased to 33.10% similarly in case of Sensex the growth rate has been increased to 32.33%, and in the next year of 2016 there is a drastic fall or decrease in the growth rate of Nifty to-0.01% and in case of Sensex growth rate decreased to -2.01% . In the 2017 growth rate of both indices increased to 6.60% and 4.94% and similarly from the 2018 the growth rate has been increasing and decreasing as shown in the above graph.

Volatility Effect of Select Stock Market Indices

ARCH test

H_0: There is no volatility influence on the-volatility of the select-stock market indices.

ARCH LM Test: for Nifty 50

Table 3: ARCH Test for Nifty 50

Heteroskedasticity Test: ARCH				
F-statistic	0.723628		Prob. F(1,2817)	0.3950
Obs*R-squared	0.723956		Prob. Chi-Square(1)	0.3948
Test Equation:				
Dependent Variable: WGT_RESID^2				
Method: Least Squares				
Date: 05/21/21 Time: 22:06				
Sample (adjusted): 1/05/2010 10/23/2020				
Included observations: 2819 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.016263	0.066762	15.22209	0.0000
WGT_RESID^2(-1)	-0.016025	0.018839	-0.850663	0.3950
R-squared	0.000257	Mean dependent var	1.000234	
Adjusted R-squared	-0.000098	S.D. dependent var	3.400420	
S.E. of regression	3.400587	Akaike info criterion	5.286482	

Contd...

Sum squared resid	32575.76	Schwarz criterion	5.290699
Log likelihood	-7449.297	Hannan-Quinn criter.	5.288004
F-statistic	0.723628	Durbin-Watson stat	1.995050
Prob(F-statistic)	0.395029		

ARCH LM test has been applied to know the heteroscedasticity and the result indicates that the independent variable standard deviations are related to the prior time periods. The P-value is found to be significant. Hence study states that the volatility exists in Nifty, which signifies the ARCH test.

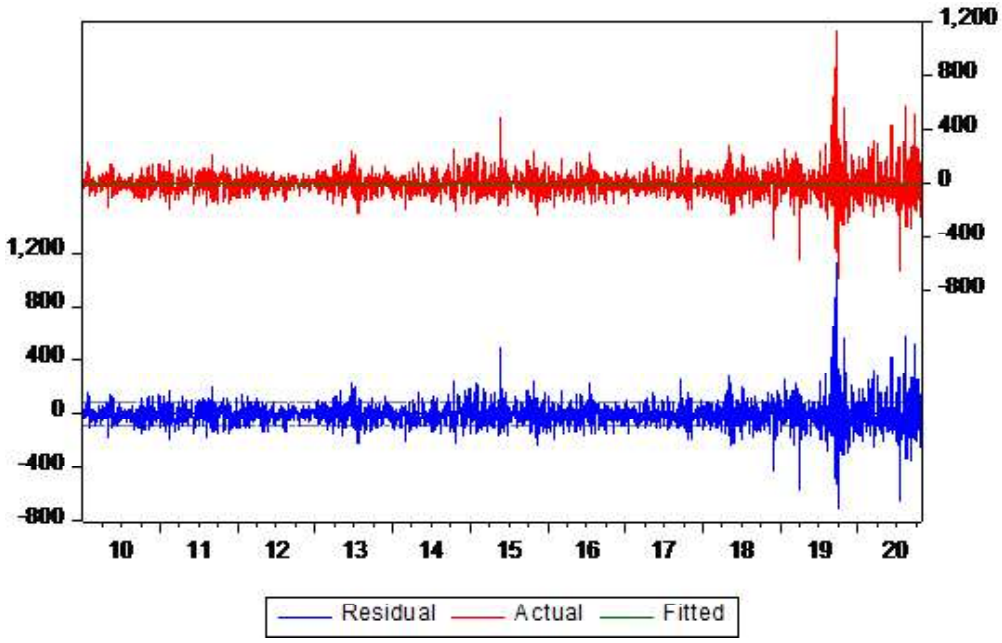

Fig no :2 Graph significances that GARCH can be applied.

The residual graph 2 shows the volatility of the Nifty. It is observed that the trend line is crossing the fitted lines, which states that data is normally distributed. The one cluster volatility is closely related and overlapping other cluster volatility. The white noise test has been applied on the returns of Nifty and the result stated the wide sense of stationary. Therefore, GARCH model can be applied to know the volatility influence on Nifty.

GARCH Test

Table 4: GARCH test for Nifty 50

Dependent Variable: RNIFTY				
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)				
Date: 05/21/21 Time: 22:08				
Sample (adjusted): 1/04/2010 10/23/2020				
Included observations: 2820 after adjustments				
Convergence achieved after 21 iterations				
Coefficient covariance computed using outer product of gradients				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(1) + C(2)*RESID(-1)^2 + C(3)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
	Variance Equation			
C	76.29288	15.94911	4.783520	0.0000
RESID(-1)^2	0.075149	0.006424	11.69808	0.0000
GARCH(-1)	0.917006	0.007266	126.2093	0.0000
R-squared	-0.001368	Mean dependent var	-3.474450	
Adjusted R-squared	-0.001013	S.D. dependent var	93.94122	
S.E. of regression	93.98881	Akaike info criterion	11.50830	
Sum squared resid	24911586	Schwarz criterion	11.51463	
Log likelihood	-16223.71	Hannan-Quinn criter.	11.51058	
Durbin-Watson stat	1.976008			

The GARCH family model table is used to know the effect of volatility on the volatility of the Nifty. It is observed that the probability value of the Nifty volatility is significant i.e., 0.000 is less than 0.05 Thus it states that an increase in Nifty will increase the volatility value to 0.917. Hence, the null hypothesis has been rejected. It can be concluded that the volatility of the Nifty is affected by the volatility

ARCH LM Test for Sensex

H_0: There is no volatility influence on the-volatility of the select-stock market indices.

Table 5: ARCH test for Sensex

Heteroskedasticity Test: ARCH				
F-statistic	0.645138	Prob. F(1,2527)	0.4219	
Obs*R-squared	0.645484	Prob. Chi-Square(1)	0.4217	
Test Equation:				
Dependent Variable: WGT_RESID^2				
Method: Least Squares				
Date: 05/21/21 Time: 22:22				
Sample (adjusted): 1/06/2010 9/16/2019				
Included observations: 2529 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.016355	0.071435	14.22763	0.0000
WGT_RESID^2(-1)	-0.015976	0.019890	-0.803205	0.4219
R-squared	0.000255	Mean dependent var	1.000375	
Adjusted R-squared	-0.000140	S.D. dependent var	3.450051	
S.E. of regression	3.450293	Akaike info criterion	5.315586	
Sum squared resid	30082.72	Schwarz criterion	5.320201	
Log likelihood	-6719.558	Hannan-Quinn criter.	5.317260	
F-statistic	0.645138	Durbin-Watson stat	1.994689	
Prob(F-statistic)	0.421932			

ARCH LM test has been applied to know the heteroscedasticity and the result indicates that the independent variable standard deviations are related to the prior time periods. The P-value is found to be significant. Hence study states that the volatility exists in Sensex , which signifies the ARCH test.

The above residual graph shows the volatility of the Sensex. It is observed that the trend line is crossing the fitted lines, which states that data is normally distributed. The one cluster volatility is closely related or overlapping other cluster volatility. The white noise test has been applied on the returns of Sensex and the result stated the wide sense of stationary. Therefore, GARCH model can be applied to know the volatility influence on Sensex.

GARCH TEST: for Sensex

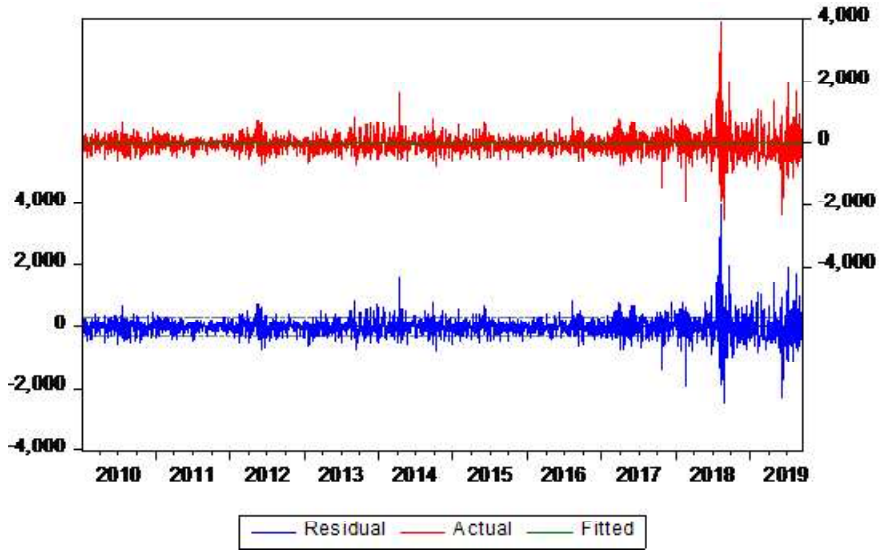

Fig :3 Graph significances that GARCH can be applied

Table 6: GARCH test for Sensex

Dependent Variable: RSENSEX

Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)

Date: 05/21/21 Time: 22:25

Sample (adjusted): 1/05/2010 9/16/2019

Included observations: 2530 after adjustments

Convergence achieved after 21 iterations

Coefficient covariance computed using outer product of gradients

Presample variance: backcast (parameter = 0.7)

GARCH = C(1) + C(2)*RESID(-1)^2 + C(3)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
	Variance Equation			
C	619.7262	173.8521	3.564675	0.0004
RESID(-1)^2	0.070951	0.006397	11.09088	0.0000
GARCH(-1)	0.924634	0.007419	124.6288	0.0000
R-squared	-0.001516	Mean dependent var	-12.75503	

Contd...

Adjusted R-squared	-0.001120	S.D. dependent var	327.6436
S.E. of regression	327.8271	Akaike info criterion	13.95194
Sum squared resid	2.72E+08	Schwarz criterion	13.95886
Log likelihood	-17646.20	Hannan-Quinn criter.	13.95445
Durbin-Watson stat	1.987010		

The GARCH family model table is used to know the effect of volatility on the volatility of the Nifty. It is observed that the probability value of the Sensex volatility is significant i.e., 0.000 is less than 0.05 Thus it states that an increase in Nifty will increase the volatility value to 0.924. Hence, the null hypothesis has been rejected. It can be concluded that the volatility of the Sensex is affected by the volatility Effect of Select Stock Market Indices on VIX (India Volatility index)

Ordinary Least Square

Null Hypothesis: Commodity has no effect on VIX.

Independent variable: NIFTY50

Table 7: OLS test for Nifty 50

Dependent Variable: VIX

Method: Least Squares

Date: 05/22/21 Time: 11:11

Sample (adjusted): 1/04/2010 10/23/2020

Included observations: 2820 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18.06097	0.139749	129.2387	0.0000
DNIFTY	0.004399	0.001487	2.958274	0.0031
R-squared	0.003096	Mean dependent var	18.07625	
Adjusted Rsquared	0.002742	S.D. dependent var	7.426296	
S.E. of regression	7.416107	Akaike info criterion	6.845895	
Sum squared resid	154986.2	Schwarz criterion	6.850111	
Log likelihood	-9650.711	Hannan-Quinn criter.	6.847416	
F-statistic	8.751383	Durbin-Watson stat	0.426130	
Prob(F-statistic)	0.003119			

Ordinary least square is used to check the impact of the variables. In the Table 7 it represents that the change in the Nifty values will have an impact on VIX.As it is shown in the above table that the probability value of Nifty (independent

variable) is 0.0031 which is less than 0.05 and the coefficient value is 0.0043, it is a positive value. Thus, it states that an increase in Nifty will increase the VIX value by 0.0043 for the future (Nifty is having a positive impact on VIX). Therefore in this case there is a rejection of the Null Hypothesis.

Independent variable:Sensex

Table 8: OLS test for Sensex

Dependent Variable: VIX				
Method: Least Squares				
Date: 05/22/21 Time: 11:16				
Sample (adjusted): 1/05/2010 9/16/2019				
Included observations: 2530 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.88417	0.113582	148.6520	0.0000
RSENSEX	0.000114	0.000346	0.328574	0.0025
R-squared	0.000043	Mean dependent var	16.88272	
Adjusted R-squared	-0.000353	S.D. dependent var	5.707732	
S.E. of regression	5.708739	Akaike info criterion	6.322664	
Sum squared resid	82386.76	Schwarz criterion	6.327277	
Log likelihood	-7996.169	Hannan-Quinn criter.	6.324337	
F-statistic	0.107961	Durbin-Watson stat	0.448507	
Prob(F-statistic)	0.742505			

In Table 8, it represents that the change in the Sensex values will have an impact on VIX.As it is shown in the above table that the probability value of Sensex (independent variable) is 0.0025 which is less than 0.05 and the coefficient value is 0.0001, it is a positive value. Thus, it states that an increase in Sensex will increase the VIX value by 0.0001 for the future (Sensex is having a positive impact on VIX). Therefore, in this case there is a rejection of the Null Hypothesis.

Findings of the Study

The study with the ARCH model stated that Nifty got influenced positively with a coefficient value of 0.91 as well as the Sensex also got a positive influence with the coefficient value of 0.92. Here, the results are stated from the GARCH model identified by the residual graph. It is also found that, in the GARCH model or applying the GARCH model the null hypothesis has been rejected (due to the positive impact of both the indices). The study has resulted from the Ordinary

Least squares that Nifty and Sensex are observed to be having a significant impact on the volatility index. It also found that the Nifty is having a higher impact on the volatility index than the Sensex is with 0.004 units.

Conclusion and Implication

The ARCH model has been used to know the volatility effect of stock market indices – Nifty and Sensex. Nifty got influenced positively with as well as Sensex also got a positive influence. The Ordinary Least squares is applied to know the Impact of the Stock market indices, Nifty and Sensex is observed to be having a significant impact on the volatility index and Nifty is having a higher impact on the volatility index than the Sensex that is with 0.004 units. Hence, there is a need to do further research in this area by considering the impact of the stock market volatility with respect to other stock market indices.

The study suggests the intra-day traders to focus on the higher volatile stocks, so that they can take open and closing positions in higher deviation points. Investors should monitor the VIX movement to identify the risk involved in the market, so that they can take the short positions. The derivative traders are advised to observe the VIX along with the Theta, which reflects the volatility impact on the premium values. The traders can take opt decision with the gap emerging with the VIX relation with the theta.

Further Research Scope

The study indicates the suggestions that there is a study conducted from the year 2010 to 2021, but wherein there is scope for further analysis for the preceding years. The research also has scope to identify the market indices changes and impact of the other stock market indices such as UK index, or for USA Index likewise. There is also scope for further analysis to know the Indian stock market indices effect on the international country stock indice's.

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The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Price Volatility and Impact of Various Economic Parameters on the Futures Prices of Selected Commodities

PRIYANKA KANSARA, KAMINI SHAH, SANDIP K. BHATT

Abstract: The research is an attempt to study the commodity market in India. The Indian commodity market provides various benefits to the investors. It also helps for the economic development of the country. The market provides trading in commodities. The commodities are traded under various categories like Base Metal, Agro commodities, Energy and Base Metal. The futures prices of commodities are affected due to various economic parameters like global supply, global Consumption, Indian imports and spot prices. The present study includes four commodities cotton, crude oil, aluminium and gold. The analysis covers the impact of various economic parameters on the futures prices of commodities. The results throw lights on the relation of various commodities futures prices with different economic parameters.

Keywords: commodity market, economic development, growth and development of commodity market, global supply, global consumption, Indian imports, Spot prices, futures prices

Introduction

A commodity market is a geographical location where buyers and sellers meet to exchange commodity ownership through negotiation at a mutually agreed price. The commodity market is a significant piece of the financial market of any nation. In this market, an assortment of items can be traded, such as agricultural commodities, energy, gold bars and other metals. The commodity market is more likely to be a stock market than to buy and sell stocks; in the commodity market, investors buy and sell commodities. The commodity market exists in two different forms: Over-the-counter trading, Exchange trading market

Ms. Priyanka Kansara is Research Scholar, Faculty of Management, Sardar Patel University & Academic Associate – IIM, Ahmedabad, Dr. Kamini Shah is Research Guide,Associate Professor, Department of Business Studies, Sardar Patel University, Vallabh Vidyanagar. Prof. (Dr.) Sandip K. Bhatt is Dean and Head Department of Business Studies, Sardar Patel University,Vallabh Vidyanagar.

The spot market is essentially an over-the-counter market, and the scope of participation is limited to the participants. But derivatives trading are conducted through an exchange-based market, with standardized contracts, settlement, etc.

With the advent of the facility of minimizing risk, producers of the commodity agreed to exchange the product with the exchange dealer for future time, that period will be called the delivery time at the mutually agreed price. In the situation, where the dealer is not able to take the delivery of the product, he can sell that contract to the other party who is ready to have that product. Similarly, if the producer faces the same problem in producing that promised product, he can also pass on the responsibility to others who are prompt to take it. Thus, the entry of different buyers and sellers speculate the price movement in the market. This price fluctuation makes the market efficient.

Commodity market has been playing important role in the economic growth, employment and welfare of large segment of the society. Different countries have comparative advantage for different commodities. Thus the growth of commodity market in different countries will be based on the commodity which is available in that country. The commodity market assumes an essential role in the overall economic development.

Literature Review

Velappan and Prasanna (2016), found that during the global financial crisis, commodity market returns have shifted from low to high volatility. International trade commodities such as sugar and rubber have affected the financial crisis. (Velappan & Prasanna, 2016) Chand, et al, (2015)advocated that commodity market required policy liberalization, initiating new development policy and regulatory framework. (Bhagat, Omre, & Chand, 2015)

Ambrish and Singh (2015) revealed that fragmentation in the agricultural market and price differentials in agricultural produce is the major problem in Indian agriculture. However, demutualization of commodity exchanges may help to overcome this problem (Ambrish & Singh, 2015).

Jaiswal and Manoj (2015) found that among all factors, inflation rate and US dollar affects the most to the gold price variations. As gold has acted as heaven for investors, they tend to preserve some amount as gold portfolio. This is a key factor in fluctuations of gold prices (Jaiswal & Manoj, 2015). Selvalakamshmi and Arumucs (2014) observed that all the macro-economic factors are having positive impact on the prices of commodity. It is mandatory for trader to understand the effects of the various economic parameters. Moreover, there are certain Governmental influences like various policy instruments, tariffs, subsidies, and the price floors. These efforts are necessary to maintain the effect of the

price variations and help in sustaining the trade balance in the economy (Selvalakshmi & Arumugam, 2014).

Aggarwal et al, (2014) revealed that future prices help in identifying efficient information and help in managing risk. The commodities markets help in price discovery process, but the hedging effectiveness was lower. The commodity futures market if reformed can be substituted for the commodity risk management (Aggarwal 2014).

Lagesh, et all (2014) studied the portfolio diversification benefits of traditional asset market and commodity future indices of India. The outcomes concentrated on exceptionally short relationship among the commodity futures lists and other resource files which is potential for the portfolio broadening. Consequently, commodity futures contracts are effective to achieve diversification benefits when combined with other investment avenues (Lagesh M A, 2014).

Anjum and Harwinder (2013) studied the different types of commodities and regulatory framework of Indian Commodity Market. The commodities traded in these exchanges are sorted in bullion, base metals, vitality products, rural products. Forward Market Commission performs all the roles related to smooth functioning of the commodity market and provide the better control mechanism. (Harwinder & Anjum, 2013)

Objectives of the Study

The objectives of the study are:

- To analyze the price volatility of selected commodities traded on MCX.
- To examine the relationship of futures prices of selected commodities with the different economic parameters.

Hypotheses

The hypotheses was formed to test the relationship between commodity futures prices and economic variables such as global supply, global consumption, Indian imports and spot prices. The hypotheses are:

H_{01}: There is no significant relationship between futures price and global supply, global consumption, Indian imports and spot price of cotton

H_{11}: There is a significant relationship between futures price and global supply, global consumption, Indian imports and spot price of cotton.

H_{02}: There is no significant relationship between futures price and global supply, global consumption, Indian imports and spot price of crude oil.

H_{12}: There is a significant relationship between futures price and global supply, global consumption, Indian imports and spot price of crude oil.

H_{03}: There is no significant relationship between futures price and global supply, global consumption, Indian imports and spot price of aluminium.

H_{13}: There is a significant relationship between futures price and global supply, global consumption, Indian imports and spot price of aluminium.

H_{04}: There is no significant relationship between futures price and global supply, global consumption, Indian imports and spot price of gold.

H_{14}: There is a significant relationship between futures price and global supply, global consumption, Indian imports and spot price of gold.

Research Methodology

For the present study; exploratory research design is used; which helps to explain more on the topic to gain familiarity, and consider different aspects of commodity market. The futures contract prices of commodities like cotton, crude oil, aluminium and gold traded on MCX, India have been considered.

The data were analyzed with the use of various appropriate analytical tools and techniques like arithmetic mean, averages, descriptive statistics, correlation, regression, ANOVA, historical volatility calculation.

Volatility Calculation

The volatility calculation is based on the historical volatility method. The historical volatility is also called the statistical volatility which measures the fluctuations of underlying commodity by measuring the price changes over the period of time. The calculation for the historical volatility are based on the changes from one closing price to the next. The formula for calculating historical volatility is as follows;

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(R_i - R_{avg})^2}{n-1}}$$

For calculating the volatility; the futures contract traded on MCX are taken. The closing prices of futures contract available in the historical data tab were downloaded for the year 2009 to 2019. The daily closing prices of each selected commodities were downloaded and the daily data were converted into monthly data for calculation of the volatility.

Cotton

The cotton futures contract started in the year 2012 so data of closing prices of cotton futures contract are available from the year 2012. The volatility calculation for cotton is as follows;

Year	2012	2013	2014	2015	2016	2017	2018	2019
Volatility	0.04	0.055	0.0226	0.0217	0.058	0.8515	0.0314	0.031

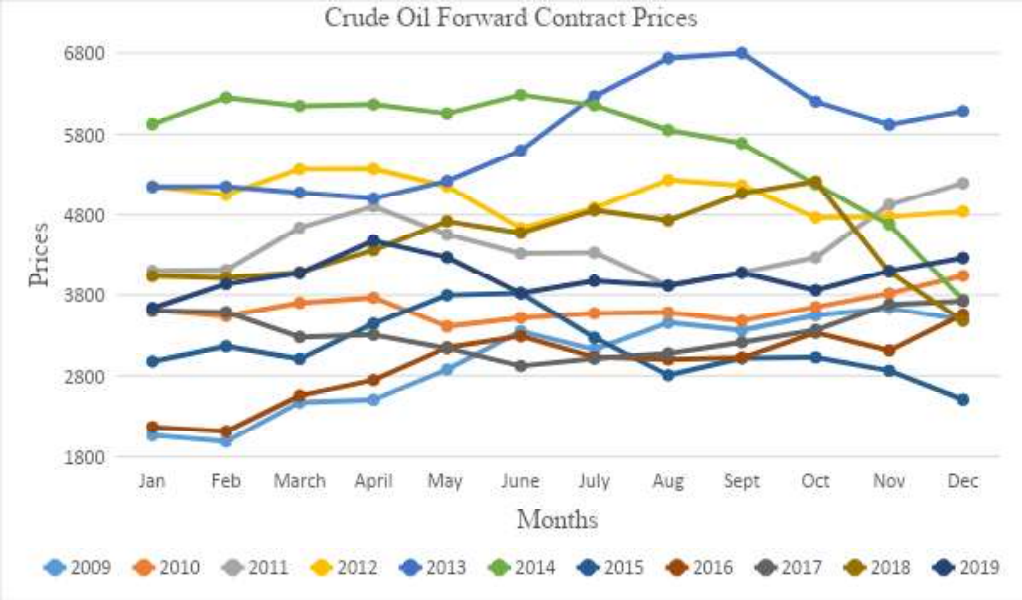
The graph represents the volatility of cotton futures contract prices. The cotton prices are highly volatile in the year 2017. There was low volatility in the year 2012-13. The prices were considerably stable in the year 2014- 15 and 2018-19.

Crude Oil

The price volatility of crude oil contract are presented below for the analysis.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Volatility	1.0111	0.0436	0.0724	0.0531	0.0559	0.0729	0.0979	0.0846	0.0518	0.0975	0.0602

The graph showed the volatility of crude oil futures contact. The prices were highly volatile over the period of study. Every year the prices fluctuate and provide the benefit of investments.



Aluminium

The volatility calculation of aluminium is as follow;

Month	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Volatility	0.0573	0.0590	0.02117	0.0394	0.0358	0.0436	0.0358	0.0286	0.0237	0.0476	0.0264

The graph presented the volatile nature of aluminium futures contract prices are presented. The volatility was high in the year 2009 and 2018. The prices were more or less stable during the year 2010, 2011 and 2012.

Gold

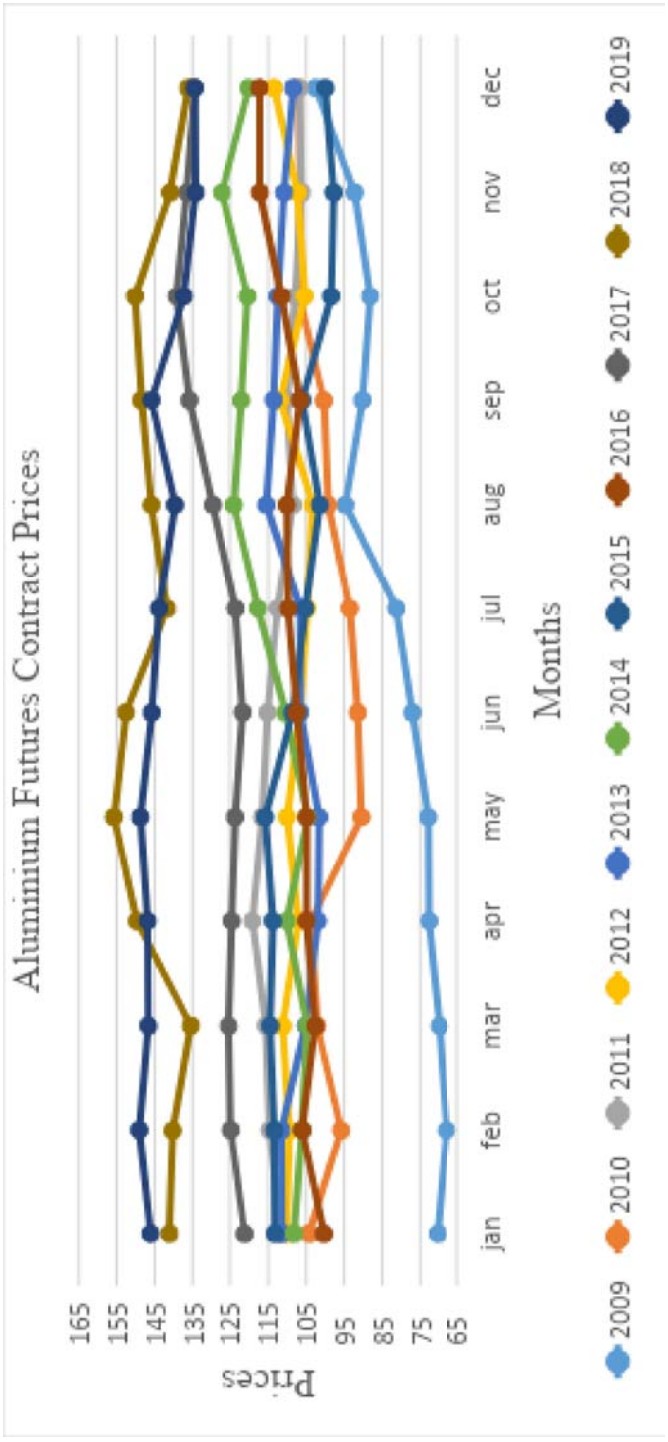
The volatility calculation of gold is as follow;

The graph depicts the volatile nature of gold futures contract. The gold prices are increasing year by year. The volatility is less but pricing are increasing. The highest volatility was in the year 2019. Thus, gold prices are less volatile but it is value increasing in nature.

Statistical Analysis

The statistical analysis carried out to test the hypothesis for the study. The detailed analysis of each selected commodities and economic parameters is as follows.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Volatility	0.040595	0.02467	0.04354	0.02209	0.04946	0.02875	0.03086	0.041114	0.0225827	0.0212866	0.04094



Cotton

The analysis covers the year wise values of different economic parameters and futures price of Cotton. Table 1 (a) presents the descriptive statistics for Cotton. Table 2(b) shows correlation between future price and global supply, global consumption, Indian imports, spot prices for the cotton. As per analysis it is clear that future price has strong significant positive correlation with spot price for the cotton. It means future price increases as Spot price increase and vice versa. The global consumption and Indian imports and global supply have positive correlation with the futures price of cotton.

Table 1 (a) Descriptive statistics

	Mean	Std. Deviation	N
future prices	18693.2857	1911.85623	7
Global Supply (bales)	245077.5714	7561.09904	7
Global Consumption(bales)	114659.5714	5571.12630	7
Indian Imports (bales)	1481.8571	668.77685	7
Spot prices(Rs./bales)	18662.2857	1898.32090	7

Table 1 (b) Correlations

		Global Supply (bales)	Global Consumption (bales)	Indian Imports (bales)	Spot prices (Rs./bale)
Future prices	Pearson Correlation	.177	.613	.309	.994**
	Sig. (2-tailed)	.705	.143	.500	.000
	N	7	7	7	7

Table 1 (c) Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.995[a]	.991	.972	319.22240

Predictors(Constant), Spot prices(Rs./bale), Global supply (bales), Global consumption(bales), Indian Imports (bales)

Table 1 (d)ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21727359.542	4	5431839.886	53.304	.018[b]
	Residual	203805.886	2	101902.943		
	Total	21931165.429	6			

a. Dependent Variable: future prices

b. Predictors: (Constant), Spot prices(Rs./bale), Global supply (bales), Global consumption (bales), Indian Imports (bales)

Table 1(e)Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6924.791	10277.343		.674	.570
	Global Supply (bales)	-.022	.036	-.089	-.631	.593
	Global Consumption(Bales)	-.023	.041	-.067	-.558	.633
	Indian Imports (bales)	-.181	.358	-.063	-.505	.664
	Spot prices(Rs./bale)	1.081	.131	1.073	8.245	.014

a. Dependent Variable: future prices

Tables 1 (c) to (e) presents the details of regression analysis for the cotton. Here, a future price is dependent variable and global supply, global consumption, Indian imports and spot price are independent variables.

In the Table 1(c), R square 0.991 shows 99.1% of the variation of the dependent variable is clarified by the independent variables considered. In table 1 (d) the p-value is (0.018) which is not exactly the degree of essentialness 0.05(5%) so the null hypothesis is dismissed and it shows that there is a straight connection between the dependent variable and independent variables. Table 1(e) uncovers that spot cost is significant at 5% level of importance and it has positive contribution in the model. The other independent variables have no significant contribution in the model. The model is as follows;

Future price = 6924.79 – 0.22 (global supply) -0.023 (global consumption)

- 0.181(Indian imports) +1.081 (spot price)

Crude Oil

The analysis covers the year wise values of different economic parameters and futures price of crude oil.

Table 2 (a) Descriptive statistics

	Mean	Std. deviation	N
Future prices	4149.2433	1124.37878	9
Global supply ('000 barrels)	124832.3333	39376.25331	9
Global consumption('000 barrels)	93052.8889	5142.90644	9
Indian imports ('000 barrels)	4148.3333	798.77453	9
Spot prices(Rs./barrels)	4071.7956	1160.42791	9

Table 2(b) Correlations

		Global supply ('000 barrels)	Global consumption ('000 barrels)	Indian imports ('000 barrels)	Spot prices (Rs./barrels)
	Pearson Correlation	-.194	.036	-.067	.993**
future	Sig. (2-tailed)	.617	.927	.865	.000
prices	N	9	9	9	9

* "Correlation is significant at the 0.05 level (2-tailed).**. Correlation is significant at the 0.01 level (2-tailed)".

Table 2 (a) presents the descriptive statistics for crude oil. Table 2(b) shows correlation between future price and global supply, global consumption, Indian imports, spot prices for the crude oil. As per the analysis it reveals that future price has strong significant positive correlation with spot price for the crude oil. It means future price increases as spot price increase and vice versa. The global supply and Indian imports have negative correlation with the futures price of crude oil; but global consumption shows positive correlation with the futures price of crude oil.

Table 2 (c) Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994[a]	.988	.977	171.04206

a. Predictors: (Constant), Spot prices(Rs./barrels), global consumption('000 barrels), global supply ('000 barrels), Indian imports ('000 barrels)

Table 2 (d) ANOVA[a]

Model		Sum of Squares	df Square	Mean	F	Sig.
1	Regression	9996799.518	4	2499199.879	85.427	.000[b]
	Residual	117021.542	4	29255.386		
	Total	10113821.060	8			

a. Dependent Variable: future prices

b. Predictors: (Constant), Spot prices(Rs./barrels), Global consumption('000 barrels), Global supply ('000 barrels), Indian imports ('000 barrels)

Table 2 (e) coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	-5132.056	6153.946		-.834	.451
	Global Supply ('000 barrels)	-3.162E-005	.004	-.001	-.008	.994
	Global Consumption ('000 barrels)	.080	.095	.366	.839	.448
	Indian Imports ('000 barrels)	-.470	.673	-.334	-.699	.523
	Spot prices (Rs./barrels)	.930	.067	.960	13.799	.000

a. Dependent Variable: future prices

Tables 2 (c) to (e) provide details of regression analysis for the crude oil. The future price is dependent variable and global supply, global consumption, Indian imports and spot price are independent variables for the study.In the Table 2(c), R square 0.988 shows 98.8% of the variation of the dependent variable is clarified by the independent variables considered. In Table 2 (d) the p-value is (0.000) which is not exactly the degree of significance 0.05(5%) along these lines null hypothesis is dismissed which demonstrates that there is a straight connection between the dependent variable and independent variables. Table 2(e) shows that spot cost is significant at 5% level of significance and it has positive contribution in the model. The other independent variables have no significant contribution in the model. The regression model is as follows;Future price = -5132.056 – 3.162 (global supply) + 0.080 (global consumption) - 0.470(Indian imports) +0.930 (Spot price)

Aluminium

The analysis covers the year wise values of different economic parameters and futures price of aluminium.

Table 3 (a) Descriptive statistics

	Mean	Std. Deviation	N
Future prices	110.8082	17.74105	9
Global Supply (tonnes)	93659.8889	46383.84773	9
Global Consumption(tonnes)	54357.4444	11156.02349	9
Indian Imports (tonnes)	1376.8333	725.88082	9
Spot prices(Rs./10gm)	110.4478	16.96948	9

Table 3(b) Correlations

		Global supply ('000 barrels)	Global consumption ('000 barrels)	Indian imports ('000 barrels)	Spot prices (Rs./kg)
	Pearson Correlation	.717*	.880**	.864**	.997**
future	Sig. (2-tailed)	.030	.002	.003	.000
prices	N	9	9	9	9

*."Correlation is significant at the 0.05 level (2-tailed).**. Correlation is significant at the 0.01 level (2-tailed)".

Table 3 (a) shows descriptive statistics for aluminium. In the Table 6.2.5(b) shows correlation between future price and global supply, global consumption, Indian imports, spot prices for the aluminium. All the four variables global supply, global consumption, Indian imports and spot prices have significant positive correlation with the futures price of aluminium. The increase or decrease in any one of the four variable will lead to increase or decrease in futures price.

Table 3 (c) Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.999[a]	.998	.996	1.14381

a. Predictors: (Constant), Spot prices(Rs./kg), Global supply ('000 tonnes), Indian imports ('000 tonnes), Global consumption('000 tonnes)

Table 3(d) ANOVA[a]

Model		Sum of Squares	df Square	Mean	F	Sig.
	Regression	2512.725	4	628.181	480.148	.000[b]
	Residual	5.233	4	1.308		
	Total	2517.959	8			

a. Dependent Variable: future prices

b. Predictors: (Constant), Spot prices(Rs./kg), Global Supply ('000 tonnes), Indian Imports ('000 tonnes), Global Consumption('000 tonnes)

Table 3 (e) Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta1		
	(Constant)	-4.910	5.435		-.903	.417
	Global Supply ('000tonnes)	5.860E-005	.000	.153	2.658	.057
	Global Consumption ('000tonnes)	.000	.000	-.106	-.946	.398
	Indian Imports ('000tonnes)	-.002	.002	-.086	-1.025	.363
	Spot prices (Rs./kg)	1.107	.057	1.059	19.317	.000

a. Dependent Variable: future prices

Tables 3 (c) to (e) presents the details of regression analysis for the aluminium. Here, a future price is dependent variable and global supply, global consumption, Indian imports and spot price are independent variables.

In the Table 3(c), R square 0.998 shows 99.98% of the variation of the dependent variable is clarified by the independent variables considered. The p-value (0.000), in Table 3(d) is not exactly the degree of essentialness 0.05(5%) subsequently null hypothesis is dismissed which implies that there is a straight connection between the dependent variable and independent variables. Table 3(e) portrays that spot cost is significant at 5% level of centrality and it has positive contribution in the model. The other independent variables have no significant contribution in the model. The model for the regression is as follows;

Future price = -4.910+ 5.860 (Global Supply) + 0.000 (Global Consumption) - 0.002(Indian Imports) +1.107 (Spot price)

Gold

The analysis covers the year wise values of different economic parameters and futures price of gold.

Table 4 (a): Descriptive Statistics

	Mean	Std. Deviation	N
Future prices	26248.0556	5491.12011	9
Global Supply (tonnes)	4346.6667	391.26621	9
Global Consumption(tonnes)	3519.4444	382.73787	9
Indian Imports (tonnes)	792.7778	173.70073	9
Spot prices(Rs./10gm)	26168.6667	5529.51322	9

Table 4 (b): Correlations

		Global Supply (tonnes)	Global Consumption (tonnes)	Indian Imports (tonnes)	Spot prices (Rs./10gm)
Future prices	Pearson Correlation				
	Sig.	.960**	.119	.293	1.000**
	(2-tailed)	.000	.760	.445	.000
	N	9	9	9	9

*. "Correlation is significant at the 0.05 level (2-tailed).**. Correlation is significant at the 0.01 level (2-tailed)".

Table 4 (a) shows descriptive statistics for Gold. Table 4 (b) shows correlation between future price and global supply, global consumption, Indian imports, spot prices for the gold. It shows that future price has strong significant positive correlation with global supply and spot price for the gold. It means future price increases as global supply and spot price increase and vice versa. The rest of the other variables positive correlations.

Table 4 (c): Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000[a]	1.000	.999	143.05298

a. Predictors: (Constant), Spot prices(Rs./10gm), Global consumption(tonnes), Indian imports (tonnes), global supply (tonnes)

Table 4 (d): ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	241137344.048	4	60284336.012	2945.850	.000[b]
	Residual	81856.622	4	20464.156		
	Total	241219200.670	8			

a. Dependent Variable: future prices

b. Predictors: (Constant), Spot prices(Rs./10gm), Global Consumption(tonnes), Indian Imports (tonnes), Global Supply (tonnes)

Table 4 (e): Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig
		B	Std. Error	Beta	.	
1	(Constant)	3017.138	3691.214		.817	.460
	Global Supply	-1.041	1.080	-.074	-.964	.390
	Global Consumption	.053	.324	.004	.165	.877
	Indian Imports	-.469	.382	-.015	-1.228	.287
	Spot prices(Rs./10gm)	1.068	.076	1.075	14.110	.000

a. Dependent Variable: future prices

Tables 4 (c) to (e) show details of regression analysis for the gold. Here, a future price is dependent variable and global supply, global consumption, Indian imports and spot price are independent factors.

In Table 4 (c), R square 1.0 shows 100% of the variation of the dependent variable is clarified by the independent variables considered. The p-value (0.000), in the Table 4 (d) is not exactly the degree of centrality 0.05(5%) consequently null hypothesis is dismissed and it shows that there is a direct connection between the dependent variable and independent variables. Table 4 (e) shows that spot price is significant at 5% level of significance and it has positive contribution in the model. The rest of the independent variables have no significant contribution in the model.

The model is,

Future price = 3017.138 - 1.041 (Global Supply) + 0.053 (Global Consumption) – 0.469 (Indian Imports) +1.068 (Spot price)

Findings

The findings are as follows;

Volatility is a statistical measure of the dispersion of returns in a market index or any security. It is generally unpredictable changes over the time. The changes in price may be upside or downside. The volatility helps in taking the benefits of the price fluctuations of the commodity. The investors can take the benefits of the price fluctuations with the proper understanding of volatile nature of commodity. The findings from the analysis of volatility of different commodities are as follows;

The prices of cotton futures contract are fluctuating. The cotton futures contract prices were highly volatile over the past years. Due to the nature of highly volatile prices; it has the tremendous profit potential. The investor can make profits by investing in the futures contract of cotton as it showns higher volatility which will follow the trend in future.

The price of crude oil is volatile in nature. The fluctuations in prices provide the opportunity to make capital gains. The high volatility of crude oil is an indication of heavy buying or selling in the market; due to which the prices tend to fluctuate and which will provide an opportunity to earn profits.

The prices of aluminium futures contract were less volatile during the period of study. The prices of futures contract of aluminium remained steady. Hence, the aluminium futures contract price will be more stable in future. Hence, it is recommended to invest in the aluminium futures contract for earning short term profits.

The prices of gold futures contract does not fluctuate dramatically day by day; but the gold changes in value at a steady pace over the time. Hence, the price volatility of gold futures contract is less during the period of study. An investor gain profits by investing for the long period of time in gold futures contract. The profit expectation for the short-term is less.

The objective of the study is to analyze the relationship of futures prices of commodities with different economic parameters. The data was interpreted using regression analysis, correlation, ANOVA to derive the results. The followings findings here present a factual view on the hypothesis and their results.

Result of Correlation

Dependent Variable	Independent Variables			
Commodity Futures Prices	Global Supply	Global consumption	Indian Imports	Spot Price
Cotton	Positive	Positive	Positive	Significant Positive
Crude oil	Negative	Positive	Negative	Significant Positive
Aluminium	Significant Positive	Significant Positive	Significant Positive	Significant Positive
Gold	Significant Positive	Positive	Positive	Significant Positive

Results of Regression Analysis

Commodity	p-value	Accept/ Reject Null Hypothesis	Result
Cotton	less than 0.05 (5%) level of significance	Reject the Null Hypothesis	There is a linear relationship between dependent and independent variables. The spot price has positive contribution in the regression model.
Crude Oil	less than 0.05 (5%) level of significance	Reject the Null Hypothesis	There is a linear relationship between dependent and independent variables. The spot price has positive contribution in the regression model.
Aluminium	less than 0.05 (5%) level of significance	Reject the Null Hypothesis	There is a linear relationship between dependent and independent variables. The spot price has positive contribution in the regression model.
Gold	less than 0.05 (5%) level of significance	Reject the Null Hypothesis	There is a linear relationship between dependent and independent variables. The spot price has positive contribution in the regression model.

Limitations of the Study

The results of this research work are limited to the selected exchange, the Multi Commodity Exchange of India. In the present study limited commodities were selected for the research work. High frequency data were not available so study has been confined to daily closing price data.

Conclusion and Implications

The commodity market is a key player in Indian economy. There are various other businesses also linked with the commodities, so prices of the commodity will help in identifying the cascading effect on the other related merchandises. The commodity market is an important indicator of economic development. The Multi Commodity Exchange of India provides online trading in different commodities and this will benefit the investors to enhance their investment horizon, taking the benefits of portfolio diversification and reducing the risk of losses. Moreover, the knowledge of various economic parameters, and other related factors gave better investment opportunities to the investors. Thus, the better understanding of commodities, their market, and how are their prices fluctuating benefit the investors for better investment.

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The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Impact of Derivatives on the Financial Performance of NSE Listed Financial Companies

SATPAL

Abstract: The present study examines the different aspects of the use of derivatives and their impact on financial performance, liquidity position and behavior of stock prices of the financial companies under study. The study has examined the risk management practices of a sample of 20 financial companies for fifteen years during the period (2005 to 2020). In order to collect primary data via structured questionnaires, 30 financial companies were selected by raising five point Likert Scale. Majority of respondents strongly agree that use of derivatives in risk management helps in maximizing market value of Shares, ROA, and ROI, managing liquidity and improving operational efficiency of their companies. Use of financial derivatives can help in improving liquidity of company. There has been a stabilizing effect of derivatives on stock prices.

Key Words: Derivatives, Financial performance, NSE, Liquidity, Price stabilization

Introduction

The wave of globalization and liberalization has increased the financial risk of the corporate world. Financial disasters or risks can be seen in the tumultuous business operations. Therefore in order to manage such risks, derivative financial instruments have come into existence. Derivatives have proved a significant milestone in the area of financial innovation. Their use assists firms in hedging and speculation which has tremendous impact on the shareholders wealth. Simply stated a derivative is a contract for the sale and purchase of an underlying asset at a predetermined price on or before a predetermined date in future. Derivative is a financial instrument which derives its value from an underlying asset rather than trade or exchange of the asset itself.

Derivatives include futures forward, options and swaps. These can be combined with each other to create hybrid instruments. These instruments are used for hedging the risk by the management.

Dr. Satpal is Faculty Member, University School of Law, Rayat Bahra University Mohali

Review of Literature

Luyali & Mouni (2014) investigated the impact of use of derivatives on financial performance of companies listed in the Nairobi Securities Exchange and found that apart from price stabilization others variables contributed positively to the financial performance. Nidhi et al, (2014) examined price discovery and hedging effectiveness of commodity futures after using derivatives and concluded that on average, future prices do discover information relatively efficiently and help to manage risk less efficiently. The hedging effectiveness was lower and had wider variations across the commodities particularly agricultural. Shaofang & Matej (2014) examined the impact of financial derivatives on systematic risk of publicly listed US Bank Holding Companies and advocated that the higher use of interest risk derivatives, exchange rate derivatives and credit derivatives corresponds to greater systematic interest rate risk, exchange rate risk and credit risk. Caroune & Kavitha (2015) did their study on an analysis of financial derivatives and its growth rate in India. The results show that sample firms are experiencing increased trading volume over the longer periods. It found that around 15% to 25% of equity market volume is the result of option and variant market activity. Divya (2016) examined the impact of financial derivatives futures and options on the underlying market volatility .For this purpose data was collected for a period of 18 months from January 1997 to February 2015 through questionnaires and analyzed by using AR 1-GARCH model and concluded that overall volatility had reduced in the spot market after introduction of derivatives.

Branko and Mina (2017) tried to know whether Serbian companies used derivatives to manage risk. For this purpose comparative study was done between Slovenia companies and the companies in Croatia and Slovenia. In order to do this study FX and IR rates data were used from the Bloomberg and the NBS with the help of questionnaires from 62 companies. The period of this study was taken in the early May 2012. After analyzing the data, it was found that 65.9% of Serbian companies had employed financial derivatives versus 43% in Croatia and in Serbia only 40.32% of companies used financial derivatives.

Yantao et al, (2021) studied usages of derivatives and firm performance in Chinese Shenzhen stock exchange. For this study, unbalanced panel data was utilized during the period from 2005 to 2015. It was concluded that use of derivatives impacts negatively firm performance rather than improving it. Bankita et al (www.sebi.gov.in) tried to analyze price discovery of single stock option market of NIFTY bi -collection information option prices in India. The results were obtained by comparing it to PD in the corresponding futures and stock markets. This study had analyzed PD in spot, future and options for 10 individual stock during 3 different times pertaining security transaction tax. Finally it was concluded that traded value of the options has increased and future value has increased due to increase in security transaction tax.

Most studies examined the impact of derivatives on either financial or non-financial companies. Only few studies examined the impact of derivatives on financial and non-financial companies taken together. The present study has covered both financial and non-financial firms.

Need of the Study

Generally two types of arguments can be seen in the existing literature. According to one school of argument, the usage of derivatives increases trading stock market volatility due to high degree of leverage and ultimately it creates destabilization in the market. In case of future market, it acts as uniformed trades due to low transaction costs. According to the other school, derivatives play pivotal role of price discovery and beneficial effect on the underlying cash market. Kumar et al (1995) concluded that usage of derivatives helps in price discovery, improves market debt, increase market efficiency and reduces uneven information in spot market. The literature shows mixed results about its usages. It was observed that most of the studies have been conducted in the developed countries like US, UK and Japan and only few studies have been conducted in the developing country like India. Therefore it provides an opportunity to carry out further research in this regard.

Objectives of the Study

The overall objective of the study is to analyse the effect of derivatives on the financial performance of financial companies listed in NSE (National Stock Exchange). The Specific objectives of the study are; .

- To examine the impact of risk management through the use of derivatives on the financial performance of companies.
- To examine the impact of risk management through the use of derivatives on liquidity position of companies listed in NSE
- To examine whether the trading in derivatives results into price stabilization of securities of companies listed in NSE.

Conceptual Framework

Risk management through derivatives is expected to influence financial performance of financial companies, liquidity position and stabilization of securities prices. Risk management through derivatives has been considered as the independent variable and financial performance, liquidity position and price stabilization are taken as dependent variables

Hypotheses

The following hypotheses have been formulated to be tested:

H_{01}: There is no significant impact of derivatives on the financial performance of NSE listed financial companies.

H_{02}: There is no impact of derivatives on the liquidity position of NSE listed financial companies.

H_{03}: There is no impact of derivatives on the price stabilization of NSE listed financial companies.

Research Methodolgy

The primary data is collected from twenty financial and fund managers through Structured Questionnaires of NSE listed Finance companies. The study has examined the impact through derivatives on the financial performance of the sample of 20 financial companies for fifteen years during the period (2005 to 2020). The secondary data has been collected from PROWESS CMIE and annual reports of companies and National Stock Exchanges (NSE) website. The sample has been drawn using Stratified Random sampling. Financial ratios and Regression have been used for the analysis of data.

Reliability and Validity

This study has used coefficient of reliability which describes internal consistency or reliability of a psychometric test score regarding study variables. The instrument has an acceptable level of reliability as Cronbach's (Cronbach, 1951) is greater than 0.70 for all the scales. Here reliability was reported above .70 and can be considered a good scale. Thus there is no need to drop any item.

Table 1: Cronbach's alpha for reliability of study variables

Independent Variables	No of Items	Cronbach'sAlpha
Financial performance	6	.73
Liquidity Position	2	.90
Risk management through derivatives	32	.84

There is positive correlation between risk management through derivatives and financial performance of financial NSE listed companies as shown in Table 2 (Financial performance R=.945, Liquidity position R=.87, Price stabilizing R=.77

Table 2: Correlation analysis of impact of derivatives on financial performance of NSE financial listed companies

Impact of Derivatives	Financial Performance Index	
Financial Performance	Pearson correlation	0.945
Index	Sig. (2-tailed)	0.00
	N	20
Liquidity position	Pearson correlation	.087
Index	Sig. (2-tailed)	.000
	N	20
Price stabilizing	Pearson correlation	.77
	Sig. (2-tailed)	000
	N	20

Correlation is significant at 0.05 level (2 tailed)

Impact of Risk Management through derivatives on financial performance of financial NSE listed companies

Table 3 : Impact of risk management through derivatives on financial performance of NSE listed companies model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.600a	.36	.336	.704

a. Predictors: (Constants), Financial performance, Liquidity position, price stabilizing

The Table 3 shows correlation of impact of derivatives through risk management on financial performance of financial NSE listed companies(R=.600).Here adjusted R square is .336 that indicates that the three independent variables namely financial performance, liquidity position , price stabilizing support in the model account for 33.6% variance in the dependent variable. Thus clearly indicates a good model fit.

ANOVA Table 4 that was generated from the data was used to show the statistical significance of the model and also for correlation analysis. Tables show that the model is statistically significant since .p<.005(sig=.000 or .001)

Regression Model

The model summary Table 3 shows the percentage of the dependent variable(Impact of derivatives through risk management on financial performance of financial NSE listed companies) that could be explained by the independent

variables. From Table -3, (36% R Square) that could be explained by independent variables, when other factors were kept constant. Coefficients Table 5 shows that all independent variables contribute positively to the dependent variable, in the first model. Moreover, the contributions are all statistically significant as the p-values are less than .05 (Sig. = .000).

Table 4: Annova of impact of big data analytics and independent variables (financial performance, liquidity position, price stabilizing)

Model	Sum of Square	Df	Mean Square	f	Siq	
Regression	3.330	9	0.370		7.742	0.033
Residual	9.97	20	0.499			
Total	13.300	29				

Dependent Variable: Impact of derivatives through risk management on the financial performance of financial NSE listed companies

Predictors: (Constant), Financial performance, Liquidity position, Price stabilizing It shows significance level of .05

Analysis and Results

Majority of respondents strongly agree that use of derivatives in risk management helps in maximizing market value of Shares (93.34%), Maximizing ROA (96.67%), managing liquidity (73.34%), and improving operational efficiency (63.33%) of their companies. All (100%) of respondents strongly agree that use of derivatives in risk management can help in maximizing ROI of their companies. On the other hand majority (63.33%) of respondents opine that there is not any effect of the practice of using derivatives for risk management on maximizing price earnings ratio of their companies.

Table 5: Coefficients table of impact of derivatives against the independent variables (Financial performance, Liquidity position, price stabilizing) Coefficients

Model	Un- Standardized Coefficients	Std Coefficients		T	Sig
	B	Std Error	Beta		
Constant	0.676			2.34	0.019
Financial performance	0.284				
Liquidity Position	0.163	0.774	0.158	2.348	0.037
Price stabilizing	0.169	0.161	0.148	2.808	0.0004

Dependent Variable: Performance of financial companies listed on NSE

Thus the Hypothesis (H_{01}) that there is no significant impact of risk management through the use of derivatives on the financial performance of financial companies listed on NSE stands to be rejected.

Liquidity can have influence on the financial performance of a company. Liquidity of the companies has been analyzed with the help of financial ratios. The current ratios of financial companies Allahabad Bank, Andhra Bank, Bank of Baroda, Bank of India, Bank of Maharashtra, Canara Bank, Indian Bank, Corporation bank, Federal bank, UCO Bank and Reliance capital Limited have higher level of current ratios as compared to conventional rule. Fluctuations can be observed in the behavior of quick ratio in the case of financial companies. All financial companies were having good liquidity except Kotak Mahindra because Kotak Mahindra was not having good liquidity position in 2020. Thus it can be concluded that use of financial derivatives can help in improving liquidity of a company.

Thus the Hypothesis (H_{02}) that there is no significant impact of risk management through the use of derivatives on liquidity position of financial companies listed on NSE stands to be rejected.

Impact of Derivatives on Price Stabilization of Securities

Volatility refers to the extent of fluctuations in the security prices. It is necessary for the derivatives market because derivatives are needed only when there is volatility in the stock prices. Volatility in the stock prices has been analyzed with the help of the study of the behavior of stock prices, standard deviation and coefficient of variation. Opinion of the respondent companies about impact of derivatives on stock price volatility was also obtained and analyzed.

Average stock prices of all companies under study do not form any discernible trend. The prices have been volatile over the years. Increase was noticed in the average stock prices of only five financial companies. Volatility in the stock prices of all companies under study do not form any discernible trend as reflected by the behavior of their standard deviation. Increase was noticed in the volatility of average stock prices of only two financial companies. Thus Stock prices of majority of the financial companies have become more stable during the period of study. Decrease in volatility of average stock prices was observed in 2020.

Therefore it can be concluded that there has been a stabilizing effect of derivatives on stock prices. Majority (96.67%) of the respondents strongly agree that volatility plays an important role in derivative market; it is expedient to use derivatives for risk management and derivatives market in India is efficient. Only (33.34%) of the respondents strongly agree that it is possible to get accurate estimate of volatility in derivative market. 66.66% of the respondents are neutral regarding the possibility to get accurate estimate of volatility in derivative market. (100%)

of respondents strongly agree that cost of hedging through derivatives is prohibitive.

Thus the Hypothesis (H_{02}) that there is no significant impact of risk management through the use of derivatives on price stabilization of securities of financial companies listed on NSE stands to be rejected.

Implications of the Study

The use of derivatives impacts the financial performance of the companies. Its use improves the financial performance and liquidity position and price stabilization. The findings of this research can help the management of the companies in the formulation of policies and practices for the management of risk through the use of derivatives.

The study did not consider the data of the period before and after 2005 to 2020 and the sample includes financial companies listed on NSE.

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The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Impact of Behavioural Intention Factors on Use Behavior of Digital Payment

BINEYDEEP SINGH AND MANJIT SINGH

Abstract: An attempt has been made to examine the impact of behavioural intention factors on digital payment methods. A sample size of 500 respondents were taken from four districts of Punjab and pre-tested structured questionnaire was administered to them and after checking the reliability of data an analysis was made. It was found that Performance expectancy and Perceived Value have a significant positive effect on behaviour of digital payment methods but perceived trust, effort expectancy, perceived risk, personal innovativeness, facilitating condition and rules & regulations have no significant positive effect on behaviour of digital payment methods. The study shows that perceived value and performance expectancy are two important factors which can be leveraged to get the benefits of digital payment methods.

Keywords: Perceived Trust, Performance Expectancy, Innovativeness, UTAUT Model, Facilitating Conditions.

Introduction

Digital payment methods are becoming popular with the customer in new cashless economy. It is expected that by 2025, digital payments are expected to grow from $ 6.6 trillion to $ 10.5 trillion by 2025. This was possible as different methods of digital payments are now available like debit card, credit card, NEFT, RTGS, UPI etc. The onset of COVID pandemic has also given push to digital payment system as people now want to move towards paperless economy particularly younger generation, who are more techno-savvy. There is growing perception that digital payments are not only safe but it is easier to use with efficiency, effectiveness, transparency, and accessibility.

Literature Review

Many studies have also been conducted highlighting the advantage of using digital payment. According to Sharma et al. (2020) and Venkatesh et al. (2012),

Bineydeep Singh is Assistant Professor, Chandigarh University, Gharuan (Punjab) and Dr. Manjit Singh is Professor & Head, University Institute of Applied Management Sciences, Punjabi University, Patiala

"major benefit is convenience because users can make payment transactions through smartphones with an Internet connection and no need to carry cash". The unified theory of acceptance and use of technology (UTAUT) model by Venkatesh et al. (2012) is a "technology acceptance model that aims to explain user intentions to use an information system and subsequent usage behavior". UTAUT model aims to determine user acceptance of new information technology, acceptance behavior of new information technology shown by users, and the effect of new information technology on most (Sivathanu, 2019). One of the factors is Performance expectancy, which is described as the extent to which an individual believes that the use of a system will help them achieve work (Patil et al., 2020; Raza et al., 2021; Venkatesh et al., 2012). Previous research has found that performance expectancy significantly influences respondents' intentions to use digital payments (Venkatesh et al., 2012). Someone will use a system if the system is able to provide benefits so that it can cause an intention to use the system or technology (Chayomchai et al., 2020; Rosnidah et al., 2019; Sivathanu, 2019). Similar observation was made by Chopdar et al., (2018), Wu et al., (2016), Sivathanu (2019) where they observed that effort expectancy affects user intentions in using digital payment. Previous research has found that social influence has a significant effect on the intention to use digital payment (Sivathanu, 2019). People will feel more accepted in their interactions when using trending technology.

Research Methodology

The combination of exploratory research and descriptive research was undertaken to achieve the stated objectives of the present study. Exploratory personal investigations involving original field interviews with the respondents will help to have a greater insight into all possible practical aspects of the research problem.

The universe of the study was all the persons who used digital payment methods in India but due to non-feasibility and time constraint, the scope of the study has been restricted to population who were using one of the digital payment methods in Punjab and Chandigarh. So, the study focused primarily in Punjab and Chandigarh. Since geographical area of Punjab comprises of three major regions, i.e., Majha, Doaba and Malwa region. One city from each region on the basis of highest population has been taken from Punjab. Therefore, the scope of the study is limited to cities of Chandigarh, Ludhiana (Malwa Region), Jalandhar (Doaba Region), Amritsar (Majha Region).

The study has been based on primary as well as secondary data. Secondary data analysis has been done to establish the needs and objectives of the study via various research papers, articles, journals and books. Primary data for the research was collected with the help of the self–administered questionnaire especially designed to achieve the study goals as outlined. To collect enough data to test the hypothesis, a survey has been conducted after a pilot study and had identified and refined measurement items used in this study.

The preliminary draft of the questionnaire was pre-tested on 60 customers of Banks. This helped in improving and finalizing the questionnaire. The respondents were asked to evaluate questions related to digital payment awareness, usage, impact of digital literacy, experience and perception of digital payment users regarding the use of various digital payment services and behavioral intention etc. Thus, in total 33 items were included under nine dimensions i.e. performance expectancy, effort expectancy, social influences, facilitating conditions, perceived value, perceived trust, personal innovativeness, perceived risk and regulatory framework to assess behavioral intention. The items were measured on the five-point likert scale and respondents were asked to rate the statements on a five-point scale.To study the awareness and usage of digital payments, the questions were asked on nine digital payment channels.

Sample Design and Sample Size

Purposive Sampling has been used to collect the data. Primary data has been collected by approaching the respondents personally and explaining in detail about the survey objectives and purpose of study. Multi stage sampling has been done to collect the data. Questionnaires have been distributed to the customers and they contacted the researcher whenever they encounter any difficulty in understanding any question of the questionnaire. Table 2 shows the number of stated and the corresponding number of customers who have participated in the study. Efforts have been made for the equal representation of the universe by way of the socio-economic status of the respondents along with the demographic variables. We used Microsoft Excel and SPSS Software Packages 21 for the analysis.

Table 1: Distribution of respondents among different cities

Cities	No. of respondents
Chandigarh	125
Ludhiana	125
Jullundur	125
Amritsar	125
Total	500

Developing the Research Instrument

The determinants of information technology (IT) acceptance, such as TRA(Theory of Reasoned Action), TPB (Theory of planned behavior), TAM (Technology acceptance Model), DIT (Theory of Diffusion of Innovation) and so on from last many decades. However, UTAUT (Unified Theory of Acceptance and use of

Technology) model was based on studies of eight prominent models in information system adoption research, which had improved theoretically and its acceptance power had achieved 70% which is empirically proved by (Venkatesh., at el 2003). So, the present study was drawn its roots from TAM. However, UTAUT as theory foundation was adopted with further modifications in reference to the nature of the research. So the proposed conceptual model is given below:

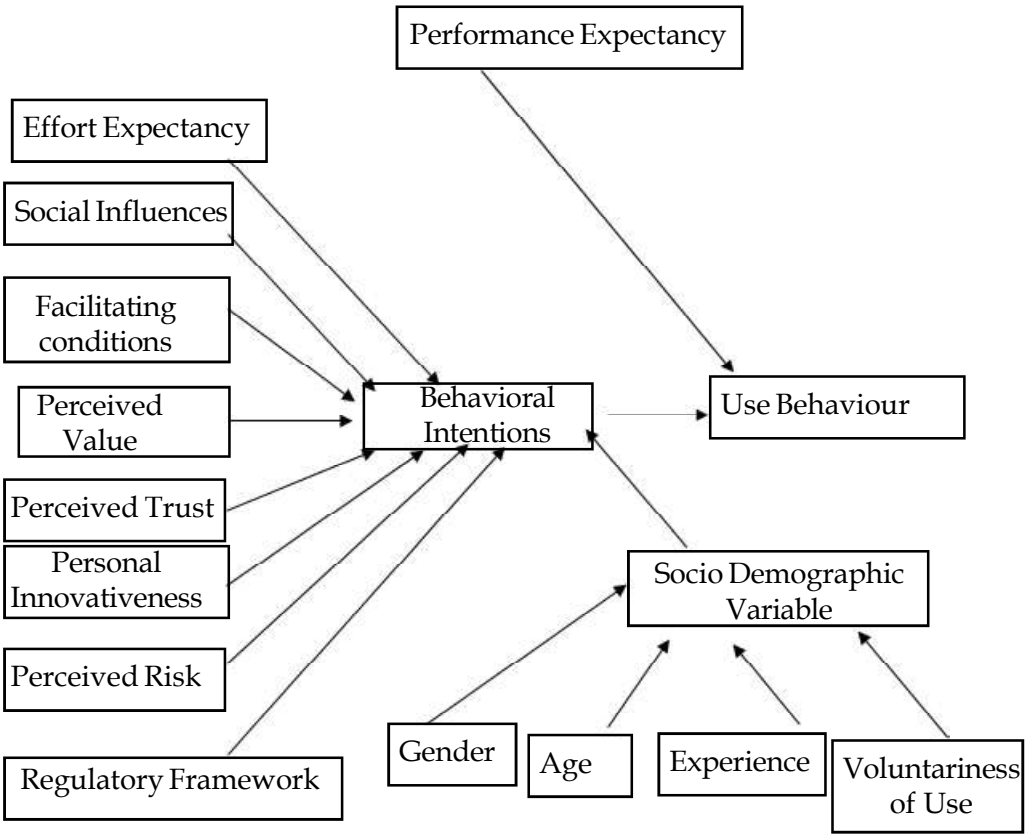

Figure 1: Conceptual model

The explanation of each variables used on the conceptual model is given below:

Performance Expectancy: Performance expectancy is defined "as the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venketesh at el 2003). As this study is particularly focused for the studying the digital payment in India so we have a combination of five factors that will help in formation of performance expectancy variable, consisting of perceived usefulness, external motivation, job fit, relative advantages and outcome expectations (Venketesh at el 2003).

Effort Expectancy: "Effort expectancy is defined as the degree of ease associated with the use of the system. Thus, this concept includes three constructs i.e., perceived ease of use, complexity and ease of use" (Venketesh at el 2003).

Social Influences: Social influence, is the degree to which an individual perceives that other's opinion is utmost important in using new system. For better understanding of the construct, we have included subjective norms (SN), social factors (SF) and image reference (IR) (Ajzen 1991; Davis et al. 1989; Fishbeina nd Azjen 1975, Venkatesh et al. 2003).

Facilitating Conditions: "Facilitating conditions refer to all the variables like technical and organizational infrastructure required to use intended system are available in the manner in which it was perceived to be used by the potential customer" (Ventetesh at el 2003). So, this construct included perceived behavioral control and compatibility (Ajzen 1991; Taylor and Todd 1995a, 1995b).

Perceived Value: "Perceived value is "the consumer's overall assessment in relation to the overall utility of a product based on his/her perceptions of what is received and what is given to him" (Zeithaml 1988). "It is difficult for the consumers to accurately assess the objective value of goods, so vis-a-vis they take decisions based upon the perceived value, i.e., the subjective evaluation of the total benefits and losses derived from the offering" (Dodds and Monroe 1985).

Perceived Risk: "Perceived risk reflects the feelings of uncertainty among consumers regarding the negative repercussions of using new technology that may deter the adoption process in the longer run" (Bauer, 1967, Featherman and Pavlou, 2003). Following constructs are included in perceived risk in this study:

Perceived Financial Risk: "Perceived financial risk refers to consumer perception about the possible monetary loss that might occur by the usage of m-payment (Biswas and Biswas, 2004)

Perceived Privacy Risk: "Privacy is another major consumer concern in digital payment adoption because private information, like phone numbers, social security numbers, pin code, consumption locations, shopping records, etc., is required in the digital payment process" (Featherman and Pavlou, 2003).

Perceived Performance Risk: "It refers to user's perception about the possibility of the digital payment system malfunctioning and not working as intended or advertised, and thus being unable to provide the desired services" (Featherman and Pavlou, 2003).

Perceived Psychological Risk: "It refers to consumer's perception of any possible psychological frustration, pressure, or anxiety resulting from the use of digital payment" (Lim, 2003).

Perceived Time Risk: "It refers to any possible time loss due to the usage of digital payment. This may result from uncertainties about the time required to learn how to operate the software, which procedures to follow when failing to pay bills, or how to delete mobile applications when their performance is below expectations" (cheng at el., 2008).

Perceived Trust: "Consumers' perceived trust in digital payment system is defined as consumers' strong conviction that e-payment transactions will be processed in accordance with their set level of expectations" (Tsiakis and Sthephanides 2005, Mallat 2007).

Personal Innovativeness: "Personal innovativeness is explained as the propensity of an individual to try out any new information systems (Chang et al, 2005). Research on individual adoption of technologies represent innovations to the targeted customers and it drives its roots from innovation diffusion process" (Al-Jabri and Sohail, 2012; Lassar et al., 2005; Laukkanen et al., 2007; Yi et al., 2006).

Regulatory Framework: "The government ought to lay down the ground rules because without regulations anything and everything goes haywire. In this research, we studied the regulatory frame work in Indian context for card schemes (banks issuing credit/debit cards and card associations like Visa and MasterCard); mobile operators , retailers (the businesses accepting payments by credit and debit cards, etc); device suppliers (smartphone and PoS (point of sale) device manufacturers) and SIM suppliers service providers delivering the m-payment and related solutions; and a growing 'overlay' category of TSMs (trusted service managers) which manages the range of contractual and technical connections between the participants that is necessary to enable digital payments to happen. "However this regulatory structuring depends on where and how each of the participants fits into the digital ecosystem" (Kemp, 2013).

Behavioral Intentions: Rooted in the Theory of Planned Behavior (TPB), perceived behavioral intentions refer to "beliefs regarding access to the resources and opportunities needed to perform a behavior, or alternatively, to the intention and external factors that may impede performance of the said behavior" (Ajzen, 1985,). With higher behavioral intention, a consumer would become more likely to use a new technology quickly.

Hypotheses

Based on the explanation, the hypotheses of this study are:

H_1: Perceived Trust has a significant positive effect on use behaviour of digital payment.

H_2: Performance expectancy has a significant positive effect on use behaviour of digital payment.

H_3: Effort expectancy has a significant positive effect on use behaviour of digital payment.

H_4: Perceived Risk has a significant positive effect on use behaviour of digital payment.

H_5: Perceived Value has a significant positive effect on use behaviour of digital payment.

H_6: Personal Innovativeness has a significant positive effect on use behaviour of digital payment.

H_7: Facilitating condition has a significant positive effect on use behaviour of digital payment.

H_8. Rules & Regulations has a significant positive effect on use behaviour of digital payment.

Reliability Analysis

Prior to the analysis of the results, the research instrument was tested for its reliability. The internal consistency of the grouping of the items was estimated by using.

Cronbach's á is defined as

$$\frac{N}{N-1}\frac{\left(\sigma^2 x-\Sigma_{i=1}^{N}\sigma_{yi}^2\right)}{\sigma^2 x}$$

Where, N is the number of components, $\sigma^2 x$ is the variance of the observed total test scores, and $\sigma^2 y$ is the variance of component i. The compound reliability coefficient (á) is shown in Table 1.

Table 2: Reliability test of perceptions of customers of banks

Sector	Number of Respondents	Number of items	Cronbach's alpha
Banks	500	36	0.842

The Table 2 reports the descriptive statistics for the measures used and internal consistency reliability for each measure. The value of Cronbach Alpha 0.842 confirms that our variables' value has good internal consistency in it.

Final Measurement Model

The final measurement model for variables behavior and use behavior is depicted in Figure 1:

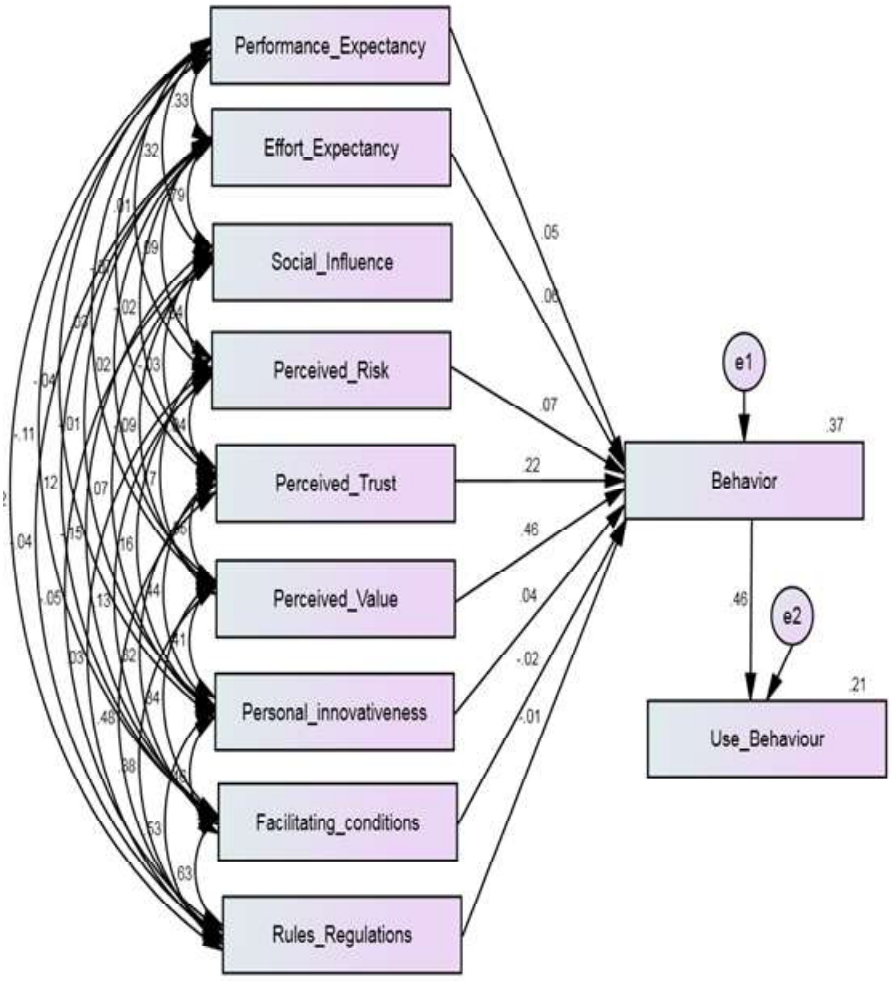

Figure 1: Consolidated model

Table 3: Standardized regression weight factor loading for variables use-behavior, behavior and its dimensions

	Standardized Estimate	Non-Standardized Estimate	S.E.	C.R.	P
Behavior <— Perceived_Trust	0.221	0.214	0.041	5.157	***
Behavior <— Performance_Expectancy	0.047	0.058	0.047	1.225	0.221
Behavior <— Effort_Expectancy	0.06	0.061	0.039	1.576	0.115
Behavior <— Perceived_Risk	0.069	0.059	0.032	1.85	0.064
Behavior <— Perceived_Value	0.463	0.51	0.045	11.271	***
Behavior <— Personal_innovativeness	0.044	0.04	0.041	0.961	0.336
Behavior <— Facilitating_conditions	-0.024	-0.021	0.041	-0.513	0.608
Behavior <— Rules_Regulations	-0.01	-0.009	0.048	-0.199	0.842
Use_Behavior <— Behavior	0.462	0.377	0.032	11.631	***

In order to assess the impact of structural paths, t-value was applied together with the significance of regression. For the path to be considered statistically significant, C.R. (t-value) have to be greater than ±1.96 at 5% significance level (or greater than ±1.65 at a 10% significance level or greater than ±2.58 at a 1% significance level). Table 1 represents the standardized and non-standardized estimates, along with standard error, critical ratios, and p-values for all the paths involved in the analysis.

As shown by the p-values in Table 3, most of the paths were found to be non-significant as their p-value is coming out to be greater than 0.05, except for the paths Behavior ← Performance Expectancy, Behavior ← Perceived Value, and Use Behavior ←Behavior. The significant results provide evidence confirming the conceptual model proposed for this study.

The R^2value for variable behavior is 0.368, signifying that 36.8% of the variance in behaviour was accounted for by the variables tested within this study. Where, R^2 value of 0.213 for variable Use_Behavior indicating the variance coverage of 21.3%.

Table 4: Total effect of variables on behavior and Use_Behavior

	FC	PI	PV	PR	EE	RR	PE	PT	Behavior
Behavior	-0.021	0.04	0.51*	0.059	0.061	-0.009	0.058	0.214*	0
Use_Behaviour	-0.008	0.015	0.192*	0.022	0.023	-0.004	0.022	0.08*	0.377*

#FC: Facilitating conditions; PI: Personal Innovativeness; PV: Perceived Value; PR: Perceived Risk; EE: Effort Expectancy; RR: Rules & Regulations; PE: Performance Expectancy; PT: Perceived Trust

The Table 4 represents the total effect of each variable on dependent variables Behavior and Use-Behavior. As shown by the table, only variables having significant effect of variable Behavior are: Perceived Value and Perceived Trust with values 0.51, 0.19, 0.21, and 0.08, respectively. On the other hand, Behaviour has total effect of 0.38 on Use-Behaviour with highly significant value.

Table 5: Direct effect of variables on Behavior and Use_Behavior

	FC	PI	PV	PR	EE	RR	PE	PT	Behavior
Behavior	-0.024	0.044	0.463*	0.069	0.06	-0.01	0.047	0.221*	0
Use_Behaviour	0	0	0	0	0	0	0	0	0.462*

#FC: Facilitating conditions; PI: Personal Innovativeness; PV: Perceived Value; PR: Perceived Risk; EE: Effort Expectancy; RR: Rules &Regulations; PE: Performance Expectancy; PT: Perceived Trust

The Table 4 represents the direct effect of each variable on dependent variables Behavior and Use-Behavior. As shown by the table, Perceived Value and Perceived Trust have significant direct effect of variable Behavior with values 0.46, and 0.22, respectively. Additionally, Behaviour has significant direct effect of 0.46 on Use-Behaviour.

Table 6: Indirect effect of variable on Use_Behavior

	FC	PI	PV	PR	EE	RR	PE	PT	Behavior
Behavior	0	0	0	0	0	0	0	0	0
Use_Behaviour	-0.011	0.02	0.214*	0.032	0.028	-0.005	0.022	0.102*	0

The Table 6 represents the indirect effect of each variable on dependent variables Behavior and Use-Behavior. As shown by the Table 7, Perceived Value and Perceived Trust have significant direct effect of variable Behavior with values 0.21, and 0.10, respectively.

Findings and Implications

After analysis, it is found that Perceived Trust has no significant positive effect on use behaviour of Digital payment methods, so first hypothesis H_1 is rejected. On the other hand it is found that Performance expectancy has a significant positive effect on use behaviour of Digital payment methods; so hypothesis H_2 has been supported. Further, it is found that Effort expectancy, Perceived Risk, Personal Innovativeness, Facilitating condition and Rules & Regulations have no significant positive effect on use behaviour of digital payment methods, So hypotheses H_3, H_4, H_6, H_7 and H_8 have been rejected. It is pertinent to mention here that Hypothesis H_5 has been supported as Perceived Value has a significant positive effect on use behaviour of digital payment methods. The study has

implications for the banking, non-banking and also for traders that perceived value and performance expectancy are two important factors which can be leveraged to get the benefits of digital payment methods.

Future Direction for Research

Research is more complex in the field of social sciences and management as compared to other areas because of dynamic, uncontrolled and uncertain environment where interrelated variables may exist. Therefore, present study is subject to a number of limitations which could be subsequently looked at as scope for further studies. Few limitations of the study are: the scope of the study has been limited to Punjab region and Chandigarh. The selected region may differ from other regions in culture, size, demographics, expectation of consumer, psychographics of consumers and their behavior. Therefore, the results of the present study may not hold good for other regions. Further, any study which is based on primary data collected through the pre designed questionnaire suffers from the basic limitation of possibility of difference between what is recorded and what is truth, no matter how carefully the interview has been conducted and questionnaire was filled. The same may be with the present study as the people may not deliberately report their true opinions due to some biasness. The limitations may be considered in future resu studies.

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The Indian Journal of Commerce
Vol. 74, No. 4, Oct-Dec., 2021

Mediating Role of Human Capital on the Relationship Between HRM Practices and Innovation: Evidence From Assam's Hotel Firms

RAJDEEP DEB

Abstract: The paper attempted to investigate the effect of human capital as a mediator on the relationship between HRM practices and innovation. A cross-sectional survey of 114 firms from hotel industry in the three major towns of Assam namely Guwahati, Silchar, and Sivasagar was employed. Moreover, a self-administered questionnaire was given to HR managers of hotels. Furthermore, in order to test the hypotheses, a hierarchical regression analysis was adopted. The results of the study indicated a significant positive linkage between three leading constructs namely HRM practices, human capital, and innovation.The findings also revealed that HRM practices affect innovation by influencing the mediating variable i.e. human capital in the context of hotel firms of Assam. In short, the findings of the study assert that an enhancement in HRM practices usher in to innovation through increase in the level of human capital.

Keywords: HRM practices, Innovation, Human capital, Hotel firms, Assam.

Introduction

It was Schumpeter who in the first half of the 20th century elucidated the world regarding the strategic significance of innovation and insisted that innovation gives impetus to growth (Schumpeter, 1942). He counted on the setting in of new technological waves and thought that it will wipe out the aged industries and restore them with new ones. To describe this process, he coined a term called 'creative destruction'. Unfortunately, Schumpeter's ideas only sporadically got mentioned in studies related to behavior of business (Wiggins &Ruefli, 2005). However, the onset of dynamic and highly aggressive operating environments in 1990s forced many academicians and researchers to pay serious and sincere attention to his perspectives (Nieves & Quintana, 2018).

Dr. Rajdeep Deb is Assistant Professor, Department of Tourism & Hospitality Management, Mizoram University, Aizawl, Mizoram.

The extant literature confers innovation as one of the most enabling components impacting organizational end result (Ottenbacher, 2007; Karakas et al., 2017; Zhang et al., 2019). It generates some kind of opportunity for market novices to penetrate the market and cement their positions (Wang & Ahmed, 2004); provides yardstick for gauging the firms' success by assessing their degree of competitiveness (Damanpour et al., 2009), and offers avenues for the firms to consolidate their growth and profitability levels (Yavuz, 2010).

A number of studies have attempted to examine how can innovation performance be obtained by human resource management (HRM) practices. Within this ambit of research, some authors established that innovation performance is vastly influenced by specific organizational practices and actions (Chand & Katou, 2007; Chang et al., 2011). On contrary to this, another group of researchers unearthed the indirect influence of these practices and actions on innovation performance (Collins & Smith, 2006; Cabello et al., 2011). The point of views of these authors is directed toward the fact that HRM practices nourish certain organizational dimensions (resource mobility and capability build up) and in turn influence innovation (Nieves & Quintana, 2018). While ratifying this school of thought, Sainaghi (2010) affirms an indirect relation between HRM practices and innovative behavior in hotel industry.

In light of aforesaid discussion, it may be commented that the relationship between these two important constructs are often ill-understood and offer disparate conclusion, pressing for further research (Laursen, 2012). The rationale behind this fluctuating behaviour may be explained by the conduct of quantitative analysis in diverse socio-economic sectors as well as in different geographical settings. So, in order to discount the affect of samples heterogeneity, the present paper pinpoints on the hotel business.

Literature Review and Hypotheses Formulation

HRM Practices and Innovation

The attention of scholars towards HRM practices has been evolving out of the fact that it has the capability to influence directly the productivity of a firm (Schuler, 1987). The past literature on the subject patronizes the indispensability of HRM towards production and growth (Edralin, 2008). Researchers tend to believe that the domain of HRM basically focuses on the functional areas such as recruitment and selection, compensation techniques, training and development, and performance appraisal which endeavours to explicate employees' innovative behavior in the organization (Kooij,2010; Veth, 2017).

The competitiveness of an organization is largely decided by innovation, which is considered to be one of the expository components to enhance company value

(Tseng & Goo, 2005). In their description of innovation in organization, Waheed et al. (2019) conceive it as a novel idea execution for product enhancement, and a novel organizational exercise or system which finds application in organizations, groups, workplaces, and operations (Mortensen, 2005). They further argue that enforcing novel ideas by the employees can very well uplift the credence among employees resulting in unadulterated organizational innovation, which may lead to enhancement of the innovation performance. Further, organizational innovation is the process through which firms try to fulfill customers' expectations and positive outcomes are consummated (Prajogo, 2006). In order to develop innovative capacity, innovation must be blended with human capital investment to enable marked change of innovative capability into productive outcomes (Martin et al., 2009).

HRM practices occupy a pre-eminent part in deciding employees' success level, development standard, skills development, behavioural growth, and competence to realize firm's innovation (Chen, 2009; Donate,2015), which ultimately does a world of good for innovation performance (Xing, 1997; Donate,2015).Additionally, strong views are presented in support of indirect influence of HRM practices on innovation(Lo´pez-Cabrales et al., 2009). A number of researches have attempted to probe into the relationship between HRM practices and innovation in the context of hotel industry (Chang et al., 2011,Slatten & Mehmetoglu, 2011). Likewise, another group of authors have highlighted the worth of human capital in enabling innovation performance in organizations belonging to hotel industry (Orfila-Sintes et al., 2005; Ottenbacher et al., 2006; Dwyer & Edwards, 2009).

Thus, innovations at organizations are treated to be highly significant to erect strong technological capabilities, competitive advantage, and new engineered products.

H_1: HRM practices have positive influence on innovation

Mediating Role of Human Capital

The term human capital presents the 'set of knowledge, skills, and abilities that are embedded in the firm's human resources (Lado & Wilson, 1994, as cited in Nieves & Quintana, 2018, p.75) that fetch economic worth to an organization (Jalal, et al, 2011). For Carson et al. (2004), human capital encompasses implicit knowledge and communication abilities, entrepreneurial mindset and other idiosyncratic traits such as behavioural dispositions and bent for lifelong learning.

Some studies have directed towards a direct influence of HRM practices on innovation (Foss& Laursen, 2003; Beugelsdijk, 2008; Chang et al., 2011), while another group asserts that no direct influence is exerted by HRM practices on innovation and instead these practices stimulate other organizational dimensions

thus, effecting innovation performance (Nieves & Quintana, 2018). In this sense, Lo´pez-Cabrales et al. (2009) claim that HRM practices lead to improvement in human capital, which in turn shows positive influence on innovative behavior (Cabello et al., 2011). Ozbag et al. (2013) highlighted the mediating role of knowledge management capability between HRM capabilities and innovation (Chen & Huang, 2009).

It seems that both HRM practices and innovation have solid connection with human capital thus HRM practitioners have to play significant roles in elevating the level of human capital in organizations (Gibb & Waight, 2005). In fact, it has been drawn by a number of researchers that HRM practices directly influence firm-specific assets (Mukherjee et al., 2011), which is critical for creation of novel ones (innovation) and thus triggering sustainable competitive advantage (Lado & Wilson, 1994;Iqbal et al, 2010).Particularly, HRM practices can add to firm capability by putting weight behind human capital (Bowen & Stroff, 2004; Takeuchi et al., 2007). Taking cue, Jiang et al. (2012) assert that higher the caliber of human capital in organizations, higher is the chances of accomplishing innovation performance. Based on the aforesaid literature, the following hypothesis has been put forth:

H_2: Human capital mediates the relationship between HRM practices and innovation

Methodology

The current study is mainly a cross-sectional survey undertaken with the aid of self-administered questionnaires. The major towns of Assam namely Guwahati, Silchar, and Sivasagar were chosen because most of the hotels are located in these areas as they are tourist places. A total of 150 hotels were conveniently selected and as many questionnaires were given out to the organizations (only one questionnaire was assigned to each hotel). The HR managers were requested to fill out the questionnaire as they were perceived to have better understanding of their organization's planning and policies. To enhance the response rate, hard copy approach to gather data was adopted since mail questionnaire technique often limits the scope of response. A total number of 119 filled up questionnaires were received. After screening, 5 questionnaires were rejected due to incompleteness, so finally the total number of usable responses was down to 114.

The study was intended to measure three leading constructs namely HRM practices, innovation, and human capital. In order to examine the hypotheses developed for the study, linear regression analysis was done.The measures of these three constructs were extracted from the past applied and well-validated scales. HRM practices were quantified as the independent variable by8 items (á

= 0.832) as developed by Waheed et al. (2019), innovation as the dependent variable was measured by using 6 items (á = 0.720) as developed by Waheed et al. (2019), and human capital was measured using 5 items (á = 0.717) operationalized by Nieves & Quintana (2018). All these constructs were gauged on a seven-point Likert scale ranging from 1= strongly disagree to 7= strongly agree. The tool to collect data was discussed informally with the professionals from the industry to minimize ambiguity and impreciseness as well as to augment questionnaire's readability and relevance.

Results and Discussion

Table 1 displays the correlations and descriptive statistics for each variable. The type of hotels were found to be positively and significantly related to HRM practices ($r = 0.16$, $p<0.05$), human capital ($r = 0.353$, $p<0.01$), and innovation ($r = 0.287$, $p<0.05$). This suggests that type of hotels affects HRM practices, innovation, and human capital. Also, these three constructs were found to be positively and significantly linked to each other.

Table 1: Descriptive statistics &correlations

	Variables	1	2	3	4	5
1	Age of hotels					
2	Type of hotels	.127				
3	HRM practices	-.104	.160*			
4	Human capital	.33	.353**	.655**		
5	Innovation	-.256	.287*	.693**	.547**	
	Mean	17.57	24.91	3.64	3.48	3.62
	S.D.	11.05	13.05	1.32	1.29	1.28

Note: N=114 for all the variables. $^{**}p< 0.01$; $^{*}p< 0.05$.

Table 2 presents the results of hierarchical regression analysis of the relationship between HRM practices and human capital. After controlling for age and type of hotels, evidence was found positive and significant relationship between HRM practices and human capital. Furthermore, the predictor variable i.e. HRM practices account for nearly 43% of variance in the dependent variable i.e. human capital.

The results obtained through hierarchical regression analysis of the effects of HRM practices and human capital on innovation is displayed in Table 3. Model 3 comprises control variables only. Model 4 indicates that HRM practices are significantly related to innovation (â=0.26, $p < 0.01$). Therefore, there exists an empirical support for hypothesis 1 and hence it is supported. Similarly, model 5

presents the significant effect of human capital on innovation (â=0.31, p < 0.001). Finally, model 6 involves all the variables and pursues their effects on the dependent variable i.e., innovation.

Table 2: Hierarchical regression results of human capital

Predictors	Human capital	
	Model 1 Std. β	Model 2 Std. β
Age of Hotels	-0.29	- 0.14
Type of Hotels	0.47***	0.21**
HRM Practices		0.38*
Adjusted R^2	0.06	0.49
F-value	4.91*	12.76***

Note: N=114 for all variables. ***p < 0.001; **p < 0.01; *p < 0.05.

Table 3: Hierarchical regression results of the relationship between HRM practices and innovation mediated by human capital

Predictors	Innovation			
	Model 3 Std. β	Model Std. β	4Model 5 Std. β	Model 6 Std. β
Age of Hotels	-0.249	0.11	0.10	0.07
Type of Hotels	0.317***	0.09	0.08	0.05
HRM Practices		0.26**		0.32**
Human Capital			0.31***	0.17*
Adjusted R^2	0.08	0.51	0.39	0.46
F-value	4.21*	18.67***	16.91***	15.39***

Note: N=114 for all variables. ***p < 0.001; **p < 0.01; *p < 0.05.

However, the current paper considers Nieves & Quintana (2018) method of studying the mediating role of human capital on the relationship between HRM practices and innovation. The first step is to see whether there exists a significant relation between HRM practices and innovation. Model 4 in Table 3 endorses this relationship. Similarly, the second step involves evaluating the effect of HRM practices on human capital. Focusing on Model 2 in Table 2, a positive and significant relationship between them is found. The third step consists of probing the relation between human capital and innovation. After analysis, a positive and significant relation was found (model 5 in Table 3). Finally, the last step calls for the inclusion of the mediating variable (human capital) in the models to

assess whether it marginalizes the influence of HRM practices to non-significance. However, the entry of the mediating variable in the model does not make the relation between HRM practices and innovation non-significant. Hence, it is proven that HRM practices affect innovation by influencing the mediating variable. Therefore, hypothesis 2 is supported.

Conclusion

The present paper provides an empirical support to the mediating role of human capital on the relationship between HRM practices and innovation in the context of hotel firms of Assam. The findings display that an enhancement in HRM practices usher in to innovation through increase in the level of human capital in the context of hotel sector in Assam. Recently, innovation has managed to attract some sort of attention from academics and practitioners, but only limited studies have perused the mediating effect of human capital on the association between HRM practices and innovation. Therefore, the empirical outcomes of the research fill the research gap in the extant literature.

Similar to all studies, the present study also suffers from few limitations. Firstly, HRM practices encompass various aspects and are rarely possible to undertake research with every dimension at one go. Hence, the study focuses on some specific practices of HRM. Secondly, innovation not being a homogeneous process makes the situation more complex (Ozbag et al., 2013). Future study on the same topic may very well take into account the nature of innovation. Furthermore, inability to generalize its conclusions is a major limitation of the study. This is because, the hospitality sector comprises cluster of firms with different set of attributes, making it hard to generalize the acquired results.

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On behalf of Indian Commerce Association