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Pandemic Effects on the Asian Emerging Markets and the Korean Stock Market

DHAREN KUMAR PANDEY, VINEETA KUMARI AND VARUN KUMAR RAI

Abstract: With the daily log-returns of 17 indices and 48 stocks, we examine the global pandemic's impact on the Asian emerging markets, the Korean stock market, and the KOSPI50 constituent stocks. The study uses the standard event methodology and Spearman's correlation. We also use the simple measure of volatility. Covid-19 had negative impacts on the Asian emerging markets except the Chinese and the Taiwanese market. The Korean stock indices, too, experienced significant negative abnormal returns. The individual stocks' analysis shows that the stock returns have been hit hard by the global pandemic. While the stock indices reaction in a few nations are significantly correlated, those in China, Taiwan, and Malaysia are different. The mean cumulative returns for China and Malaysia are also positive. Although the event has had significance on returns, the overall volatility in the Korean stock indices was insignificant. This study is an addition to the event study literature and provides a basis for future research using a simple measure of volatility regressed through the market model. It is different from others in terms that it examines the impact of the global pandemic in a three-tier deductive approach by first analyzing a lot of Asian emerging markets, then the Korean stock indices, and finally, the stock level abnormal returns.

Keywords: Global pandemic, event study, abnormal returns, market model, Asian emerging markets, Korean stock market.

Introduction

The novel coronavirus outbreak was declared the 'global pandemic' by the World Health Organisation (WHO) on 11 March 2020. Although the WHO already alarmed the world by its announcement on 30 January 2020, the financial markets worldwide experienced a sudden fall in their indices around the 'global pandemic' announcement. It was after this date when most of the nations introduced restrictions, including social distancing and lockdowns. Stock market reactions

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to epidemic outbreaks are not new.However, the reactions to this pandemic have been the worst. Stock market reactions are due to the pandemic and the associated mortalities (Correia et al., 2020).Literature evidenced the stock market adverse reactions to the previous epidemics (for example, Chen et al., 2009; Chen, Jang, et al, 2007) and the current global pandemic (for example, Baker et al., 2020; Pandey and Kumari, 2021a; Takyi and Bentum-Ennin, 2020). Although, somestudies have focused on the Korean stock market, they seldom use event study method. This study aims to fill this regional as well as methodological gap. This study is different from others in terms that it tries to examine the impact of the global pandemic in a three-tier deductive approach by first analyzing a lot of Asian emerging markets, then the Korean stock indices, and finally, the stock level abnormal returns. It is an addition to the event study literature and provides a basis for future research using a simple measure of volatility regressed through the market model.

Review of Literature

The Impacts of Epidemics on Global Stock Markets

Stock markets are not immune to uncertain shocks, so it has been during the Covid-19 and other previous pandemics. Researchers worldwide have found evidence of the abnormal performance of the global stock markets employing different research methodologies. For example, Baker et al. (2020),using the text-based method, found that previous pandemics had mild impacts on the US markets, but the Covid-19 impacts are intense. Pandey and Kumari (2021a),employing the event study method with a market model estimation on 49 global indices, found that the developed markets were hit hard compared to the emerging markets. They, too, found a significant impact on the Asian stock markets and no significant impact on the American stock markets.Belaid et al. (2020),using the spill-over and causality approach on 22 emerging and developed nations, found that the emerging markets have been badly impacted due to the pandemic effects in the European financial markets. Khatatbeh et al. (2020),in their event study, found significant negative impacts of the pandemic on global stock markets during the announcement of the first confirmed case and more substantial as it was declared a global pandemic.Pandey and Kumari (2021b)used the event study method to find that markets reacted differently to different events. They found evidence for different market reactionsto the news ofthe first Covid-19 cases detected and a similar reaction to the news of the first Covid-19 deaths. It is obvious from the literature that emerging and developed markets, although negatively impacted, have not been impacted with the same intensity.

The Impacts of Epidemics on Regional Stock Markets

Apart from global markets, few studies have also focused on specific regions. Previous pandemic studies have found significant and negative impacts on regional stock markets (as in Chen et al., 2009; Chen, Jang, et al, 2007); however, positive impacts on biotech stocks (in Chen et al., 2009).Takyi and Bentum-Ennin (2020) employed the Bayesian structural time series approach to examine the short-term impacts of Covid-19 on 13 African countries and found that eight countries were negatively impacted while five countries, although not significantly impacted, experienced negative returns.In their event study, Alam, Wei, and Wahid (2020) found a mix of positive and negative significant abnormal returns from stocks of several sectors in the Australian stock market.Pandey and Kumari (2020a & 2020b), conducting an event study on the Indian stock market, found that the outbreak has negatively and significantly impacted the pharmaceutical and the hospitality and tourism sector stock returns. Adenomon, Maijamaa, and John (2020) found the pandemic's negative impacts on the Nigerian stock market using the GARCH models. He et al. (2020) examined the direct and spill-over effect of COVID-19 on stock markets in eight countries, including South Korea, to find that the pandemic has a short-term negative impact on stock markets; these impacts have bidirectional spill-over effects between Asian countries and European and American countries.Anh and Gan (2020) employed the panel data regression model on 723 listed stocks to conclude that the daily increasing numbers of Covid-19 cases adversely impacted the Vietnamese stock market.Yilmazkuday (2020) employed the structural vector autoregressive (SVAR) model to find that cumulative increase in the number of cases in the United Statesled to a cumulative decline in the US S&P 500 index.Liu et al. (2020), examining the short-term impact of the outbreak using the event study method on 21 leading stock market indices in eight nations, including Korea, found that Asian countries have experienced more negative abnormal returns than others. They found that since the first confirmed case in Korea, the mean returns of indices fell by 115 percent.Korea is among the nations which confirmed their first human transmission in January 2020. On 13 March 2020, the Korean stock market fell by 20 percent just after two days of the global pandemic declaration (Kim, 2020).Malini (2020) examined the stock return behaviour in six nations to find that the market reaction was different for different nations. She also found that the South Korea markets, along with the US market, has been the fastest responding.

Research Questions and Hypotheses

After the review of literature we head towards few research questions: "Did the Covid-19 similarly impacted the Korean stock market as the Asian emerging markets?","Did KOSPI50 constituent stocks reacted in the same way as the KOSPI50 index?" and "How Asian emerging markets are related to each other?".

To find answers to these questions, we need to analyze the Asian emerging market indices, the Korean stock indices, and the KOSPI50 constituent stocks separately. We aim to study the relation between the global pandemic, the Asian emerging markets, and the Korean stock market to determine the degree of impact of the pandemic to the Asian emerging markets with special emphasis on the Korean stock market. Hence, we move to the formation and testing of the following hypotheses:

H_{01}: "The Asian emerging markets have experienced no significant abnormal returns during the event window."

H_{02}: "The Korean stock indices have experienced no significant abnormal returns during the event window."

H_{03}: "The KOSPI50 constituent stocks have experienced no significant abnormal returns during the event window."

H_{04}: "The Asian emerging markets and the Korean stock market were impacted similarly by the global pandemic."

H_{05}: "There exists no correlation between the Asian emerging markets."

H_{06}: "The Korean stock indices have experienced no significant abnormal volatilities during the event window."

Data and Methodology

Data

The study has been divided into three parts. The first part analyses the Covid-19 impacts on Asian emerging markets (Panel A), the second part examines the Covid-19 impacts on the Korean stock indices (Panel B), and the third part examines the Covid-19 impacts on the KOSPI50 constituent stocks (Panel C). The first and second part examines 4338 observations of daily returns calculated from the daily closing prices of 17 sample indices and one benchmark index for the period from 22 May 2019 to 23 April 2020. Since the study aims to examine the Covid-19 impacts on the Asian emerging markets, we collected the data of standard (large + mid-cap) Morgan Stanley Capital International (MSCI) indices for China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, and Thailand from the MSCI database. The study further aims to concentrate on the Korean stock market. Hence, the data of the Korean stock indices, viz., KOSPI, KOSPI200, KOSPI200 Leveraged, KOSPI50, KOSPI Large sized, KOSPI100, KRX100, and KOSPI200-IT has been collected from www.investing.com. Hence, this led to two sets of data comprising nine Asian emerging markets indices (the first part) and eight Korean stock market indices (the second part). The descriptive statistics and the index specific estimation-period characteristics are depicted in Table Ia.

Table Ia: Sample description (Panel A and Panel B)

Sample Indices (N=17)	Descriptive statistics of Abnormal Returns					Estimation period characteristics		
	Mean	S.D.	Kurt	Skew	n	S.D.	α	β
China	0.01	0.27	0.44	-0.19	241	0.26	0.01	0.65
India	-0.08	0.73	19.77	-1.82	241	0.39	0.03	0.37
Indonesia	-0.07	0.92	15.70	0.57	241	0.41	0.02	0.34
Korea	-0.02	0.71	9.17	-0.13	241	0.42	0.01	0.44
Malaysia	-0.05	0.36	19.54	-1.53	241	0.21	0.03	0.81
Pakistan	-0.07	0.89	3.45	-1.02	241	0.67	0.02	0.08
Philippines	-0.08	0.78	17.51	-2.38	241	0.41	0.03	0.35
Taiwan	0.03	0.40	9.72	-0.93	241	0.28	-0.01	0.59
Thailand	-0.08	0.65	12.09	-1.54	241	0.30	0.04	0.49
KOSPI	-0.02	0.70	8.56	-0.11	241	0.37	0.01	0.68
KOSPI200	-0.02	0.71	7.62	0.07	241	0.39	0.00	0.63
KOSPI200 Leveraged	-0.03	1.09	7.62	0.06	241	0.59	0.00	0.42
KOSPI50	-0.01	0.71	7.35	0.18	241	0.40	-0.01	0.60
KOSPI Large sized	-0.02	0.70	7.76	0.11	241	0.38	0.00	0.65
KOSPI100	-0.02	0.71	7.40	0.11	241	0.39	0.00	0.62
KRX100	-0.02	0.71	7.80	0.11	241	0.39	0.00	0.64
KOSPI200-IT	-0.01	0.85	7.01	0.21	241	0.51	-0.01	0.43

The data for the third part of the study contains 13279 observations of daily returns calculated from the daily closing prices of 48 sample stocks and one benchmark index for the period from 21 March 2019 to 23 April 2020. The initial sample included 50 constituent stocks of the KOSPI50. However, the data for S. K. Biopharmaceuticals Co. Ltd. and Big Hit Entertainment Co. Ltd. was not available for the period of study, so the final sample was limited to 48 stocks. The data has been collected from www.investing.com. The descriptive statistics and the firm-specific estimation-period characteristics are depicted in Table-Ib.

Table Ib: Sample description (Panel C)

Sample Stocks (N=48)	Descriptive statistics of Abnormal Returns					Estimation period characteristics		
	Mean	S.D.	Kurt	Skew	n	S.D.	α	®
KBFinancial	-0.0007	0.009	12.88	0.77	271	0.01	0.0002	0.35
KT	-0.0005	0.005	10.80	-0.47	271	0.00	0.0002	0.26
KT&G	-0.0007	0.006	6.65	-0.47	271	0.00	0.0002	0.20
LG Corp	-0.0005	0.008	8.63	1.20	271	0.00	0.0002	0.36
LG Display	-0.0013	0.012	5.39	-0.06	271	0.01	0.0003	0.18
LGH&H	-0.0002	0.008	2.42	0.16	271	0.01	0.0002	0.19
LG UPLUS	-0.0004	0.008	4.53	-0.27	271	0.01	0.0002	0.08
LG Electronics	-0.0008	0.008	6.59	-0.52	271	0.01	0.0002	0.24
LG Chem	-0.0002	0.011	14.65	-0.60	271	0.01	0.0002	0.24
NAVER	0.0006	0.009	3.07	0.69	271	0.01	0.0001	0.18
POSCO	-0.0009	0.007	5.88	0.75	271	0.01	0.0003	0.39
S Oil	-0.0007	0.011	14.35	1.20	271	0.01	0.0003	0.23
SK	-0.0009	0.012	15.84	1.06	271	0.01	0.0003	0.24
SK Innovation	-0.0015	0.013	19.88	0.85	271	0.01	0.0004	0.28
SK Telecom	-0.0004	0.006	11.20	-1.20	271	0.00	0.0002	0.13
SK Hynix	0.0003	0.009	2.10	0.31	271	0.01	0.0000	0.31
Kangwonland	-0.0007	0.009	7.38	0.61	271	0.01	0.0002	0.19
Korzinc	-0.0005	0.008	10.02	0.75	271	0.01	0.0003	0.26
Kia Corp	-0.0004	0.010	4.97	-0.85	271	0.01	0.0001	0.15
IBK	-0.0015	0.008	11.51	-0.60	271	0.00	0.0004	0.37
Netmarble	-0.0006	0.010	2.97	-0.32	271	0.01	0.0002	0.12
Lotte Chemicalcorp	-0.0008	0.012	16.64	1.22	271	0.01	0.0004	0.25
Samsung SDI Co. Ltd	0.0005	0.012	11.63	-0.40	271	0.01	0.0000	0.22
Samsung C&T	-0.0003	0.008	4.03	0.18	271	0.01	0.0002	0.34
Samsung Biologics	0.0008	0.012	6.04	1.16	271	0.01	0.0001	0.10
Samsung Life	-0.0013	0.009	17.60	1.26	271	0.00	0.0004	0.46
Samsung SDS	-0.0008	0.007	3.37	-0.46	271	0.01	0.0003	0.37
Samsung	0.0001	0.010	3.36	0.05	271	0.01	0.0000	0.26

Contd...

ElecMech								
Samsung Elec	0.0004	0.005	1.37	0.11	271	0.00	-0.0002	0.57
Samsung F&M Ins	-0.0011	0.009	9.02	0.78	271	0.01	0.0003	0.19
Celtrion	0.0000	0.013	12.84	1.11	271	0.01	0.0002	0.15
SinhanGroup	-0.0010	0.008	10.39	0.17	271	0.00	0.0002	0.35
AmoreG	-0.0005	0.013	4.45	0.14	271	0.01	0.0002	0.10
AmorePacific	-0.0004	0.012	2.32	0.39	271	0.01	0.0002	0.12
NCsoft	0.0005	0.009	4.21	0.83	271	0.01	0.0001	0.14
Woori FinancialGr	-0.0012	0.010	7.72	-0.09	271	0.01	0.0002	-0.01
Emart	-0.0011	0.009	2.20	0.38	271	0.01	0.0003	0.17
Kakao	0.0010	0.009	3.50	0.43	271	0.01	0.0000	0.16
COWAY	-0.0009	0.011	14.45	-1.88	271	0.01	0.0002	0.10
HanaFinancialGr	-0.0010	0.009	9.24	-1.04	271	0.01	0.0002	0.29
KEPCO	-0.0008	0.008	2.52	0.01	271	0.01	0.0002	0.14
KSOE	-0.0010	0.012	7.48	-0.41	271	0.01	0.0002	0.22
Hankook Tyre&Tech	-0.0015	0.010	5.06	-0.68	271	0.01	0.0004	0.24
Hanon Systems	-0.0006	0.009	6.89	-0.94	271	0.01	0.0002	0.15
Hyundai Eng&Cons	-0.0009	0.012	7.79	-0.79	271	0.01	0.0003	0.21
HyundaiGlovis	-0.0005	0.010	4.86	0.14	271	0.01	0.0001	0.17
Hyundai Mobis	-0.0004	0.009	10.31	0.90	271	0.01	0.0001	0.27
HyundaiMotors	-0.0006	0.009	9.99	-0.41	271	0.01	0.0001	0.24

Methodology

We use the Ordinary Least Squares (OLS) market modelfor estimating the normal returnsemploying the standard event study methodology (Brown & Warner, 1980 & 1985). The event date (t) is when the novel coronavirus outbreak was declared a 'Global Pandemic' by the WHO, i.e., 11 March 2020. For the first and second part, a 180-day estimation period and a 61-day event window, while for the third part, a 210-day estimation period and a 61-day event window, have been used. Although the available literature suggests several models for estimating normal returns, the OLS market model is the most used, along with the Fama-French three-factor model. In Brown and Warner (1980 & 1985) and MacKinlay (1997),we find that the results generated by different models are

similar. The positive thing is that the market model used in this study does not impose any restrictions and that, too, without affecting the results. Hence, we do not employ the three-factor model and proceed with the market model.

The abnormal returnsof the index'i', on day 't', using the market modelis calculatedas follows:

$$MMAR_{it} = \mathrm{LR}_{it} - \alpha - \beta \mathrm{R}_{\mathrm{mt}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.1$$

where $\mathrm{LR}_{it}$is the daily log return for the stock 'i';á&â are intercept and slope coefficients of the OLS regression model; and, R_{mt} is the rate of return on the benchmark index (MSCI Emerging Markets Index) on day t.

Now with the available daily abnormal returns (AR_{it}) for each of the sample indices, theaggregated daily abnormal returns for the 61 days event windowis calculated and divided by the sample size (**N**) to arrive at the average abnormal return (AAR_t) as follows:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.02$$

Further, for the shorter event windows, we calculate the AAR as follows:

$$AAR_{p,q} = \frac{1}{n}\sum_{i=1}^{N} AAR_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.03$$

where $\mathrm{AAR}_{p,q}$ is the average abnormal return for the window period p,q; and **n** is the number of days in the window period p,q

The cumulative AAR figures in a window period result in cumulative average abnormal return (CAAR) for that window period. We also analyze the cumulative abnormal returns (CARs) of the individual indices, which are calculated by cumulating the ARs for the number of days in the event window. For example, to calculate the 4-day CARs, we cumulate the ARs for day t to t+3.

Testing the significance

To test the significance of the calculated ARs, CARs, AARs, and CAARs and to accept or reject the null hypothesis discussed in section 3, we calculate the t-statistics as follows:

$$AR_t\ t = \frac{AR_t}{\sigma_{n,e}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.04$$

$$CAR_t\ t = \frac{CAAR_t}{\sigma_{n,e}\sqrt{N_{t+1}}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.05$$

$$AAR_t\ t = \frac{AAR_t}{\sigma_{N,e}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.06$$

$$CAAR_t\ t = \frac{CAAR_t}{\sigma_{N,e}\sqrt{N_{t+1}}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.07$$

where,$\sigma_{n,e}$is the standard deviation of the estimation period ARs for that particular index, $\sigma_{N,e} = \sqrt{\frac{\sum_{i=1}^{N}\sigma_{i,e}^2}{N^2}}$, is the aggregated estimation period standard deviation, $\sigma_{i,e}^2$is the estimation-period variance for each of the stocks; and, N_{t+1} is the absolute value of event day t plus 1.

The t-statistics, as obtained from the above calculations, are tested for significance. Positive and significant abnormal returns infer that the market reacted positively. We have tested the significance of CAARs for long and shorter event windows (as in Mackinlay, 1997; Pandey and Jaiswal, 2017; Pandey and Kumari, 2021a). The critical t-values for thetwo sample sizes are reflected in Table-II.

Table 2: Critical t-values for the two sample sizes

Sample	df	Range of critical value	
		1% significance level	5% significance level
Asian emerging markets	8	-3.36 to +3.36	-2.31 to +2.31
Korean Stock market	7	-3.50 to +3.50	-2.36 to +2.36
KOSPI50 Constituents	47	-2.68 to +2.68	-2.01 to +2.01

Finally, we calculate the Spearman's correlation between the event-window abnormal returns of the different indices in the Asian emerging markets to find any correlation between them. At a degree of freedom of 59 and alpha of 0.01, the null hypothesis will be rejected if the correlation coefficient between the two indices is more than 0.327. For an alpha of 0.05, the critical correlation value is 0.252.

Abnormal Volatility of the Korean Stock Indices

As we tested the significance of the AARs and CAARs, similarly, we use the actual volatility of the Korean stock indices as the independent variable for

calculating the AVs (as in eq.10). We calculate the actual volatility as the first logarithmic difference between the intraday high and low values, as in Floros, (2009) (as in eq.8 & 9). The difference between the actual volatility and the estimated volatility is the AV that will be tested for significance (eq.6).

$$V_{it} = Ln(H_{it}) - Ln(L_{it}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.8$$

$$V_{mt} = Ln(H_{mt}) - Ln(L_{mt}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.9$$

$$EV_{it} = \alpha + \beta . V_{mt} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.10$$

$$AV_{it} = V_{it} - EV_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots eq.11$$

Where, $V_{it}$is the simple measure of the volatility of the stock i on day t; V_{mt} is the simple measure of the volatility of the benchmark index (MSCI Emerging Markets Index) on day t; H_{it} and L_{it} are the high and low figures of the stock i on day t; H_{mt} and L_{mt} are the high and low figures of the market index (MSCI Emerging Markets Index) on day t; EV_{it} is the estimated volatility of stock i on day t; á&â is the intercept and slope coefficients of the OLS regression model; and, AV_{it} is the abnormal volatility of the stock i on day t.

Thereafter, the average abnormal volatility (AAV) and Cumulative average abnormal volatility (CAAV) and the test-statistics for the same is calculated following the equations 02, 03, 06 and 07.

Data Analysis and Interpretation

This section contains the data analysis and interpretation of results. It has been divided into four parts, viz., analysis of the nine Asian emerging markets indices, analysis of the eight Korean stock indices regressed with the MSCI emerging markets index, analysis of the 48 constituent stocks of KOSPI50, and the analysis of how the nine Asian emerging market indices are interrelated to each other. The comparison of the findings with pertinent literature goes in line with the discussion in each part.

Covid-19 and the Asian Emerging Markets

The mean abnormal returns for the sample indices (in Table1a) reflect positive figures only for China and Taiwan, the two nations that have successfully contained the coronavirus's spread. It indicates that the nations who were successful in the early containment of the disease have led to stability in their stock market returns.

Table 3: Country-wise event day abnormal returns and shorter window cumulative abnormal returns

Asian Emerging Markets	SD	Event Day AR	CAR (0,+3)	t-value	CAR (0,+7)	t-value	CAR (0,+10)	t-value
China	0.26	-0.15	-1.06	-2.02	-0.28	-0.37	0.57	0.66
India	0.39	0.48	-3.51	-4.54[a]	-5.34	-4.89[a]	-8.75	-6.83[a]
Indonesia	0.41	-0.33	-4.83	-5.90[a]	-13.96	-12.04[a]	-20.42	-15.02[a]
Korea	0.42	-0.92[a]	-3.88	-4.63[a]	-7.67	-6.46[a]	-4.08	-2.94[a]
Malaysia	0.21	1.07[a]	-0.68	-1.60	0.43	0.73	-0.30	-0.43
Pakistan	0.67	0.35	-4.65	-3.47[a]	-8.51	-4.49[a]	-15.55	-6.99[a]
Philippines	0.41	0.43	-6.04	-7.45[a]	-10.45	-9.11[a]	-9.07	-6.74[a]
Taiwan	0.28	-0.09	-1.45	-2.58[b]	-2.51	-3.16[a]	-1.95	-2.09[b]
Thailand	0.30	-0.30	-5.93	-9.73[a]	-2.04	-2.36[b]	-4.61	-4.56[a]

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

Table-3 presents the event day ARs and the 4-day, 8-day, and 11-day CARs for individual countries. We find only two countries with significant ARs on the event day. While Korea experienced a significant negative AR on the event day, Malaysia had a significant positive AR on the event day. Further, the CARs for shorter durations, including the event day, have been tested for significance. The 4-day CARs are negative for all the sample nations but significant only for India, Indonesia, Korea, Pakistan, Philippines, Taiwan, and Thailand.Similarly, the 8-day and 11-day CARs are negative and significant for these nations only. The CARs of China and Malaysia are negative but not significant. Covid-19 impacts are not noticed for these nations.

Table 4: Test statistics for event window period AARs and CAARs of the Asian emerging markets

Days	AAR_t	Decision	$CAAR_t$	Days	AAR_t	Decision	$CAAR_t$
t-30	-0.14	accept	-0.03	t	0.47	accept	-34.14[a]
t-29	-2.82[b]	reject	-0.54	t+1	-12.19[a]	reject	-32.76[a]
t-28	-2.80[b]	reject	-1.07	t+2	-2.93[b]	reject	-28.44[a]
t-27	-4.10[a]	reject	-1.86	t+3	-12.49[a]	reject	-30.88[a]
t-26	3.07[b]	reject	-1.31	t+4	-9.05[a]	reject	-31.67[a]
t-25	1.46	accept	-1.05	t+5	-3.32[b]	reject	-30.26[a]
t-24	2.06	accept	-0.65	t+6	-14.86[a]	reject	-33.64[a]
t-23	-1.09	accept	-0.89	t+7	11.75[a]	reject	-27.31[a]
t-22	-1.40	accept	-1.20	t+8	-13.16[a]	reject	-30.13[a]

Contd...

t-21	-0.51	accept	-1.34	t+9	-1.54	accept	-29.07[a]
t-20	0.68	accept	-1.22	t+10	2.97[b]	reject	-26.83[a]
t-19	-0.28	accept	-1.31	t+11	7.96[a]	reject	-23.39[a]
t-18	-0.48	accept	-1.45	t+12	5.14[a]	reject	-21.04[a]
t-17	-0.15	accept	-1.53	t+13	-5.89[a]	reject	-21.85[a]
t-16	-0.59	accept	-1.72	t+14	5.83[a]	reject	-19.60[a]
t-15	0.80	accept	-1.57	t+15	-3.00[b]	reject	-19.73[a]
t-14	-1.07	accept	-1.90	t+16	2.43[b]	reject	-18.55[a]
t-13	-2.23	accept	-2.56[b]	t+17	1.20	accept	-17.75[a]
t-12	-6.16[a]	reject	-4.37[a]	t+18	1.33	accept	-16.97[a]
t-11	0.29	accept	-4.46[a]	t+19	6.35[a]	reject	-15.12[a]
t-10	-4.90[a]	reject	-6.13[a]	t+20	-3.57[a]	reject	-15.53[a]
t-9	1.32	accept	-6.02[a]	t+21	1.98	accept	-14.75[a]
t-8	-5.49[a]	reject	-8.17[a]	t+22	0.05	accept	-14.42[a]
t-7	-0.51	accept	-8.85[a]	t+23	0.13	accept	-14.09[a]
t-6	2.53[b]	reject	-8.50[a]	t+24	2.71[b]	reject	-13.26[a]
t-5	3.03[b]	reject	-7.95[a]	t+25	0.94	accept	-12.82[a]
t-4	1.25	accept	-8.15[a]	t+26	-6.72[a]	reject	-13.87[a]
t-3	-5.12[a]	reject	-11.67[a]	t+27	9.15[a]	reject	-11.89[a]
t-2	-12.05[a]	reject	-20.44[a]	t+28	-0.09	accept	-11.70[a]
t-1	0.79	accept	-24.47[a]	t+29	-4.55[a]	reject	-12.34[a]
t	0.47	accept	-34.14[a]	t+30	1.39	accept	-11.89[a]

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

Table-4 depicts the t-statistics for the individual AARs for the 61-day event window. During the pre-event day period, eleven significant AARs (eight at one per cent significance level and three at five per cent significance level) are significant and mostly negative. The event day AAR is positive and not significant. Twenty-one AARs (fifteen at one per cent significance level and six at five per cent significance level) are significant and almost equally distributed positives and negatives in the post-event day period. Higher significant AARs in the post-event day period indicate that the Covid-19 outbreak has significantly impacted the Asian emerging markets. The CAARs are significant for all days through t-13 to t+30. He et al. (2020), Liu et al. (2020), and Pandey and Kumari (2021a) also found evidence ofa significant negative impact on Asian emerging markets.

Figure 1: AAR and CAAR trend of Asian stock markets during the event window

Figure1 exhibits the trend of AAR and CAAR of the Asian emerging markets during the 61-day event window period. The AAR and the CAAR line are seen moving apart more steeply from around the event day, and the distance continues till the end of the event period. It shows that the AARs have been negative most of the time, leading to this gap.The analysis of the shorter window CARs, the longer event window AARs and CAARs, and the graphical presentation reveals that the Asian emerging markets have been hit hard, although China and Taiwan are an exception. The higher negative CAARs in the post-event day period reveals the whole story.

Covid-19 and the Korean Stock Indices

It is evident from the Table-Ia that the mean abnormal returns for all the eight indices are negative. Table-V presents the event day abnormal returns, 4-day, 8-day, and 11-day cumulative abnormal returns for the Korean stock indices. While the event-day abnormal returns and the shorter window cumulative abnormal returns are significant for all the indices. As compared to the impacts on Asian emerging markets where a few stock markets were least affected or unaffected, the Korean stock indices have been impacted badly—significant negative shorter window CARs evidence for negative impacts.

Table-5 presents the hypothesis testing results for AARs and CAARs of the Korean stock indices in the longer window period of 61 days. During the pre-event day period, thirteen AARs are significant (nine at one per cent significance level and four at five per cent significance level). While five significant AARs are positive, the rest are negative. During the post-event day period, twenty AARs are significant (fifteen at oneper cent significance level and five at five per cent significance level).

Table 5: Indices-wise event day abnormal returns and shorter window cumulative abnormal returns

Sample Indices	SD	Event Day AR	CAR (0,+3)	t-value	CAR (0,+7)	t-value	CAR (0,+10)	t-value
KOSPI	0.25	-0.68[a]	-1.59	-3.19[a]	-4.47	-6.37[a]	-3.23	-3.92[a]
KOSPI200	0.27	-0.76[a]	-1.51	-2.82[b]	-4.26	-5.61[a]	-2.87	-3.22[a]
KOSPI200 Leveraged		0.43	-1.62[a]	-6.00	-6.96[a]	-10.69	-8.77[a]	-9.07
-6.35[a]								
KOSPI50	0.29	-0.75[a]	-1.55	-2.72[b]	-4.19	-5.18[a]	-2.48	-2.62[b]
KOSPI Large sized	0.26	-0.67[a]	-1.46	-2.82[b]	-4.15	-5.66[a]	-2.67	-3.11[a]
KOSPI100	0.27	-0.74[a]	-1.51	-2.75[b]	-4.24	-5.47[a]	-2.77	-3.05[a]
KRX100	0.27	-0.69[a]	-1.47	-2.75[b]	-4.19	-5.56[a]	-2.72	-3.08[a]
KOSPI200-IT	0.41	-1.10[a]	-3.34	-4.04[a]	-6.69	-5.71[a]	-4.39	-3.20[a]

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

The event day AAR is also negative and significant at a one per cent level. The CAARs are significant on t-8, t-7, t-6, and all days through t-2 to t+25. The negative impact on the Korean stock indices is not a myth. Liu et al. (2020) and Kim (2020) provide evidence of negative returns in the Korean stock market, while Pandey and Kumari (2021a)found that the number of new cases and deaths were negatively correlated with the returns of the KOSPI.

Table 6: Test statistics for event window period AARs and CAARs of the Korean stock indices

Days	AAR_t	Decision	$CAAR_t$	Days	AAR_t	Decision	$CAAR_t$
t-30	2.13	accept	0.38	t	-5.73[a]	reject	-12.57[a]
t-29	-1.88	accept	0.05	t+1	0.01	accept	-8.88[a]
t-28	-2.47[b]	accept	-0.41	t+2	-9.72[a]	reject	-12.86[a]
t-27	0.95	accept	-0.24	t+3	0.36	accept	-10.96[a]
t-26	2.71[b]	reject	0.28	t+4	-6.59[a]	reject	-12.75[a]
t-25	0.72	accept	0.42	t+5	-7.94[a]	reject	-14.88[a]
t-24	6.69[a]	reject	1.77	t+6	-19.77[a]	reject	-21.25[a]
t-23	-0.81	accept	1.64	t+7	14.29[a]	reject	-14.83[a]
t-22	-1.03	accept	1.46	t+8	-7.51[a]	reject	-16.48[a]
t-21	1.67	accept	1.85	t+9	17.89[a]	reject	-9.98[a]
t-20	0.66	accept	2.04	t+10	9.62[a]	reject	-6.61[a]
t-19	0.07	accept	2.10	t+11	-8.32[a]	reject	-8.73[a]

Contd...

t-18	2.08	accept	2.64[b]	t+12	7.60[a]	reject	-6.28[a]
t-17	-0.35	accept	2.62	t+13	0.46	accept	-5.93[a]
t-16	-2.99[b]	reject	1.97	t+14	1.66	accept	-5.30[a]
t-15	-0.49	accept	1.91	t+15	-9.56[a]	reject	-7.52[a]
t-14	-0.20	accept	1.92	t+16	4.84[a]	reject	-6.13[a]
t-13	-2.72[b]	reject	1.27	t+17	1.12	accept	-5.69[a]
t-12	-7.42[a]	reject	-0.74	t+18	7.49[a]	reject	-3.82[a]
t-11	2.86[b]	accept	0.05	t+19	0.69	reject	-3.57[a]
t-10	-2.77[b]	reject	-0.78	t+20	-2.76[b]	reject	-4.08[a]
t-9	-1.37	accept	-1.25	t+21	1.91	accept	-3.58[a]
t-8	-6.45[a]	reject	-3.47[b]	t+22	2.57[b]	reject	-2.97[b]
t-7	1.31	accept	-3.22[b]	t+23	-5.17[a]	reject	-3.96[a]
t-6	-0.26	reject	-3.54[a]	t+24	2.73[b]	reject	-3.34[b]
t-5	5.43[a]	reject	-1.60	t+25	2.52[b]	reject	-2.78[b]
t-4	3.29[b]	reject	-0.29	t+26	6.81[a]	reject	-1.42
t-3	-2.41[b]	reject	-1.52	t+27	-3.42[b]	reject	-2.04
t-2	-3.01[b]	reject	-3.50[a]	t+28	0.91	accept	-1.83
t-1	-0.78	accept	-4.83[a]	t+29	1.16	accept	-1.59
t	-5.73[a]	reject	-12.57[a]	t+30	1.45	accept	-1.30

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

Figure 2 is the graphical presentation of the AARs and CAARs for the Korean stock. It is noticed that although the CAAR-line is moving apart from the AAR-line from around the event day, it moves closer towards the end of the event window. This is due to positive average abnormal returns after a few days from the event day.

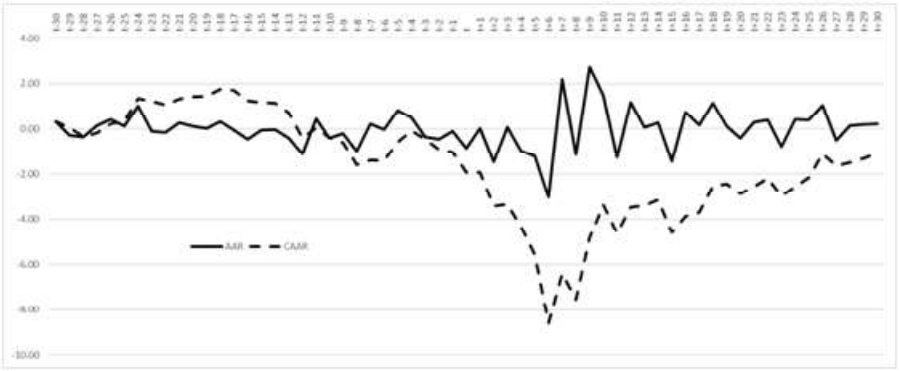

Figure 2: AAR and CAAR trend of Korean stock indices during the event window

The analysis of the shorter window CARs, the longer event window AARs and CAARs, and the graphical presentation reveals that the Korean stock indices have evidenced negative average abnormal return during the event window. However, the impact has been comparatively less intense than the Asian emerging markets.

Table 7: Test statistics for event window period AAVs and CAAVs of the Korean Stock Indices

Days	AAV_t	Decision	$CAAV_t$	Days	AAV_t	Decision	$CAAV_t$
t-30	-2.04	accept	-0.37	t	3.16[b]	reject	2.17
t-29	1.78	accept	-0.05	t+1	-0.52	accept	1.17
t-28	0.78	accept	0.10	t+2	2.98[b]	reject	2.67
t-27	0.83	accept	0.26	t+3	-2.40[b]	reject	1.11
t-26	-1.83	accept	-0.09	t+4	2.26	accept	2.01
t-25	-0.66	accept	-0.22	t+5	-1.23	accept	1.33
t-24	2.41[b]	reject	0.25	t+6	3.81[a]	reject	2.67[b]
t-23	-2.82[b]	reject	-0.32	t+7	-3.68[a]	reject	1.20
t-22	0.65	accept	-0.19	t+8	-2.80[b]	reject	0.20
t-21	-1.06	accept	-0.42	t+9	3.18[b]	reject	1.19
t-20	0.72	accept	-0.27	t+10	-2.62[b]	reject	0.35
t-19	0.66	accept	-0.13	t+11	0.81	accept	0.57
t-18	2.18	accept	0.37	t+12	2.04	accept	1.11
t-17	-2.76[b]	accept	-0.27	t+13	0.08	accept	1.09
t-16	-0.26	accept	-0.34	t+14	-4.46[a]	reject	-0.10
t-15	1.78	accept	0.09	t+15	3.82[a]	reject	0.86
t-14	0.71	reject	0.28	t+16	-0.89	accept	0.62
t-13	-3.37[b]	reject	-0.61	t+17	-1.52	accept	0.24
t-12	1.11	accept	-0.33	t+18	0.24	accept	0.29
t-11	2.28	accept	0.32	t+19	-0.96	accept	0.07
t-10	-2.16	accept	-0.32	t+20	1.10	accept	0.31
t-9	1.00	accept	-0.02	t+21	-3.54[b]	reject	-0.45
t-8	0.04	accept	-0.01	t+22	4.54[a]	reject	0.50
t-7	1.07	accept	0.37	t+23	-2.66[b]	reject	-0.05
t-6	0.58	accept	0.61	t+24	-1.18	accept	-0.28
t-5	1.72	accept	1.37	t+25	3.61[a]	accept	0.43
t-4	-4.49[a]	accept	-0.51	t+26	-1.95	accept	0.05

Contd...

t-3	-1.36	accept	-1.25	t+27	1.61	accept	0.35
t-2	0.57	accept	-1.12	t+28	-0.59	accept	0.23
t-1	0.94	accept	-0.70	t+29	1.08	accept	0.43
t	3.16[b]	reject	2.17	t+30	3.16[b]	reject	2.17

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

Table-7 represents the test statistics for the AAVs and CAAVs during the event window. It is seen that five AAVs are significant in the pre-event day period while fourteen AAVs are significant in post-event day period. While only one significant AAV in the pre-event day period is positive, seven significant AAVs are positive in the post-event day period. The event day AAV is also negative and significant. With equal numbers of positive and negative significant AAVs during the post-event day period, it points that the abnormal volatility of the Korean stock indices have been significant but the overall impact on volatility was nil. The CAAVs are insignificant for the event window except on t+6. This, too, indicates insignificant volatility during the event window. The shorter window analysis, i.e., 4-day, 8-day and 11-day also reveals insignificant cumulative abnormal volatilities (the results may be provided if sought). Hence, it is evident that although the global pandemic announcement led to significant abnormal returns, the abnormal volatilities have been insignificant for the Korean stock indices.

Covid-19 and the KOSPI50 Constituent Stocks

In the previous parts, we studied the impact on Asian emerging markets indices and the Korean stock indices; now, it calls for examining the impact on individual stocks' returns. Table-Ib represents the descriptive statistics of 48 constituent stocksof KOSPI50. The mean abnormal returns of the stocks have been lower than those of the indices.Table-8 exhibits the test-statistics of the 61-day event window period AARs and the CAARs. Twenty-one pre-event day AARs and twenty-six post-event day AARs are significant along with the event-day AAR. While eight positive AARs are significant during the pre-event say period, fourteen positive AARs are significant during the post-event period. It indicates that the KOSPI50 stocks have not followed a common trend of continuous negative or positive AARs during the event window. However, negative and significant CAARs for t-12 to t+30 days indicate that the overall impact has been negative during the event window. It is evident that when individual stocks are examined, the impact is found to be more intense. For example, Takyi and Bentum-Ennin (2020), Pandey and Kumari (2020a & 2020b), and, Adenomon, Maijamaa, and John (2020) found negative impacts in the African, Indian, and Nigerian stock markets, respectively.

Table 8: Test statistics for event window period AARs and CAARs of the KOSPI50 constituents

Days	AAR_t	Decision	$CAAR_t$	Days	AAR_t	Decision	$CAAR_t$
t-30	0.74	accept	0.13	t	-4.31[a]	reject	-53.80[a]
t-29	-2.70[a]	reject	-0.36	t+1	2.02[b]	reject	-36.61[a]
t-28	-4.03[a]	reject	-1.11	t+2	-30.69[a]	reject	-47.61[a]
t-27	-3.66[a]	reject	-1.82	t+3	-12.96[a]	reject	-47.71[a]
t-26	3.89[a]	reject	-1.11	t+4	-9.55[a]	reject	-46.95[a]
t-25	-0.64	accept	-1.26	t+5	-17.75[a]	reject	-50.10[a]
t-24	10.31[a]	reject	0.78	t+6	-29.30[a]	reject	-57.46[a]
t-23	-2.14[b]	reject	0.36	t+7	23.36[a]	reject	-45.49[a]
t-22	-0.71	accept	0.22	t+8	-18.23[a]	reject	-48.97[a]
t-21	3.54[a]	reject	0.98	t+9	24.87[a]	reject	-38.59[a]
t-20	2.09[b]	reject	1.46	t+10	23.15[a]	reject	-29.82[a]
t-19	-3.53[a]	reject	0.71	t+11	-4.22[a]	reject	-29.76[a]
t-18	-1.46	accept	0.39	t+12	6.24[a]	reject	-26.87[a]
t-17	-0.85	accept	0.20	t+13	-2.72[a]	reject	-26.62[a]
t-16	-1.88	accept	-0.25	t+14	8.01[a]	reject	-23.65[a]
t-15	-0.94	accept	-0.49	t+15	-14.39[a]	reject	-26.49[a]
t-14	-3.68[a]	reject	-1.45	t+16	10.06[a]	reject	-23.26[a]
t-13	-4.97[a]	reject	-2.83[a]	t+17	-2.72[a]	reject	-23.25[a]
t-12	-12.53[a]	reject	-6.42[a]	t+18	14.38[a]	reject	-19.33[a]
t-11	2.33[b]	reject	-6.00[a]	t+19	4.42[a]	reject	-17.85[a]
t-10	-2.38[b]	reject	-6.99[a]	t+20	-1.83	accept	-17.82[a]
t-9	-2.72[a]	reject	-8.19[a]	t+21	7.17[a]	reject	-15.88[a]
t-8	-10.47[a]	reject	-12.12[a]	t+22	6.48[a]	reject	-14.18[a]
t-7	-0.65	accept	-13.09[a]	t+23	-6.74[a]	reject	-15.26[a]
t-6	0.09	accept	-13.96[a]	t+24	5.95[a]	reject	-13.76[a]
t-5	4.71[a]	reject	-13.16[a]	t+25	-1.01	accept	-13.69[a]
t-4	4.08[a]	reject	-12.59[a]	t+26	6.12[a]	reject	-12.26[a]
t-3	-7.54[a]	reject	-17.84[a]	t+27	-0.90	reject	-12.21[a]
t-2	4.20[a]	reject	-18.18[a]	t+28	-3.09[a]	reject	-12.57[a]
t-1	-18.01[a]	reject	-35.00[a]	t+29	0.49	accept	-12.27[a]
t	-4.31[a]	reject	-53.80[a]	t+30	3.50[a]	reject	-11.44[a]

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

Figure3 is the graphical representation of the AARs and CAARs for the KOSPI50 constituent stocks. It follows a similar trend as the Asian emerging markets. The CAAR-line moves apart from the AAR-line and the gap is widening from a few days before the event day. However, the gap continues till the end of the event window, indicating continuous negative AARs during the event window.

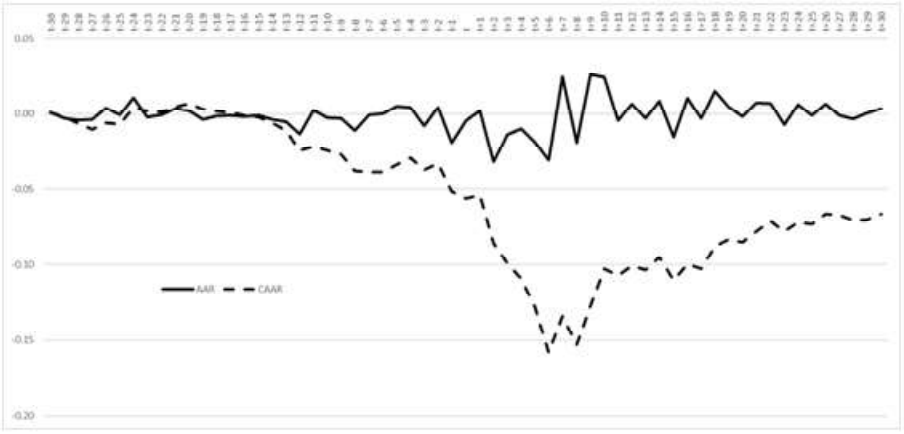

Figure 3: AAR and CAAR trend of KOSPI50 constituents during the event window

Association between the Asian Emerging Markets

While a pandemic may impact different nations, the impact may not be similar for all. Markets around the globe are interrelated, which means the disturbances in one nation's financial market affect the other nation, too. Chiang, Nam, and Li (2007) found evidence of a high correlation among the sample Asian countries during crises. It is interesting to examine the association among various stock markets falling under the same region to ascertain the pandemic impacts on regional stock markets. Table-9 depicts the correlation values between the Asian emerging market indices. It is evident that all the indices, except that of Malaysia, have a positive and significant correlation with the MSCI emerging market index. While China, Taiwan, and Malaysia do not react similarly to other nations' stock indices, Korea, India, Indonesia, Pakistan, the Philippines, and Thailand share a positive and significant correlation. This indicates that the impact of the Covid-19 has been similar on these nations. It can be said that the impact has been different on different nations, as also concluded in Pandey and Kumari (2021a). It could be said that China, Taiwan, and Malaysia reacted differently due to their early control over the novel coronavirus, as we find in Topcu and Gulal (2020), who conclude that the impact has been lesser in nations where the government introduced preventive measures to contain the outbreak within a reasonable time.

Table 9: Correlation among the Asian emerging markets

	1	2	3	4	5	6	7	8	9	10
1. China	1.00									
2. India	0.14	1.00								
3. Indonesia	-0.13	0.54[a]	1.00							
4. Korea	0.28[B]	0.48[A]	0.41[A]	1.00						
5. Malaysia	-0.23	-0.09	0.09	0.17	1.00					
6. Pakistan	0.18	0.31[B]	0.35[A]	0.09	-0.05	1.00				
7. Philippines	0.04	0.39[A]	0.59[A]	0.37[A]	0.01	0.14	1.00			
8. Taiwan	0.00	0.24	0.28[B]	0.60[A]	0.29[B]	0.01	0.37	1.00		
9. Thailand	0.11	0.72[A]	0.41[A]	0.37[A]	0.01	0.40[A]	0.44[A]	0.17	1.00	
10. Msci Em	0.48[A]	0.77[A]	0.48[A]	0.68[A]	-0.26	0.35[A]	0.48[A]	0.34[A]	0.66[A]	1.00

[a] significant at alpha = 0.01. [b] significant at alpha = 0.05

Table-10 presents the summary of the hypotheses based on the above discussions.

Table 10: Summary of Hypotheses

Sl. No.	Hypothesis Statement	Decision
H_{01}	"The Asian emerging markets have experienced no significant abnormal returns during the event window"	Rejected
H_{02}	"The Korean stock indices have experienced no significant abnormal returns during the event window"	Rejected
H_{03}	"The KOSPI50 constituent stocks have experienced no significant abnormal returns during the event window"	Rejected
H_{04}	"The Asian emerging markets and the Korean stock market were impacted similarly by the global pandemic"	Rejected
H_{05}	"There exists no correlation between the Asian emerging markets"	Rejected
H_{06}	"The Korean stock indices have experienced no significant abnormal volatilities during the event window."	Supported

Conclusions

The empirical results rejected all the null hypotheses. The Asian emerging markets, the Korean stock indices, and the KOSPI50 stocks have experienced significant negative abnormal returns around the event date. As found in other studies, the pandemic's market reaction has been different in different markets, and there is a strong association between the Asian emerging markets in terms of the reactions, except for a few exceptions, namely, China, Taiwan, and Malaysia. More significant abnormal returns are present in the Korean stock market's pre-event day period

than in the Asian emerging markets. When it comes to individual stocks, the impact of the global pandemic has been the worst.Insignificant impact is found on the volatility of the Korean stock indices. The findings support previous literature.

Since Fama et al. (1969),the efficient market hypothesis has gained interest in financial studies. A semi-strong efficiency is when the stock prices react to the publicly available information. The presence of significant abnormal returns during the pre-event day period may indicate both leakage and anticipation of information regarding an event's occurrence. In the Asian emerging markets and the Korean stock indices, the significant abnormal returns are scattered in the pre-event day period, although not concentrated heavily, which indicates that the markets are semi-efficient. However, for the KOSPI50 constituent stocks, the significant abnormal returns are concentrated around the pre-event-day period indicating prior anticipation of an event's occurrence. Reflecting certain information in the stock prices before the information is made public indicates that the market is inefficient.

Implications

This study gives an insight into pandemic effects on different sets of markets,initiating from a set of Asian emerging markets to a set of indices in a single market and concluding the analysis on individual stocks constituting one of the major indices of that market. It will help investors build their portfolio during such uncertainties and for the policymakers who work on securities pricing during different market phases. Once one knows how different markets or stocks react to certain uncertain events, it becomes easier to select a particular stock for the portfolio or a particular investment market. As all research does, this study also has a few limitations. This study emphasizes the pandemic effects but fails to discuss the post-pandemic strategies.However, it paves the way to future research based on its findings.

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Interaction between Macroeconomic Factors and Indian Stock Market: Testing Linkages using ARDL Approach

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Abstract: Stock markets are extremely sensitive to expected changes in fundamentals of an economy. There are numerous domestic economic indicators causing variation in stock prices. Due to globalisation and development of information technology, the relevance of worldwide factors in determining changes in stock prices has also increased. Therefore, it is extremely important to identify the movements of stock market with respect to an economy's macroeconomic variables and international factors like movement in exchange rates and crude oil prices. The present paper applies Bounds test based Autoregressive Distributed lag model to explore how do macroeconomic factors influence the Indian stock market. The analysis is done over a time window of eleven years from April 2007 to March 2018. The results illustrate that money supply and FII positively and gold price negatively influence stock prices in the long run whereas in short run, oil and gold prices and exchange rate negatively and foreign exchange reserves and FII positively influence stock prices.

Keywords: Macroeconomic variables, Indian stock market, ARDL approach

Introduction

Indian economy is growing steadily and is a bright spot in the world economy due to strong macroeconomic fundamentals. It has been declared as the sixth largest economy in the world with the nominal GDP of 2.6 trillion in 2017-18 and third largest by purchasing power parity (PPP) of 9.5 trillion in 2017-18 as per the World Economic Outlook (2018) Report of International Monetary Fund (IMF). Structural reforms in the recent past including demonetisation and implementation of Goods and Services tax (GST) in 2017 are exemplary initiatives in international economic history which shook the entire financial system. Despite this, the Indian economy continued to grow at a reasonable rate when compared to other economies around the world. According to a survey conducted by Bloomberg,

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"India has been rated as the second-most attractive emerging market for equities in 2019".

History has shown that the stock prices reflect dynamics of an economy. The direction of stock indices serves as a leading indicator of what is really happening within an economy. They reflect mood of the society and are responsive to changes in policies at macro-economic level. The state of an economy has a bearing on stock prices. There are various macroeconomic factors such as (GDP) gross domestic product, inflation, interest rate, index of industrial production, trade barriers, balance of payments, money supply, gold prices, savings etc. Due to globalisation and the development of information technology, now a country not only gets affected by changes in its own economy but also gets influenced by the change in international market. Therefore, it is extremely important to identify the movements of stock prices in relation to an economy's fundamentals and at the international front, market participants should also monitor the movement of market with respect to other key factors such as exchange rates, investment trends by overseas investors and crude oil prices etc. The study of macroeconomic variables and their impact on stock prices has been an area of intense interest among academicians, investors since 1970s. Several studies adopting unique methodologies have produced contradictory results regarding the relationship between stock market and macroeconomic variables across the world.

The present study considers nine major economic variables as found relevant from the review of literature and aims to investigate their impact on stock prices in India for a time span of eleven years spanning from April 2007 to March 2018. Latest cointegration approach Autoregressive Distributed Lag (ARDL) bounds testing procedure and Granger Causality test are used to investigate the relationship between the variables.

Review of Literature

The influence of economic factors on stock market has been well examined in the financial economics literature. Arbitrage pricing theory (APT) as proposed by Ross (1976) is based on the assumption that expected returns depend on macroeconomic factors although the range of those factors has not been specified in the initial theory. Later in 1980, Roll and Ross stated that unexpected variations in inflation, risk premiums, term structure of interest rates and industrial production influence stock returns. Chen et al. (1986) examine the validity of APT in US market and found that variables such as industrial production, inflation and yield spread between the long and short term government bonds are significant in explaining stock returns which refutes the validity of semi-strong efficiency in US market. Later numerous studies across the world examined the

influence of economic factors on stock prices and returns.The review of literature for macro-economic factors is categorised for each variable separately.

Index of Industrial Production

The index of industrial production is measure of real economic activity. This index details out the growth of different sectors of economy like mining, manufacturing and electricity. Ibrahim and Aziz (2003) in Malaysia and Maghayereh (2003) and Al-Sharkas (2004) in Jordan stock market suggest the positive association between level of real economic activity as proxied by index of industrial production (IIP) which is explained through the effect of industrial production on expected cash flows of companies. Yusof and Majid (2007) and Liu and Shrestha (2008) also suggest positive relationship between IIP and stock prices. Raju and Khanapuri (2009) show the evidence of influence of IIP in case of both manufacturing and financial service sector of India. The results of Sohail and Hussain (2009) revealed the long run relationship between macroeconomic variables and stock prices and found that index of industrial production positively impact stock prices. There is some evidence of insignificant influence of index of industrial production such as Hosseini et al. (2011), Saeed and Akhter (2012), Ray (2012) suggest the insignificance of IIP.Aromolaran et al. (2016) exhibited that IIP has positive effect on Nigeria Stock Exchange which signifies that increased industrial production leads to increase in economic activities which translated into higher earnings and in turn higher stock prices.

Money Supply

Money supply is the sum total of monetary assets available in the economy at a particular time. It measures the abundance or scarcity of money. Pilinkus and Boguslauskas (2009), Rad (2011), Vejzagic and Zarafat (2013) and Khan and Khan (2018) discovered that stock price is positively related with money supply and negatively with exchange rate. Raju and Khanapuri (2009) found existence of money supply effect in case of manufacturing sector whereas in case of financial service sector it is found to be insignificant. Sohail and Hussain (2009) found negative influence of money supply on stock prices which supports the keynsian views. Hosseini et al. (2011) failed to show the significant influence of money supply in both Indian and Chinese market. Osamuonyi and Evbayiro-Osagie (2012) and Saeed and Akhter (2012) findings in respect of money supply are in consistence with the findings of Maghayereh (2003), Hosseini et al. (2011) show that money supply cause negative variations in stock market. Mustafa et al. (2013) indicated the short run causal effect of money supply on stock prices whereas in the long run it is suggested that stock market is inefficient with respect to money supply. Prabhu et al. (2019) explored the linkage between monetary policy and sectoral stock indices using identification through

heteroscedasticity approach and found significant impact on banking and reality sector while its impact on other sectors is insignificant.

Inflation

Inflation is a rise in general price level of goods and services in an economy and consequently results in decrease in value of currency. Mixed results have been found in case of influence of inflation on stock prices. Ibrahim and Aziz (2003) and Yogaswari et al. (2012) favours Fisher (1930) hypothesis. According to Fisher (1930) hypothesis, common stock represents contingent claims against real assets of a business which help in beating inflation. In such case stock prices reflect inflation and the relationship between these two variables is positive. However there are some studies which challenged the validity of fisher effect and found negative association between inflation and stock prices. Fama (1981) found inverse relation between equity returns and inflation. This phenomenon has been termed as the Proxy Hypothesis. Maghayereh (2003), Liu and Shrestha (2008), Pal and Mittal (2011), Ray (2012) and Naik (2013) supported the proxy hypothesis.

Oil Price

The prices of crude oil are keenly gauged across the world. The relationship between oil price and stock market varies from country to country depending on its consumption and the fact whether the country is a net importer or exporter. Empirical evidence suggest that there is positive association between crude oil prices and stock prices in oil exporting economies whereas reverse applies for oil importing countries where the research has established negative relationship between the two. Jones and Kaul (1996) investigated the link between oil price and stock price and find the existence of negative association. Valadhkhani et al. (2009) and Filis (2010) also document negative influence of crude prices on Thailand stock market. Toraman et al. (2011) and Sharma and Khanna (2012) found positive relationship between stock and oil price. Raju and Khanapuri (2009) in Indian market and Hosseini et al. (2011) in both Indian and Chinese market, Saeed and Akhter (2012) in Pakistan and Alqattan and Alhayky (2016) target all GCC countries: Kuwait, Qatar, Oman, KSA and UAE failed to prove the relevance of oil price in determining stock market prices. Chittedi (2012) by applying ARDL and Sahu et al. (2014) by applying Johansen cointegration and vector error correction model (VECM) tested long run association among oil prices and Indian stock market and found that long run causality moves from Indian stock market to oil prices but not the vice versa. Hammami et al. (2019) explored the long run and short run relationship between international oil price and stock price and found significantly long and short run negative influence on stock prices in Jordan.

Gold Price

Gold is considered as an alternative investment opportunity for Indian investors. It is very liquid and can be easily converted into money. It immunises investors portfolio against inflation and currency depreciation. Ray (2012) examined the association of Indian stock returns with five macroeconomic and results suggest that except IIP all variables impact stock market performance significantly. Kaliyamoorthy and Parithi (2012) documented that Indian stock market is not cointegrated with gold prices. Rao (2015) found negative impact of gold prices on stock prices in Indian stock market. Yahyazadehfar and Babaie (2012) found that the influence of gold price is negative on stock market which can be attributed to the fact that the gold market is an alternative to stock market. Hemavathy and Guruswamy (2016) and Tripathi (2016) found that there exists change in stock price with the change in gold prices.

Interest Rate

Interest rate is a macroeconomic variable known to influence savings and investments in the country (Tripathi and Kumar 2015). The interest rate is a vital macroeconomic variable, that affects growth and prosperity of an economy. Kurihara and Nezu (2006) document inefficiency of interest rate to predict the Japanese stock prices. Ahmed and Imam (2007) empirically tested the association between macroeconomic factors and Bangladesh stock market and results show no cointegration between the variables. The results of granger causality test demonstrate unidirectional causality from interest rate to stock price. Coleman and Tettey (2008) show that lending rate have negative relationship with stock price supporting the view that higher lending rates increase cost of operation and therefore makes shares of these companies less attractive. Srivastava (2010) and Pal and Mittal (2011) also found the existence of interest rate effect but only for Nifty index. Yahyazadehfar and Babaie (2012), Saeed and Akhtar (2012), Yogaswari et al. (2012) and Khan and Khan (2018), found negative influence of interest rate on stock market. Naik (2013) also tried to investigate whether Indian stock market is inefficient in respect of macroeconomic factors or not and his findings in respect of interest rate shows that interest rate in insignificant determinant of stock prices.

Exchange Rate

With increase in globalisation, economies around the world are getting integrated to each other and thus, exchange rate has become one of the important fundamental factors which can influence stock prices and also can get influenced by the fluctuations in stock market. Muhammad and Rasheed (2002) examined the long run and short run association between exchange rate and stock prices for four south Asian nations, India, Pakistan, Bangladesh and Sri Lanka and

found no short run and long run link for India and Pakistan, whereas for Bangladesh and Sri Lanka long run causality is found which suggests that in short run exchange rate and stock prices are unrelated in Asian countries. Yusof and Majid (2007), Pilinkus and Boguslauskas (2009), Pal and Mittal (2011), Rad (2011), Ray (2012), Saeed and Akhtar (2012), Vejzagic and Zarafat (2013) and Khan and Khan (2018) found negative relationship between exchange rate and stock price which supports the view that when a currency depreciates, its exports become cheaper which in turn increase its profitability and therefore the value of stock. Coleman and Tettey (2008), Raju and Khanapuri (2009), Sohail and Hussain (2009) in respect of exchange rate found positive influence on stock market which indicates the fact that major movers of the market have actually gained from the depreciation of domestic currency. Liu and Shrestha (2008) using heteroscedastic cointegration attempt to explore the relationship between macroeconomic variables and the Chinese stock market and found exchange rate significantly influence stock prices. Richards et al. (2009) explored the association between exchange rate and stock prices and found that variables are cointegrated in the long run and supported the portfolio balance model which says that changes in stock prices affect exchange rate while reverse is not true. Megarravali and Sampagnaro (2018) made an effort to explore the impact of exchange rate on stock market of ASIAN 3 economies (India, Japan and China) and found significant positive long run impact of exchange rate on stock prices in all economies. Some studies found insignificance of exchange rate in determining stock prices such as Muhammad and Rasheed (2002), Kurihara and Nezu (2006), Raju and Khanapuri (2009 in financial services sector), Srivastava (2010), Naik (2013) and Aromolaran et al. (2016).

Foreign Exchange Reserves

Foreign exchange reserves are the assets held by a central bank in the form of foreign currency reserves, bonds and also comprises of gold, special drawing rights and International Monetary Fund (IMF) reserve position. It is important to understand the relationship between foreign exchange reserves and stock prices because accumulating international reserves is preferred by developing nations to ensure financial stability. A very few studies explains the influence of foreign reserves on stock prices. Bhattacharya and Mukherjee (2003) and Kurihara (2016) found no evidence of influence of foreign exchange reserves on stock market. Maghayereh (2003), Hussain (2009) and Sulaiman et al. (2009) concluded the stock market index is fundamentally linked with foreign reserves. Similarly Akinlo (2015) and Abakah and Abakah (2016) concluded that enhancing foreign exchange reserves will booster stock market growth.

Foreign Institutional Investments

FII is an investment made by an individual or an institution of one country in the financial market of other country. It is imperative to understand the influence of these foreign institutional investments (FII) on stock market due to its growing importance worldwide. Kumar (2001), Gordon and Gupta (2003), Trivedi and Nair (2003), Pal (2005),Behera (2010), Upadhyay (2006), Ray (2012) found unidirectional positive influence of FII on stock prices which indicates that increase or decrease in FII induce stock prices to move in the same direction. Bekaert, Harvey and Lumsdaine, (2002)found that increase in capital flows increase stock returns which is in line with a price pressure hypothesis. Badhani (2005) also examined the association among FII and stock prices using granger causality test and found long run relationship between the two but no short run causality could be traced. Bindu (2004), Sundaram (2009), Stigler, Shah and Patnaik (2010) and French (2011) discovered unidirectional causality running from stock returns to FII, however, reverse is not found in their studies. Rai and Bhanumurthy (2004), Ray and Vani (2003), Mazumdar (2004) and Panda (2005) found no effect in stock prices due to change in foreign investments and also show that foreign investors are not relying on the stock market performance of the host country. There are very few studies found outside India like Hasan and Nasir (2008) also found the positive relationship between FII and stock price whereas French (2011) do not found any link between the two. Singhania and Saini (2016) examined the impact of FIIs on Sensex returns and suggested that more liberalised policies are required to gain confidence of foreign investors as it impact Indian market significantly.

Research Methodology

The study tests the influence of selected nine economic factors on stock prices using ARDL Bound testing approach. Monthly data for eleven years spanning from April 2007 to March 2018 has been used. Descriptive statistics, namely, mean, maximum, minimum, standard deviation, coefficient of variation, skewness, kurtosis and Jarque-Bera test are computed for Nifty 50 index which has been used as the proxy of the stock market and the selected nine economic factors i.e. index of industrial production (IIP), broad money supply (M3), wholesale price index (WPI), crude oil prices (OIL), gold price (GOLD), interest rate as proxied by monthly average of yield on 91days Government of India treasury bills, exchange rate (EXR), foreign exchange reserves (FOREX) and foreign institutional investments (FII). Further, the variables are graphically presented and examined to look for the possibility of trend in the mean and variance.

The present study makes use of time series analysis. Economic time series generally face the problem of non-stationarity and applying ordinary least square

regression on such series might provide spurious results. Therefore, instead of applying regression, use of cointegration technique is favoured. The most commonly used cointegration techniques are Engle Granger (1987) cointegration and Johansen and Juselius (1990) and Johansen (1991) cointegration. The ARDL bounds test given by Pesaran et al. (2001) can be applied even if variables are integrated of order 0 or 1 or both. It also does well with small sample size (Hasan and Nasir, 2008; Oskenbayev et. al, 2011). Before proceeding for ARDL estimation following assumptions have to be satisfied: (i) Data should be stationary at level or first difference; (ii) Data must be free from serial correlation; (iii) Data must be free from heteroscedasticity; (iv) Data must be normally distributed.

Augmented Dickey Fuller test (ADF) and Philips and Perron (PP) unit root tests have been used to test the order of integration of the selected variables. To test the assumptions of no serial correlation, homoscedasticity and normality of data, Breusch-Godfrey Serial Correlation LM test, Breusch-Pagan- Godfrey Heteroscedasticity test and Jarque-Bera normality test have been used respectively.

The equation of ARDL model can be represented as equation 1:

$$LNIFTY = \alpha_1 + \beta_1 LIIP_{t-1} + \beta_2 LM3_{t-1} + \beta_3 LWPI_{t-1} + \beta_4 LOIL_{t-1} + \beta_5 lGOLD_{t-1} + \beta_6 INT_{t-1} + \beta_7 EXR_{t-1} + \beta_8 FOREX_{t-1} + \beta_9 FII_{t-1} + \sum_i^q \beta_{10i} DLNIFTY_{t-i} + \sum_i^q \beta_{11i} DLIIP_{t-i} + \sum_i^q \beta_{12i} DLM3_{t-i} + \sum_i^q \beta_{13i} DLWPI_{t-i} + \sum_i^q \beta_{14i} DLOIL_{t-i} + \sum_i^q \beta_{15i} DLGOLD_{t-i} + \sum_i^q \beta_{16i} DINT_{t-i} + \sum_i^q \beta_{17i} DLEXR_{t-i} + \sum_i^q \beta_{18i} DLFOREX_{t-i} + \sum_i^q \beta_{19i} DFII_{t-i} + \mu_t \quad \ldots 1$$

Where, LNIFTY represents the natural logarithm of Nifty 50, LIIP denotes natural logarithm of the Index of Industrial Production, LM3 denotes natural logarithm of broad money supply, LWPI represents natural logarithm of monthly wholesale price index, LOIL explains the natural logarithm of monthly crude oil prices, LGOLD depicts natural logarithm of gold price, INT depicts interest rate as proxied by monthly average yield on 91days Government of India treasury bills, LEXR represents natural logarithm of month-average exchange rate of the Indian rupee vs. US dollar, LFOREX represents natural logarithm of foreign exchange reserves, FII describes net investments by foreign institutional investors, and ε_t represents error term in the model where LNIFTY is the dependent variable.

General error correction representation of ARDL model is presented in equation 2 as:

$$D(LNIFTY) = \alpha_1 + \sum_i^q \beta_{10i} DLNIFTY_{t-i} + \sum_i^q \beta_{11i} DLIIP_{t-i} + \sum_i^q \beta_{12i} DLM3_{t-i} + \sum_i^q \beta_{13i} DLWPI_{t-i} + \sum_i^q \beta_{14i} DLOIL_{t-i} + \sum_i^q \beta_{15i} DLGOLD_{t-i} + \sum_i^q \beta_{16i} DINT_{t-i} + \sum_i^q \beta_{17i} DLEXR_{t-i} + \sum_i^q \beta_{18i} DLFOREX_{t-i} + \sum_i^q \beta_{19i} DFII_{t-i} + ECM_{t-1} + \mu_t \quad \ldots 2$$

Where, D is the difference operator q is used for the maximum lags selected for the model, β_1 to β_{19} are drift components and μ_t represents error term in the model. Rest of the terms are same as given for equation 1. ECM_{t-1} denotes the residuals from the cointegrating equation and is expected to be negative. Cumulative Sum of Recursive Residuals (CUSUM) test and Cumulative Sum of Squares of Recursive Residuals (CUSUM of squares) test have also been used to check whether the parameters are stable (desirable) or not.

Results and Discussion

The descriptive statistics of the stock market index Nifty 50 and the selected nine economic variables are presented in Table 1. During the study period, Nifty 50 exhibits the mean value of 6,398.266 and its maximum value is around five times the minimum value. The coefficient of variation indicates that it is relatively volatile. IIP is used as a measure of real economic activity has mean value of 103.402 over the last eleven years and is the least volatile variable. Money supply has considerably increased over the past eleven years from 33064.350 billion rupees in April 2007 to 139625.900 billion rupees in March 2018. Inflation as measured by WPI is second least volatile variable. The standard deviation of crude oil price is 1283.224 while the coefficient of variation is 0.306 suggesting its instability in oil prices. There has been a phenomenal increase in gold prices from as low as Rs. 8707.42 per 10 grams to Rs. 31672.83. During this period interest rates remained at the minimum level of 3.218% and rose to as high as 11.334%. The range of exchange rate during the study period is Rs. 28.863. Foreign exchange reserves have grown substantially. The flow of FII has been highly volatile. The highest FII during the study period is 336.830 billion rupees while its lowest value is -173.550 when the outflows were more than the inflows. The skewness has been estimated to reveal the symmetry of the distribution. All the variables, except WPI, gold prices, interest rate and exchange rate, are positively skewed. The value of kurtosis helps to spot the peakedness of the data. Barring interest rate, all the distributions are platytokurtic resulting in lower peaks than normal distribution. The null hypothesis of normality is rejected for all the distributions except IIP and FII.

The first and the simplest way to determine stationarity of the time series is to present the series graphically and look for the possibility of trend in the mean and variance as shown in Figure1. The time series of exchange rate, foreign exchange reserves, gold price, IIP, money supply and WPI clearly exhibit signs of non- stationarity. FII is relatively volatility and there is a possibility of FII being stationary. The graphical presentation of Nifty 50, oil price, WPI and interest rate suggests drift around the years 2009 and 2014.

Table 1.Descriptive statistics of Nifty 50 and economic variables for a period from April 2007 to March 2018

	NIFTY 50 (in Rupees)	IIP	Money supply (Rupees Billion)	WPI	Oil Price	Gold Price (in Rupees)	Interest rate (%)	Exchange rate	Foreign exchange reserves (Rupees Billion)	FII (Rupees Billion)
Mean	6398.266	103.402	81317.240	100.047	4186.436	23259.950	7.080	54.566	17313.320	53.882
Maximum	11027.70	140.300	139625.900	117.200	6926.830	31672.830	11.334	68.237	27608.500	336.830
Minimum	2755.100	75.280	33064.350	73.350	2004.000	8707.420	3.218	39.374	8440.010	-173.550
Standard Deviation	1938.745	14.296	30957.220	14.264	1283.224	7221.192	1.626	9.297	5076.003	102.866
Coefficient of Variation	0.303	0.138	0.380	0.143	0.306	0.310	0.229	0.170	0.293	1.909
Skewness	0.413	0.088	0.127	-0.561	0.404	-0.678	-0.690	-0.063	0.385	0.197
Kurtosis	2.347	2.199	1.752	1.782	1.990	1.941	3.249	1.525	1.912	2.660
Jarque-Bera	6.101	3.697	8.915	15.088	9.204	16.303	10.819	12.050	9.770	1.494
Probability	0.047	0.157	0.012	0.001	0.010	0.000	0.004	0.002	0.007	0.473
Observations	132	132	132	132	132	132	132	132	132	132

Source: Result output of E-Views 9

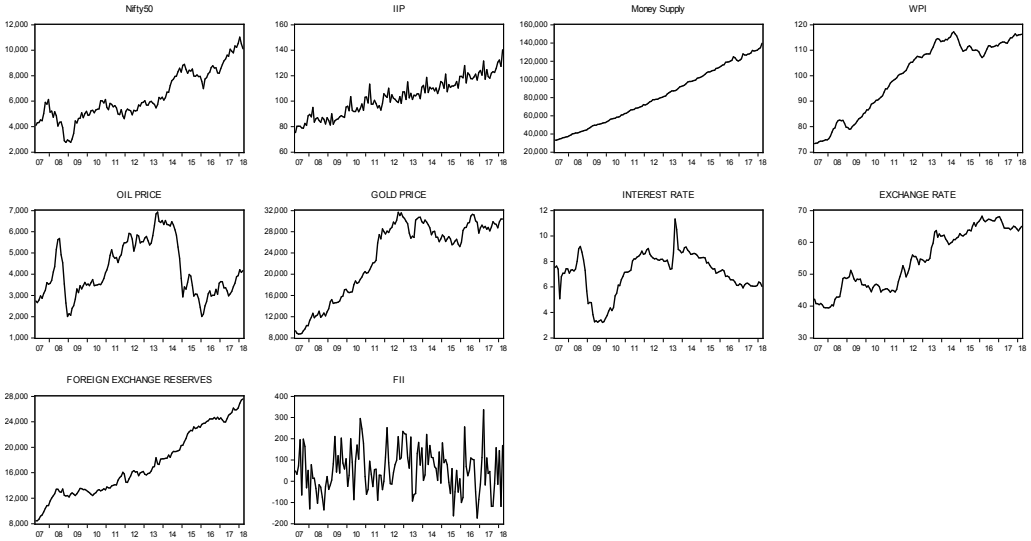

Figure 1.Dataset graphs of Nifty 50 and economic variables

Source: Result output view of Eviews 9

To test the stationarity of the variables and to determine the order of integration of the variables ADF and PP unit root tests have been carried out with and without deterministic trend (Table 2). The results show that at level most of the series are not stationary whereas at first difference they become stationary. The results of the unit root tests confirm each other and reinforce that majority of the observed variables are integrated of order one, whereas there are few variables that are integrated of order zero.

After determining the order of integration, the next step is to run ARDL model as shown in equation 2. Akaike Info Criterion (AIC) is the most commonly used information criterion to determine the optimum number of lags. It is found that ARDL (3, 1, 1, 0, 4, 3, 0, 2, 4, 1) has lowest Akaike Info Criterion value of -3.278, thus, it is considered as the optimal model for further estimation. The software automatically selected three lags for LNIFTY, one for LIIP and LM3 each, zero for WPI, four for LOIL, three for LGOLD, zero for INT, two for LEXR, four for LFOREX and one for FII.

To test if the variables have a long-run relationship, the F-test is performed to examine the joint null hypothesis that the coefficients of lagged level variables are zero. Coefficient of lagged variables in the present study are β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8 and β_9 of LIIP, LM3, LWPI, LOIL, LGOLD, INT, LEXR, LFOREX and FII respectively as presented in equation 1. The computed F-value is evaluated with reference to the critical values tabulated in Pesaran et al. (2001) to accept or reject the following null hypothesis:

Table 2. Results of Augmented Dickey –Fuller and Phillips Perron unit root test

Variables	ADF Unit Root Test				PP Unit Root Test			
	At Level (with intercept)	At Level (with intercept and trend)	At First Difference (with intercept)	At First Difference (with intercept and trend)	At Level (with intercept)	At Level (with intercept and trend)	At First Difference (with intercept)	At First Difference (with intercept and trend)
LNIFTY 50	-1.024	-2.628	-10.819***	-10.786 ***	-1.197	-3.062	-10.857 ***	-10.822 ***
LIIP	0.032	-2.482	-4.383 ***	-4.337 ***	-1.767	-10.151 ***	-37.453 ***	-37.243***
LM3	-4.036 ***	-1.653	-10.999***	-4.340***	-16.122***	-2.308	-11.031***	-26.745***
LWPI	-2.032	-1.214	-6.197 ***	-6.463 ***	-2.138	-0.917	-6.197 ***	-6.476 ***
LOIL	-2.643 *	-2.620	-7.534 ***	-7.524 ***	-2.308	-2.284	-7.610 ***	-7.601***
LGOLD	-2.592 *	-1.293	-10.592 ***	-11.047 ***	-2.572	-1.303	-10.591***	-11.061***
Interest Rate	-1.764	-1.749	-8.545 ***	-8.514 ***	-1.732	-1.721	-9.379***	-9.339 ***
LEXR	-1.335	-2.380	-8.635***	-8.629***	-1.013	-1.688	-8.499***	-8.440 ***
LFOREX	-1.719	-3.251*	-10.175***	-10.223***	-1.651	-3.404*	-10.217 ***	-10.260***
FII	-8.510 ***	-8.476 ***	-11.762 ***	-11.714 ***	-8.477 ***	-8.442 ***	-81.087 ***	-79.914***

Note: *, ** and *** indicate significance at 10, 5 and 1 per cent levels respectively

Source: Result output of E-Views 9.

H_O: If $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9$, long run relationship does not exist.

H_a: If $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9$, long run relationship exists.

Table 3. F- statisitcs of cointegration relationship

Dependent Variable	LNIFTY	
F-Statisitcs	6.794***	
Critical Value Bounds		
Significance	L	U
10%	1.880	2.990
5%	2.140	3.300
2.50%	2.370	3.600
1%	2.650	3.970

Note: *, ** and *** indicate significance at 10, 5 and 1 percent levels respectively

Source: Result output of E-Views 9

If the calculated F-statistics derived from Wald test is more than Pesaran et al. (2001)'s upper critical bound value, long run association between the variables is established. If calculated F-statistics is between lower and upper critical bounds, the results are inconclusive implying thereby that some other cointegration tests should be used. The presence of long run relationship between LNifty and maroeconomic variables is confirmed as the calculated F-value 6.794 (Table 3) is more than upper bound critical value at 1% level. The null hypothesis of cointegration is supported. The robustness of the ARDL model is examined through diagnostic tests in Table 4.

Table 4. Results of diagnostic tests

	Test Applied	Null Hypothesis ($H_{0)}$	Test Statistics	P Value	Result
Serial Correlation	Breusch- Godfrey Serial Correlation LM Test	No serial correlation	0.663	0.517	Supported
Heteroscedasticity	Breusch-Pagan-Godfrey	Homoscedasticity	1.451	0.093	Supported
Normality	JarqueBera	Normality	0.559	0.755	Supported

Source: Result output of E-Views 9

The null hypothesis of Breusch- Godfrey Serial correlation LM Test states that there is no serial correlation between the residuals. The calculated LM test value is insignificant which shows that errors are not serially correlated. Breusch-Pagan-

Godfrey test results suggest absence of heteroscedasticity and Jarque-Bera statistics suggests that data is normally distributed. As all the assumptions of ARDL model have been met, further the long-run and short-run association between the factors is estimated.

Subsequent to establishment of cointegration relationship, the study continues to determine the long-run coefficients and the error correction model (ECM) using the ARDL approach. The Akaike info criterion (AIC) is used to select the optimal lags for the time series: ARDL (3, 1, 1, 0, 4, 3, 0, 2, 4, 1). Table 5 presents the result of estimated long run coefficients for selected ARDL model.

Analysis reveals that Indian stock market index as proxied by Nifty 50 forms significant long run association with four out of selected nine economic factors. There is positive and significant long run impact of LM3 on LNIFTY. The findings indicate that if money supply increases by 1%, the stock index Nifty 50 would increase by 2.645%. Stock prices react favourably to the changes in money supply. An expansion of money supply in the economy rejuvenates the pace of economic activities (Hosseini et al., 2011). The resultant boost in corporate liquidity and earnings drives up stock prices (Khan and Yousuf, 2013). Increase in money supply makes more money available for purchase of equities and simultaneously makes bond yields less attractive. This positive influence of money supply on stock prices is constant with the prior expectations and is also suggested by Majid and Yusof (2009), Sohail and Hussain (2009), Naik (2013), Ouma and Muriu (2014). This positive relation is attributed to the fact that money supply has positive impact on real economic activity (Mukherjee and Naka, 1995).

Table 5. Estimated long run coefficients for selected ARDL model

Variable	Coefficient	Std. Error	t-Statistic
LNIIP	-1.142	0.974	-1.172
LNM3	2.645	1.386	1.908*
LNWPI	0.181	2.770	0.065
LNOIL	0.021	0.301	0.071
LNGOLD	-0.945	0.275	-3.429***
INT	-0.009	0.022	-0.425
LNEXR	-0.097	0.549	-0.177
LNFOREX	-1.223	0.743	-1.646*
FII	0.001	0.001	2.160**
C	5.067	2.677	1.892*

Note: *, ** and *** indicate significance at 10, 5 and 1 percent levels respectively

Source: Result output of E-Views 9

Gold is an alternative investment opportunity for investors. Thus, negative relationship between the gold and stock prices is expected and same has been found in this study. LGOLD has significant negative impact on LNIFTY and the findings are in consistence with the results of Zhang and Wei (2010), Ray (2012), Yahyazadehfar and Babaie (2012), Choi et al. (2013), Rao (2015), Hemavathy and Gurusamy (2016) and Tripathy (2016). The estimated long run coefficient indicates that an advance in gold prices by 1% would lead to a fall in the market index by 0.945%. Hence, gold prices may be used to predict the direction of the market due to long-term integration between the two variables. It is considered as a diversification tool due to its negative relation with stock prices (Jaffe 1989, Ameer et al 2018). Gold and equities are two alternative asset classes, of which equity is preferred in bullish market with hope of earning high returns and as the sentiments turn bearish investors shift to safer options like gold.

Another significant variable which influences stock prices in India is FII and the results are in concurrence with findings of Kumar (2001), Gordon and Gupta (2003), Trivedi and Nair (2003), Pal (2005), Behera (2010), Upadhyay (2006), Ray (2012) who also found unidirectional positive influence of FII on stock prices. FIIs are among dominant investment groups, therefore, they play a vital role in determining market direction. "The arrival of FIIs has led to increase in value of Indian securities which is considered to be undervalued because of low capital availability in India" opined Varughese and Mathew (2017) exhibiting the importance of FIIs. Rest of the variables fails to show any significant influence on stock prices in long run. Coefficient of foreign exchange reserves is -1.223 which is significant at 10% although the sign of coefficient is in contrast with major findings of Maghayereh (2003), Hussain (2009) and Sulaiman et al. (2009) and Abakah and Abakah (2016).

The outcomes of short-run dynamics of macroeconomic variables and stock prices are presented in Table 6. The error correction term ECM (-1) exhibits the pace of adjustment to re-establish equilibrium in the model. The coefficient of ECM (-1) should be significant with negative sign. It is found that estimated error coefficient (-0.224) is negative and statistically significant at 1 % level which implies that equilibrium in the long run will adjust by approximately 22.4 % after a short run shock. It is illustrated from the outcomes of error correction representation that LNIFTY is found to be influenced by its own lags in the short run but negatively. The coefficient of D(LNIFTY (-1)) and D(LNIFTY(-2)) are -0.194 and -0.182 respectively which is significant at 5% level. Gold prices negatively and significantly influence stock prices in short run also. According to the results, short term elasticity of D(LGOLD), D(LGOLD(-1)), D(LGOLD(-2)) are -0.287, -0.318 and -0.297 which are much lower than long run elasticity i.e. -0.945.It is also observed that oil prices and exchange rate do not exhibit long run relationship with stock prices but their relation become statistically significant in short run.

Oil prices exert significant negative influence on D(LNIFTY). The findings are in consistence with the findings of Jones and Kaul (1996), Valadkhani et al. (2009) and Filis (2010). The lagged variables of exchange rate D(LEXR) and D(LEXR(-1)) have significant negative influence on stock prices. The results confirm the findings of Muhammad and Rasheed (2002), Yusof and Majid (2007), Liu and Shrestha (2008),Pilinkus and Boguslauskas (2009), Rad (2011), Saeed and Akhter (2012), Vejzagic and Zarafat (2013). FII is found to be positively significant in short run also.

Table 6. Error correction representation for the selected ARDL model

Variable	Coefficient	Std. Error	t-Statistic
D(LNIFTY(-1))	-0.194	0.087	-2.212**
D(LNIFTY(-2))	-0.182	0.081	-2.278**
D(LIIP)	-0.106	0.123	-0.866
D(LM3)	-0.582	0.512	-1.135
D(LWPI)	0.040	0.623	0.065
D(LOIL)	0.031	0.063	0.502
D(LOIL(-1))	-0.032	0.083	-0.393
D(LOIL(-2))	-0.019	0.084	-0.234
D(LOIL(-3))	-0.102	0.055	-1.833*
D(LGOLD)	-0.287	0.123	-2.332**
D(LGOLD(-1))	-0.318	0.173	-1.851*
D(LGOLD(-2))	-0.297	0.135	-2.198**
D(INT)	-0.002	0.005	-0.425
D(LEXR)	-0.958	0.349	-2.744***
D(LEXR(-1))	-1.266	0.348	-3.637***
D(LFOREX)	0.035	0.243	0.146
D(LFOREX(-1))	0.682	0.292	2.331**
D(LFOREX(-2))	0.123	0.280	0.438
D(LFOREX(-3))	0.243	0.193	1.252
D(FII)	0.001	0.001	5.156***
ECM(-1)	-0.224	0.059	-3.786***

Note: *, ** and *** indicates significance at 10, 5 and 1 percent levels respectively

Source: Result output of E-Views 9

The direction of relationship of long term coefficients of gold and FII is maintained even in short run. However, money supply which has significant positive relationship with stock prices in long run fails to explain the relation in short run which may be attributed to the fact that money supply causes hike in stock prices in long term only.

The cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ) tests have been used to investigate the stability of long and short run parameters as suggested by Giri and Joshi (2015).The (CUSUM) and the CUSUMSQ plots (Figure 2) are between the critical boundaries at 5% level and confirm the stability of the parameters having an impact in India. The model seems to be stable and appropriate.

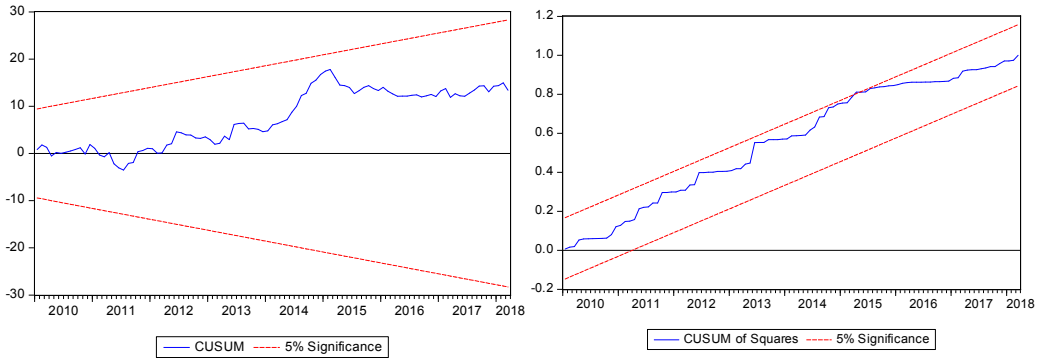

Figure 2. Plots of stability tests

Source: Result output of E-Views 9

Variance Decomposition Analysis

In the variance decomposition analysis, variance of the anticipated error of a variable is separated into fraction accountable to shocks in each variable in the system, including its own. Table 7 presents the results of variance decomposition. The results show that mostly all variance in LNIFTY is explained by itselfwhich isfollowed byLEXR, INT, LOIL, and LGOLD.

At the first period (month) stock prices i.e. LNIFTY are determined by itself and LWPI, LOIL and INT explains 0.400%, 1.331% and 2.402% of the variance of LNIFTY. In the subsequent periods the impact of other macroeconomic variables starts explaining the variance of LNIFTY. In second period, as can be depicted from Table 7 that all the macroeconomic variables explain variance of LNIFTY of which LOIL explains the most after LNIFTY i.e. 2.989%. In 12th period LNIFTY explains itself about 70% while exchange rate explains about 8.5%, INT by 7.5%

and LIIP explains the least of variance of LNIFTY. In following periods also, apart from itself LNIFTY is explained by LEXR and INT the most.

Table 7. Variance decomposition of LNIFTY

Period	S.E.	LNIFTY	LIIP	LM3	LWPI	LOIL	LGOLD	INT	LEXR	LFOREX	FII
1	0.475	95.868	0.000	0.000	0.400	1.331	0.000	2.402	0.000	0.000	0.000
2	0.669	93.212	0.728	0.375	0.224	2.989	0.140	1.387	0.402	0.323	0.221
3	0.792	91.195	0.618	0.649	0.339	3.832	0.227	0.999	0.293	0.813	1.034
4	0.889	89.476	0.551	0.804	0.311	4.446	0.238	0.884	0.457	1.140	1.693
5	0.973	87.590	0.571	0.996	0.277	4.395	0.214	1.093	0.964	1.417	2.481
6	1.045	85.472	0.555	1.155	0.284	4.168	0.206	1.682	1.792	1.730	2.955
7	1.106	83.001	0.529	1.306	0.347	3.943	0.243	2.554	2.865	1.999	3.214
8	1.157	80.239	0.507	1.441	0.446	3.846	0.350	3.631	4.080	2.187	3.272
9	1.201	77.327	0.500	1.556	0.559	3.912	0.547	4.767	5.345	2.275	3.211
10	1.238	74.454	0.511	1.651	0.660	4.117	0.844	5.840	6.555	2.268	3.099
11	1.269	71.806	0.540	1.728	0.734	4.399	1.237	6.741	7.628	2.200	2.986
12	1.295	69.519	0.583	1.792	0.774	4.691	1.710	7.406	8.509	2.116	2.900
24	1.492	60.148	0.872	2.681	1.029	4.787	5.934	7.541	9.334	4.735	2.938
36	1.599	57.653	1.010	3.585	1.376	5.358	5.769	8.401	8.841	5.046	2.962
48	1.658	57.057	1.125	4.136	1.359	5.339	5.715	8.457	8.828	5.020	2.966

Source: Result output of Eviews 9.

Conclusion

Stock markets are considered as an indicator of economic prosperity. Therefore, any variation in security prices is keenly gauged by economists, policymakers, government, researchers and investors. Macroeconomic determinants of stock prices may be used to predict future direction of the market, hence may provide valuable inputs for econometric modelling, policy making, theory building, framing laws or investment decision. The paper empirically examines the influence of selected economic variables on stock prices in India using ARDL Bounds testing approach to understand of the evolving pattern of dynamic interactions between economic factors and stock prices under changing financial conditions in India for a time span of eleven years commencing from April 2007 to March 2018. The assumptions of stationarity, absence of serial correlation, homoscedasticity and normality of data have been tested and satisfied using ADF and PP unit root tests; Breusch-Godfrey Serial Correlation LM test; Breusch-

Pagan- Godfrey Heteroscedasticity test and Jarque-Bera normality test respectively.

The results confirm the existence of co-integration between economic factors and stock prices. ECM reveals significant positive impact of money supply and foreign institutional investments on stock prices. Gold prices negatively and significantly influence stock prices in run. The direction of relationship of long term coefficients of gold and FII is maintained even in short run whereas money supply is unable to maintain its relation. Stock prices do get influenced by their own lags, oil prices and lagged values of exchange rate in short run. The results of variance decomposition analysis illustrate that mostly all variance in LNIFTY is explicated by itselfwhich isfollowed byLEXR, INT, LOIL, and LGOLD.

Implications of the Study

The findings of the present study provide a better understanding of investment environment and how macroeconomic indicators affect stock prices which would help investors and portfolio managers to understand the association between economic factors and stock prices. Similarly, the study is expected to assist the government agencies to design economic policies that encourage inflows in form of FII into the financial markets. Monetary policy may be made liberal to influence real economic activities. Gold, an effective portfolio diversifier, is strongly recommended to be part of investor's portfolio due to its inverse relation with stock prices. Further studies may span across countries and focus on a comparative study of relationship between macroeconomic variables and stock prices in developing and developed stock markets.

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Predictive Power of the India VIX – Indian Stock Market Fear Gauge

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Abstract: The study proposes an empirical model for forecasting the India VIX-implied change in future Nifty volatility. The proposed VIX-implied Change in Realized volatility (VCR) metric works specially well when absolute change in volatility is considered, and is a better estimator than the raw VIX and the Nifty mean reversion adjustment. Despite its limitations at extremely high volatility levels, the simplicity, intuitiveness and parsimony of the model makes it a compelling candidate for practical use and further research. The model's capability to forecast changes in market volatility from already available information is very useful for the Nifty options traders, who can exploit the expected change in the volatility level in their buy/sell decisions. The exchange administration can also benefit from such forecasts and be better prepared for oncoming bouts of high volatility.Volatility indices like CBOE VIX and India VIX are becoming popular as a separate asset class for building hedging strategies. An empirical forecast model for India VIX therefore holds immense practical value.

Keywords: Stock Market Volatility, India VIX, Fear Gauge

Introduction

Volatility is a key measure of stock market risk. Both, the realized volatility and the implied volatility, are important inputs to the pricing of future products, behavior of market participants, and the preparedness of market regulators. The importance of measuring and forecasting volatility has increased in line with the need for the introduction of novel financial products and portfolio hedging strategies. Implied volatility has its own dedicated indices in the global markets. These indices are popularly known as the 'Fear Gauge' as these represent the fear and anxiety of market participants, especially in high volatility regimes. Indian stock market's fear gauge is the NSE's India VIX.

The India VIX is modelled after the Chicago Board Options Exchange (CBOE)'s VIX index. While the CBOE VIX is computed from a range of stock prices of a

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basket of tradable near-term (expiring in next one month or so)S&P 500 options, the India VIX is computed from the Nifty Order Book of Out of the Money (OTM) put and call options. According to Edwards and Preston (2017, p. 2),*'VIX may be thought of as a crowd-sourced estimate of the estimated volatility of the S&P 500.'* In this statement, the 'crowd' of traders contribute their estimate of the near-term volatility by buying and/or selling put and call options. This input (of put and call option prices) is used in the computation of the VIX level. The present study uses the methodology proposed by Edwards and Preston (2017) for the CBOE VIX to examine the India VIX time series for evidence of a volatility premium and disintegratesthe India VIX implied volatility into components derivable from already available market information. These components, comprising a volatility premium, Nifty realized volatility and mean-reversion volatility, are then used to build an empirical model for estimating the future value of the India VIX, and, therefore, the future market volatility. This methodology does not involve complicated mathematics and only needs inputs derivable from historical data. The proposed model is tested on out-of-sample values to avoid the look-ahead bias.

Literature Review

The pricing of futures and options directly or indirectly uses some kind of assessment – intuitive or statistical – of future market volatility. Special-purpose market indices like the volatility indices imply this assessment of future volatility. A volatility index like the CBOE VIX or the India VIX therefore contains information about the future market volatility. A lot of empirical research, therefore, has been directed at assessing and improving the predictive performance of volatility indices in the context of their relationship with the actual realized volatility of the underlying index or asset. Most research has carried forward the application of the GARCH class of models (Chen and Ghysel, 2012; Corsi, 2009; Kaur, 2002, 2004) of forecasting the conditional variance of all kinds of financial asset prices on which high frequency time series data is generated, e.g., stock indices, exchange rates, interest rates, derivatives, and commodities, etc. These models exploit some well-known characteristics of high frequency financial data, such as their autoregressive nature, persistence in volatility and asymmetry in response to positive and negative news, etc. (Engle and Ng, 1993; French, et al. 1987).However, these models require considerable long-term historical data, involve complex mathematics and are not very intuitive.

The other important direction of research has been on the estimation of the variance risk premium (Bollerslev, et al, 2009); the relationship between implied and realized volatility (Christensen and Prabhala, 1998); and, building forecasting models for future realized volatility by decomposing the volatility indices into components representing conditional variance and volatility premia, e.g. Bekaert

and Hoerova (2014), Edwards and Preston (2017), Busch, et al (2011) and Chernov (2007).Of these, the methodology proposed by Edwards and Preston (2017) is simpler, more intuitive and has been tested on many volatility indices worldwide. In a comprehensive study on the predictive power of the VIX, Edwards and Preston (2017) examines the relationship between the VIX and realized volatility of the underlying index (S&P 500). It finds that the VIX contains a general volatility premium over and above S&P 500 realized volatility. Itproposes an empirical model for forecasting market volatility on the basis of S&P 500 recent (past one month) volatility and the current VIX level. The prediction model works well at all volatility levels with the exception of extremely high volatility percentiles (i.e., annualized volatility > 30 percent).

Chandra and Thenmozhi (2015) finds asymmetric relationship between the India VIX and Nifty returns (upward and downward movements of Nifty). This asymmetry makes the India VIX a candidate for portfolio hedging during sharp declines. The study compares the India VIX performance against ARCH/GARCH class of models and finds India VIX to be a better predictor. They find that the India VIX is a reliable signal for portfolio rebalancing, i.e. a large increase in its level is a reliable trigger for switching to large-capitalization stocks from mid- and small-capitalization stocks, and vice-versa when India VIX implied volatility significantly reduces. Bekaert and Hoerova (2014) decomposes squared VIX index into two components, viz. a stock return conditional variance (CV) component, and, an equity variance premium (VP). It finds that a non-linear model may be better equipped to capture the behaviour of the CV and the VP during periods of extremely high volatility.

Shaikh and Padhi (2014) uses the GJR-GARCH model to investigate the forecasting performance of *ex-post* and *ex-ante* volatility forecasts against realized return volatility over various time horizons, i.e. one trading day, five trading days, 10 trading days, 22 trading days and 66 trading days. It finds that *ex-ante* volatility best explains the future market volatility and implied volatility forecast of all time horizons isa positive, unbiased forecaster of Nifty realized volatility and India VIX. The implied volatility is free from any measurement error. Kumar (2012) finds that monthly volatility forecasts obtained from India VIX contain important information about future market volatility. The study suggests that the asymmetrical relationship between the India VIX and Nifty returns can be exploited for portfolio hedging but not during sharp market declines.

Bollerslev, et al. (2009) studies the expected stock returns and variance risk premia and findsthat stock market returns can be predicted by using the difference between "model-free" implied and realized variances or the variance risk premium. The results are robust across different specifications and predictability is the highest at quarterly horizons although the magnitudes of the estimated

effects appear too large to be fully explained by the theoretical model. They propose that the difference between the 'model-free' risk-neutral expected and actual variance may alternatively be seen as a proxy for the aggregate degree of risk aversion in the market. Christensen and Prabhala (1998) analyses whether volatility implied in S&P 100 index option prices predicts future realized volatility. It finds that implied volatility does predict future realized volatility in isolation as well as in conjunction with the history of past realized volatility. In the context of the 1987 crash, they find that implied volatility is a significantly better predictor of future volatility following the crash. The results provide an empirical justification for interpreting the Black—Scholes implied volatility of OEX options as a volatility forecast rather than as just a means of quoting option prices, and suggest that the implied volatility of at-the-money call options is predictable using a parsimonious set of variables in the market information set.

The present study contributes to the research on the India VIX implied volatility by providing most recent evidence on the relationship between the India VIX implied change in realized volatility and the Nifty realized volatility at various volatility levels. The study period from January 2014 to November 2020 comprises periods of low, average and high market volatility, including the extremely high volatility period in the first half of the year 2020 when the COVID-19 pandemic triggered a global sell-off.

Reserch Methodology

The Sample

The study sample comprises daily prices of two NSE indices – the Nifty50 and the India VIX – for the period from 1 January 2014 to 30 November 2020. While the Nifty50 (or, simply the 'Nifty') represents the market portfolio, the India VIX represents the implied market volatility.In addition to the in-sample period, the period from 1 December 2020 to 10 March 2021 is used to test the out-of-sample performance of the empirical model developed on the basis of the sample period data. This is done to avoid the look-ahead bias. Daily closing prices of the Nifty andthe India VIX for the period 1 January 2014 to 10 March 2021 have been taken from the NSE website (www.*nseindia.com*).

Measures of Daily Return and Volatility

The methods of computation of daily return and volatility are summarized in Table 1.

Table 1. Methods of computation of return and volatility

Volatility (Standard Deviation)	$\sigma = \sqrt{\frac{1}{n}\sum_{t=1}^{n}(r_t = \bar{r})^2}$	n = number of observations r_t = return on day t $\bar{r}$ = average return during the period
Volatility is annualised by multiplying it by the square root of number of trading days in a year.		
Daily Return	$r_t = log_n\left(\frac{p_t}{p_{t-1}}\right)$	p_t = price on day t p_{t-1} = price on the day t-1

Definitions of Terms Used in the Study

Realized Volatilityis the actual volatility computed from historical daily returns. In this study, the realized volatility during the previous 30 calendar days (or, 20 trading days) from a reference day is referred to as the Recent Volatility (RV), and, the realized volatility during the next 30 calendar days (or, 20 trading days) is referred to as the Next Realized Volatility (NRV) or the Future Volatility (FV).

Mean Reversion Volatility(MRV) is the level of the Next Realized Volatility solely attributable to the mean reversion property of the volatility process.Mean Reversion Adjustment (MRA) is the difference between the MRV and the RV.

Variance Premium (VP) at any point of time is the difference between the squared India VIX and the squared MRV. Volatility Premium then is the square root of the variance premium.

Raw VIX refers to futurechange in Niftyvolatility implied by the India VIX level.

Expected VIX (eVIX) is the future expected value of the India VIX based on the values of RV, MRV and VP.

VIX-implied Change in Realized volatility (VCR) is the change in realized volatility implied by the India VIX. VCR comprises the change in future realized volatility due to mean-reversion plus the difference between the India VIX (actual) and the eVIX (estimated).At any point in time, VCR can be computed from the RV, the MRV and the India VIX.

Hypotheses

In line with the objectives of the study, the following hypotheses are formulated and tested:

H_1: There is a linear/near-linear relationship between the India VIX and Nifty Realized Volatility during the period from 1 January 2014 to 30 November 2020.

H_2: The India VIX contains a variance/volatility premium over and above the Nifty Realized Variance/Volatility during the period from 1 January 2014 to 30 November 2020.

H_3: The VIX-implied Change in Realized volatility (VCR) metric generates a more accurate forecast of changes in realized volatility than the raw VIX and the MRA.

Results and Discussion

The results of data analyses are discussed in the following sections. (Hereafter, where required, the 'India VIX' is referred to as the 'VIX' for brevity.)

Realized Volatility and Volatility Premium

The daily values of the Nifty price, the VIX, and the corresponding values of Nifty RecentVolatility (RV) are plotted in Figure 1.

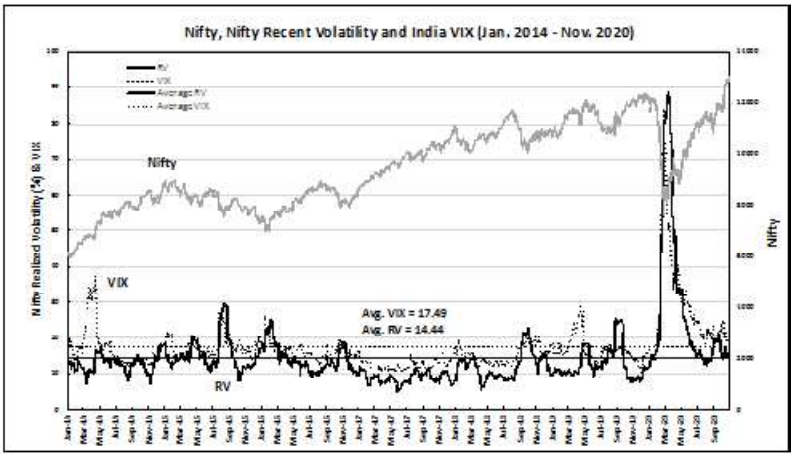

Figure 1.Nifty, India VIX,and Nifty recent volatility (Jan. 2014 – Nov. 2020)

The recent volatility on day n is the annualised volatility of daily returns of the recent 20 (n-20, …, n) trading days. The relationship between the RV and the VIX is analysed to discover if a level of past realized volatility points to a VIX level. The figure indicates that, during the January 2014 – November 2020 period, on an average, the VIX level (17.49) was higher than the Nifty Recent Volatility (14.44 percent) by around 3 points. Even during a calmer year such as 2017, the average VIX level (12.62) was higher than the average recent volatility (9.10 percent) by around 3.52 points. In other words, during the year 2017, the VIX included a 'Volatility Premium' of 3.52 points over and above the Nifty volatility.

VIX and Nifty Recent Volatility

The descriptive statistics on the Nifty Recent Volatility (annualised) in a 20-trading day sliding window are summarized in Table 2.

Table 2. Nifty recent volatility (RV) and India VIX(Jan. 2014 – Nov. 2020)

Statistic	VIX	RV (%)	Difference
Mean	17.49	14.44	3.05
Min.	10.45	4.90	5.55
Max	83.61	88.64	*-5.03*
Range	73.16	83.74	*-10.58*
Q1	13.82	10.18	3.64
Q2 (Median)	15.84	12.56	3.28
Q3	18.35	15.28	3.07
Q4	83.61	88.64	*-5.03*

This approach produces a daily value of the Nifty Recent Volatility during the recent 20 trading days. It is seen from Table 2 that as compared to the Nifty recent volatility, the VIX had higher overall mean (by 3.05 points) and higher first (by 3.64 points), second (by 3.28 points) and third quartile means (by 3.07 points), but lower fourth quartile mean (by 5.03 points). Combining the observations from Figure 1 and Table 2, it can be concluded that the VIX overestimates the Nifty realized volatility at low and medium volatility levels but underestimates it (by nearly 5 points) at extremely high volatility levels.

A scatter plot of the VIX against Nifty Recent Volatility (RV) Figure 2 provides fresh insights into the possible relationship between the two variables.

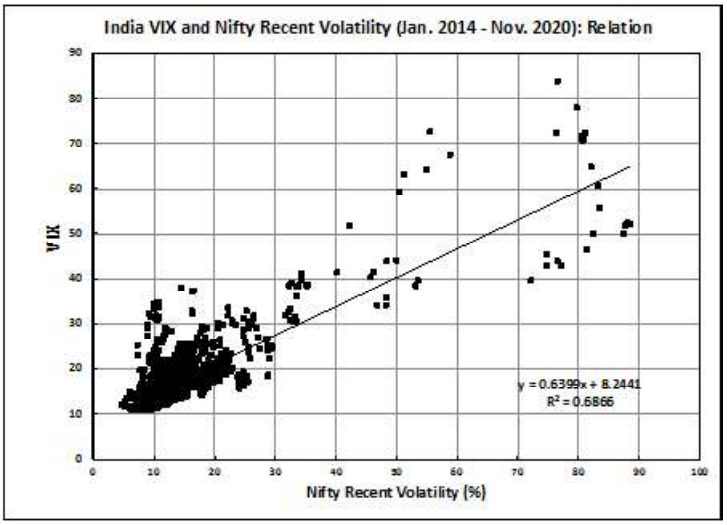

Figure 2.Nifty recent volatility and India VIX (Jan. 2014 – Nov. 2020)

The following observations can be made from the plot and the fitted linear regression line:

1. Very high R^2 (0.69) indicates that there exists a strong linear relationship between RV and VIX. However, there are too many outliers, both at low and high levels of RV and VIX.
2. For the same level of RV, there are multiple levels of VIX that are higher as well as lower than the RV level.
3. Dispersion is higher at higher volatility levels

These observations point to the need for a more nuanced examination of the VIX-RV relation at various volatility levels.

Relationship between Nifty Recent Volatility andVIX

In order to explore the nature of relationship between the VIX and NiftyRV over a range of volatility levels, we take a closer look at their corresponding levels in high and low volatility regimes by sorting their values on the RV from low to high and dividing their values over 20percentile buckets of 5 percent each. This means that while the bucket 1 containsdata points corresponding to the lowest 5 percent volatility band, bucket 20 contains data points corresponding to the highest 5 percentvolatility band. The bucket average of VIX and RV are plotted against each other in the scatter plot of Figure 3.

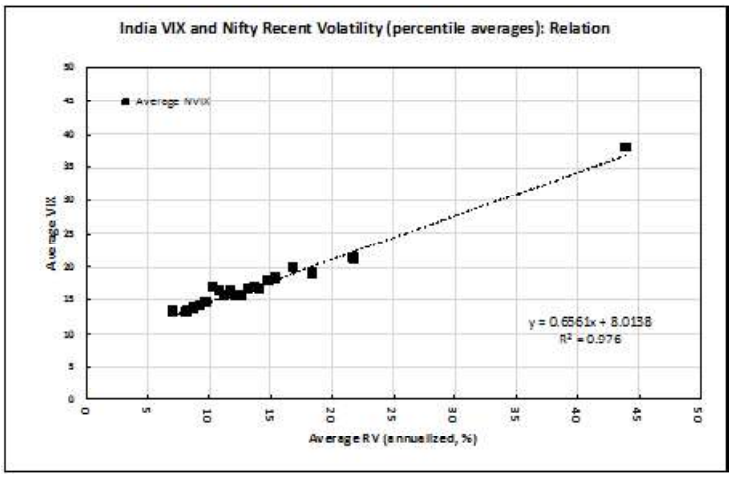

Figure 3.India VIX and Nifty volatility (percentile averages): relationship

It is found that that VIX percentile averages are higher than RV percentile averages for most percentiles, with the exception of the highest percentile buckets (buckets 19 and 20) corresponding to the extreme high volatility months of March 2020 and April 2020.The scatter plot between RV percentile averages and VIX

percentile averages (Figure 3) shows a strong linear relationship between them with a coefficient of determination of around 0.976. This means that there is a very strong linear relationship between RV and the VIX when observed at similar volatility levels.Hypothesis 1, i.e.,*'There is a linear/near-linear relationship between the India VIX and Nifty Realized Volatility during the period from 1 January 2014 to 30 November 2020',* is therefore accepted.

The existence of a volatility premium in the VIX and a linear relationship between the VIX and Nifty RV means that if the VIX can be decomposed further, a more accurate relationship between the VIX and Nifty RV can be arrived at, and, perhaps a forecast model for the VIX can be built on the basis of Nifty realized volatility.

VIX Decomposition

The study follows Edwards and Preston (2017)to decompose the VIX into the following components:

1. Recent Volatility (RV), since there is a strong evidence of a linear/near-linear relationship between the VIX and RV at various volatility levels.
2. Expected change in the *future*realized volatility due to the mean-reversion property of the volatility process, i.e.,the Mean Reversion Adjustment (MRA). MRA is the difference between RV and MRV on a given day. While RV is the actual Nifty volatility, MRV is the forecasted value of realized value based on the mean reversion parameters: M (average realized volatility) and S (speed of mean reversion).
3. Volatility/Variance Premium, as we have seen that VIX/squared VIX contains a premium over the MRV/squared MRV at most volatility levels.
4. An 'adjustment factor', that accounts for market's reaction to volatility impacting events during the next 30 calendar days, and, any changes in the Volatility Premium because of these events.

The first step in VIX decomposition then is to find the statistical relationship between the current volatility and the expected change in the future realized volatility due to the mean-reversion property of the volatility process. In other words, we need to establish the relationship between Recent Volatility (RV) on the reference day andthe Next Realized Volatility (NRV), i.e. the realized volatility over the next 30 calendar days (or 20 trading days) from the reference day.The daily values of RV and NRV for the complete period of study are plotted in Figure 4. It can be observed from the figure that similar to the case of the Nifty recent volatility(RV) and the VIX, there are multiple values of the NRV for a given RV level, and,dispersion between the RV and the NRV is higher at higher volatility levels.

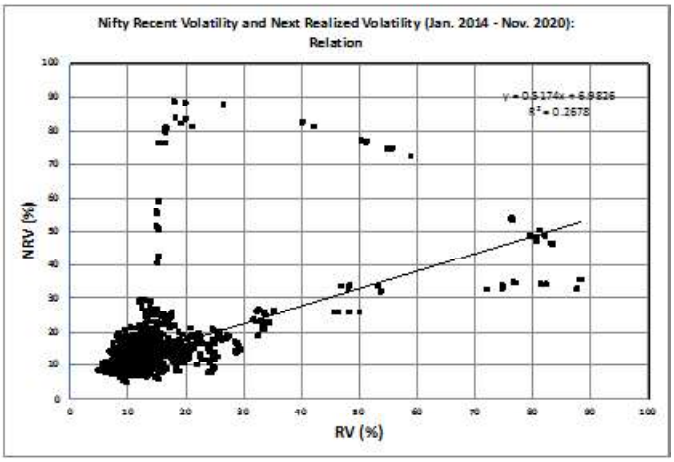

Figure 4.Nifty recent volatility and next realized volatility: relationship

The percentile averages of the 20 percentile buckets of RV and NRV are plotted in Figure 5. In the figure, NRV generally stays higher than RV and keeps reverting to RV except at extremely high volatility levels.

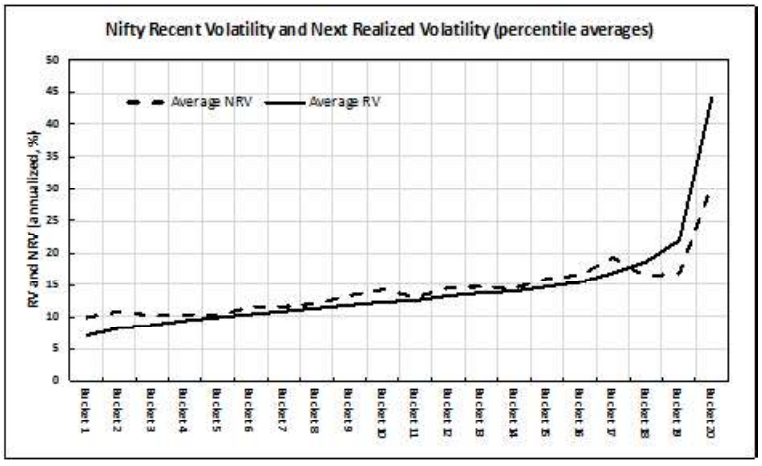

Figure 5.Nifty RV and NRV: percentile averages

Estimation of the Mean Reversion Volatility (MRV)

Regression of RV and NRV percentile averages **(Figure 6)**reveals a very strong linearrelationship between them (goodness of fit is around 0.93).The following linear regression line is fitted between average RV and average NRV:

$$NRV = 0.5609\ RV + 6.3529 \quad \text{....(Equation 1)}$$

The relationship between NRV and RV can be represented as follows:

$$NRV\ (estimated) = RV + S * (Mean\text{-}RV) \quad \text{...(Equation 2)}$$

Where, S = Speed of reversion to mean M, and, M = RV mean, i.e. long-term average volatility of the Nifty. By mapping equation 1 to the form of equation 2, S and M are computed as follows:

S = 1-0.5609 = 0.4391

M = 6.3529 / S = 14.47

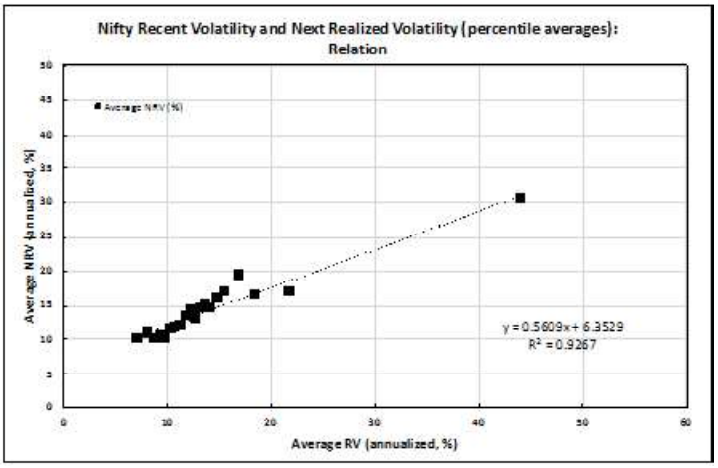

Figure 6.Nifty RV and NRV (percentile averages): relationship

The estimated value of RV mean from the regression line (14.47 percent) is very close to the actualcomputed value of RV for the period of study (14.44percent). A speed of mean version of 0.4391means that over a period of a calendar month (~20 trading days), the RV will revert 43.9percent of the way towards the long-term Nifty average volatility (M). NRV and RV will become the same when RV fully reverts to the long term average Nifty volatility, i.e. S is equal to 1. At other times, since S< 1, NRV (anticipated volatility) will be equal to RV plus a Mean Reversion Adjustment (MRA) equal to S*(M – RV). The anticipated volatility explained by the current volatility plus amean reversion adjustment is called the Mean Reversion Volatility, i.e., the MR Volatility (MRV). If the current volatility is higher than the mean, the MRA will be negative and vice versa.

Volatility Premium

The difference between the VIX and the MRVlevels on a given day is the "Volatility Premium" contained in the VIX.(The difference between the squared VIX and the squared MRV is then the "Variance Premium"). In order to estimate the volatility premium, the contemporaneous values of 245-day (roughly the number of trading days in a year) trailing averages of the annualised Next Realized Volatility (NRV) and the VIX are plotted in Figure 7. A large rolling window of one calendar year is taken to smoothen out any short-term phenomena.

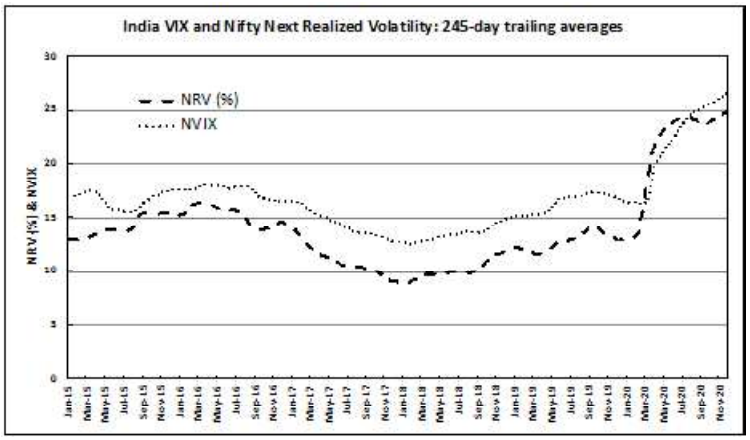

Figure 7. 245-day moving averages of India VIX and Nifty NRV

As seen in the figure, the VIX rolling 245-day average exhibits a premium over the corresponding NRV average for most of the volatility range. It falls below the NRV only during the extreme volatility 245-day period involving the month of March 2020. On the average, the VIX premium (overestimation) is 2.62 points. If the VIX premium can be modelled with respect to the NRV, the VIX can be forecasted purely from the RV, the long-term mean M and the speed of mean reversion S.

The first step in modelling the VIX volatility premium is to evaluate whether the VIX is more closely related to the RV or the MRV. Regression of 245-day moving average of the VIX against the 245-day moving averages of the VIX-RV difference and the VIX-MRV difference, separately, reveals that the VIX is more closely related to the MRV ($R^2 = 0.81$) than the RV ($R^2 = 0.40$). The year-long window

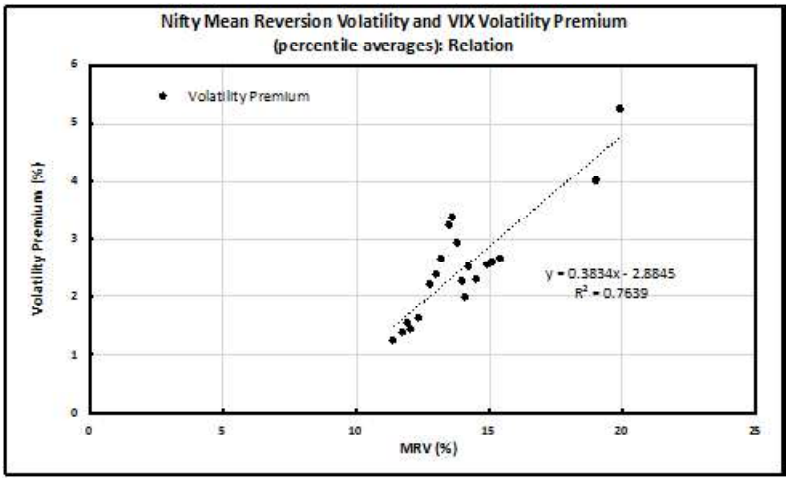

Figure 8.VIX Volatility premium and MRV(percentile averages): relationship

represents the number of Nifty trading days in a year and is a long enough period for removing the effects of any short-term phenomena.

Next, we analyse the relationship between the VIX and the MRV at various volatility levels by once again using the volatility percentile bucketing technique. The VIX and the MRV values are divided into twenty buckets of ~5 percent volatility each, after sorting the data set onthe MRV values.The bucket averages of the MRV are plotted against the corresponding bucket averages of the VIXVolatility Premiumin Figure 8. Similarly, the bucket averages of the squared MRV (Mean Reversion Variance) are plotted against the VIX Variance Premium in Figure 9.

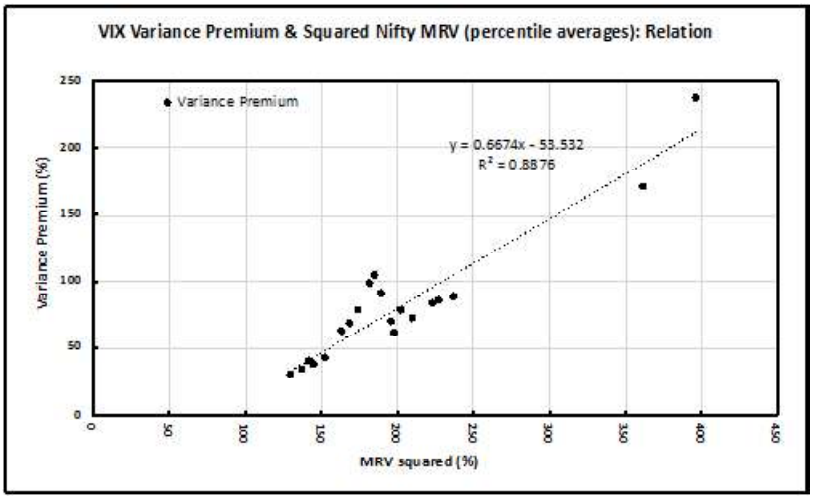

Figure 9.India VIX Variance premium and squared Nifty MRV (percentile averages): relationship

It is found that there is a stronger linear relationship between the average MRV squared and the average VIX Variance Premium (R^2 = 0.89) than between the average MRV and the average VIX Volatility Premium(R^2 = 0.76).In either case, Hypothesis H2, i.e.,*The VIX contains a variance/volatility premium over and above the Nifty Realized Variance/Volatility during the period from 1 January 2014 to 30 November 2020*, is accepted. Using the squared differences (i.e. the Variance Premium) approach to further decompose the VIX, the following regression equation is obtained for the relationship (Figure 9):

Y = 0.6674 X -53.532 …(Equation 3)

Where,

Y = (Squared VIX – Squared MRV), i.e., the Variance Premium, and

X = Squared MRV

Rearranging, we get:

Expected VIX = eVIX = Square root (1.6674 MRV^2– 53.532)…(Equation 4)

Difference to Model (DTM)

The last VIX component is the 'adjustment factor', i.e., the difference between the expected VIX(eVIX) and the actual VIX. This difference is called the 'Difference to Model (DTM)'andit accounts for remaining VIX implied volatility not explained by the RV, the MRA and the Volatility Premium. This, for instance, could be the result of option traders' reaction to events and news as they happen, something that cannot be captured by any historical measure.The VIX on any given day can then be represented as follows:

VIX =RV + MRA + Volatility Premium + DTM … (Equation 5)

Of these, the MRA and the DTM are dynamic components that are constantly evolving with time and therefore need periodic calibration. Together, the MRA and the DTM comprise the VIX-implied Change in Nifty Realized volatility (VCR) over the next 20 trading days.

Model Testing

First, we take a numerical example to explain how the model works.On January 30, 2014, the Nifty realized volatility (RV) was 12.62 percent. Using the estimated values of S (Speed of Mean Reversion = 0.4391) and M (Long-term RV mean = 14.47), the MRV is computed as 13.43percent and the Mean Reversion Adjustment (MRA) as 0.75. Using equation 4, the expected value of VIX (eVIX) is 15.64. This yields a Difference to Model (DTM) of 1.53, and VCR (DTM + MR adjustment) of 2.34 percent. This means that our model expects the RV to changein one calendar month (or, 20 trading days) by 2.34 percent. This compares well to the actual change in the RV by 1.83 percent, as compared to the change estimated by other metrics, e.g. the Raw VIX (i.e., actual VIX to FV difference) (6.47), and the MRA (0.81).

Next, we look at model's out-of-sample behavior. On December 1, 2020, the RV was 16.05 percent. Using the estimated values of S and M, the MRV is computed as 15.36percent and the MRA as 0.69 percent. The expected value of VIX (eVIX) (using equation 4)comes to18.43. This yields DTM of 1.75, and VCR of 1.06. This means that our model expects the RV to changein the next 20 trading daysby 1.06 percent. This estimate compares quite wellwith the actual change in the RV (1.08 percent), as compared to the change estimated by other metrics, e.g.,the Raw VIX(5.20), and,the MRA (0.69 percent).

For the complete period of study, the descriptive statistics on the absolute change in the RV in 20 trading days and the corresponding values of the Raw VIX, the VCR and the MRA are summarized in Table 3. The statistics corresponding to the out-of-sample period show that without a look-ahead bias the VCR tracks the change in Nifty volatilitymost closely, except at extremely high volatility,

where raw VIX performs better. The average change in volatility during the out of sample period (5.09%) is most closely tracked by the VCR (4.25%). Similarly, the Q1 (2.37%), Q2 (3.60%) and Q3 (8.60%) averages of change in volatility are best tracked by the VCR (2.96%, 4.60% and 5.34%, respectively). The raw VIX predicts the change in volatility more accurately in the highest volatility quartile. In Q4, the actual average change in volatility is 10.62%. The most accurate prediction is that of the raw VIX (10.09%), followed by the VCR (7.76%) and MRA (4.36%).

Hypothesis H_3, i.e.,*'The VIX-implied Change in Realized volatility (VCR) metric generates a more accurate forecast of changes in realized volatility than the Raw VIX and MRA'*, is therefore accepted.

Table 3. Absolute change in Nifty volatility,VCR, Raw VIX & MRA

Statistic	Actual change in Nifty Volatility (FV-RV)	Raw VIX (VIX-FV difference)	VCR	MRA
In-sample values (Look-ahead bias exists)				
Mean	4.68	5.52	3.80	2.10
Q1	1.11	2.63	1.25	0.69
Q2 (Median)	2.67	4.28	2.43	1.50
Q3	5.27	6.38	4.30	2.35
Q4	70.58	65.40	53.67	32.57
Out-of—sample values (No look-ahead bias)				
Mean	5.09	3.31	4.25	1.14
Q1	2.37	1.45	2.96	0.34
Q2 (Median)	3.60	3.25	4.60	0.60
Q3	8.60	3.97	5.34	1.09
Q4	10.62	10.09	7.76	4.36

The behavior of the proposed prediction model is now evaluated further. The contemporaneous movement of change in the Nifty volatility and the VCR are shown in Figure 10. The verticalline in the figure is the point beyond which there is no look-ahead bias). The behavior of the model at various levels of Nifty volatility is plotted in Figure 11. It is observed from Figure 11that while the VCRtracks the change in volatility well, especially so at the lower and mid percentiles, the tracking error is higher at higher percentiles. Also, the VCR overestimates the fall in the RV, or, in other words, the model underestimates the change in future volatility during high volatility.This could be due to the fact

that while option traders react to news and events that could be either stock-specific or market-wide, the Nifty realized volatility may not reflect the same level of impact due to cross-correlation among the Nifty components stocks causing stock volatilities to cancel each other out to some extent. Also, the mean-reversion component may not be stable due to relatively short period of study.

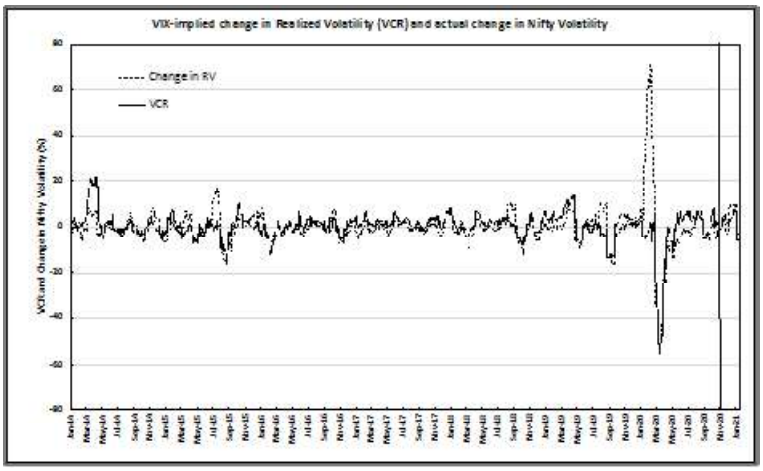

Figure 10: VCR and change in Nifty volatility (Jan. 2014 – Mar. 2021)

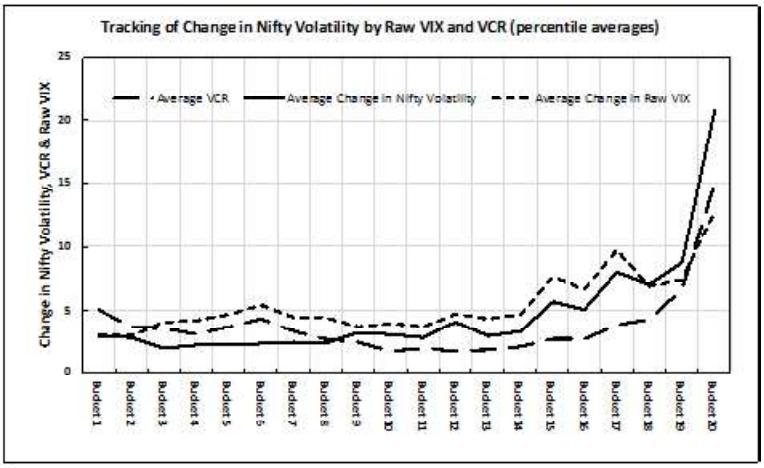

Figure 11: VCR tracking behaviour

Finally, the relationship between the VCR and the actual change in the RV across percentiles (of change in the RV) is shown in Figure 12.

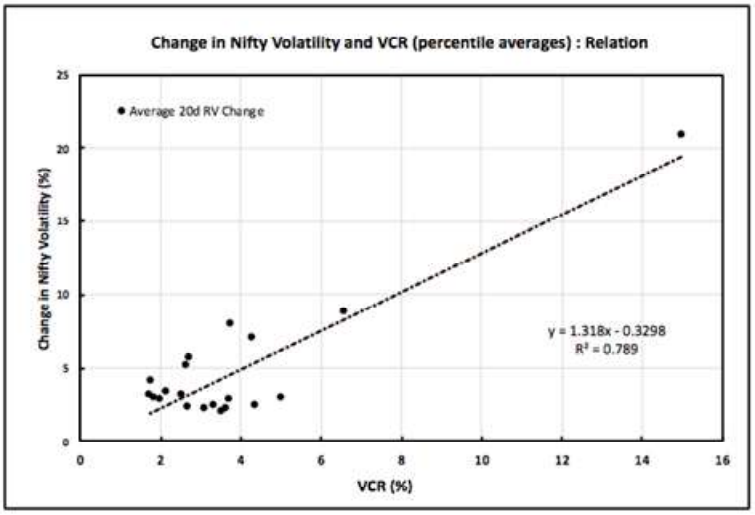

Figure 12: Performance of VCR in predicting change in Nifty volatility

In the figure, an R^2 of 0.79 indicates that the forecast model for predicting change in Nifty volatility has very high predictive power. Despite its limitations at extremely high volatility levels, the simplicity, intuitiveness and parsimony of the model makes it a compelling candidate for practical use and further research.

Conclusion

The main contribution of the study is the application of a simple and intuitive methodology (Edwards and Preston, 2017) to develop a forecast model for estimating future changes in the Nifty realized volatility from the Nifty recent volatility and the India VIX level. The model does not require very large historical time series data and future estimations can be made on the basis of recent volatility.

The model disintegrates the VIX-implied volatility into components that can be estimated from historical information, and some well-known properties of the volatility process. The study begins by analysing the relationship between the VIX and the Nifty realized volatility. It finds that the VIX includes a 'volatility premium' over and above the Nifty recent volatility (historical realized volatility), and,the VIX and recent volatility have a strong linear relationship over most percentile ranges but for the highest 5 percent volatility levels. Further, the VIX is decomposed into components representing: (a) Nifty Realized Volatility,(b) a general Volatility Premium (due to traders' generally accentuated response to near-term volatility-affecting news and events), and, (c) change in future realized volatility due to the mean-reversion property of the volatility process. Such decomposition provides a useful method for understanding the changes in implied volatility indicated by changes in the VIX. All these components are computable from historical volatility data.

The difference in the expected (estimated) values of the VIX (eVIX) and actual values of the VIX is parameterized as the VIX-implied Change in Realized Volatility (VCR). The VCR can be used to forecast the change in realized volatility as implied by the VIX. The study finds that the VCR tracks the absolute changes in Nifty volatility better than other measures, viz.,the mean-reversion adjustment and the Raw VIX, i.e. simple difference between the VIX and the Nifty future volatility (Table 3).However, when positive and negative movements of the change in Nifty volatility are considered, the VCR overestimates the expected fall in volatility. This possibly points to the fact that while option traders react to both stock-specific and general news, Nifty volatility may not fully reflect the VIX implied volatility since cross-correlation among the Nifty components may, to an extent, cancel each other out. In addition, the mean-reversion adjustment component may not be stable due to relatively short period of study.

The study finds a strong linear relationship between the VIX and Nifty volatility, and, between the VIX variance premium and mean reversion variance across volatility levels. However, the power of the VCR to predict absolute changes in volatility hinges upon stable values of S (speed of mean reversion) and M (Nifty average volatility). These variables require constant calibration.

Practical Implications

Volatility indices like the CBOE VIX and the India VIX are inputs to building hedging strategies, and are an asset class by themselves. An empirical forecast model for India VIX therefore holds immense practical value. This study, following the methodology of Edwards and Preston (2007), proposed one such model for forecasting the VIX-implied change in the future Nifty volatility. The VIX-implied Change in Realized volatility (VCR) metric works specially well when absolute change in volatility is considered, and is a better estimator than the raw VIX and mean reversion adjustment. This capability is very useful for the Nifty options traders, who can exploit the expected change in the volatility level in their buy/sell decisions. The exchange administration can also benefit from such forecasts and be better prepared for oncoming bouts of high volatility.

The ability of the model to predict future volatility is however far from being perfect, particularly so when the direction of volatility change is considered and during extreme volatility periods. The estimate of the VIX-implied volatility is computed from the Nifty volatility and the Nifty options volatility. A broad-based index like the Nifty only exhibits aggregate volatility of its component stocks. Volatility impacting events have varying impacts on individual stocks and industry sectors. Such an interplay of correlations among the Nifty component stocks may, therefore, cancel out some of the impact on the Nifty volatility. Therefore, it is recommended that these should be employed in tandem with

historical measures of volatility and long-term forecast models. Exchange administration should also be mindful of this characteristic of volatility indices.

Directions for Future Research

This study spans a period of more than six years and includes market regimes of low, average and high volatility. However, a longer period could generate more stable parameters of the volatility process, for instance, the long term mean and the speed of mean reversion. This calls for similar studies over a longer time horizon. As the study observes, VIX performance vis-à-vis the future Nifty realized volatility shows high dispersion at high volatility levels. This phenomenon could be studied in greater detail by considering one or more periods of high volatility and the accuracy of the forecast model improved. Another interesting area of research is the potential use of the VIX as an asset class in portfolio diversification. The subject area of volatility indices is open to vast possibilities. Such studies can also be done on market segments other than equity, for instance, commodities, exchange rates and interest rates, etc.

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Portfolio Optimization on Indian Equity Market

DEBAJIT RABHA AND RAJKUMAR GIRIDHARI SINGH

Abstract: The principal aim of this paper is to construct an optimal portfolio and to discuss the optimization problems in the Indian Equity Market using Harry Markowitz portfolio optimization theory. In order to construct the optimal portfolio, the present study used fundamental analysis to select the best combination of assets. The selection procedure along with fundamental analysis of securities or assets plays a very important role while constructing an optimal portfolio. For the present study two types of assets have been used i.e., stocks and risk-free (364-Days T-Bill) funds to build the optimal portfolio in the Indian equity market. The Treasury bill has been selected as the zero-risk investment, while stocks have been selected because of the high level of risk premium which they achieved. The NSE nifty 50 listed stocks were selected for the purpose of the study to construct an optimal portfolios. The monthly data has been used for a period of 5 years i.e. from August, 2015 to August 2020. The study adopted the methodology of Ivanovic, Baresa & Bogdan (2013) for short listing of securities and construction of portfolio. One of the important highlights of this study is the effect of diversification which reduced the risk at a significant level.

Key Words: Optimal portfolio, diversification, asset allocation, stock, risk free fund, risk, fundamental analysis.

Introduction

Stock market is a volatile market where the price of the stocks changes in every passing seconds. Holding a single stock or security makes it riskier due to the high volatility of the market. Any changes in the market can severely impact the stock's price either positively or negatively and investors usually prefer to hold a portfolio rather than a single asset to minimize the risk. Portfolio is a combination of various securities. In a portfolio an investor can allocate its investment in securities of companies, fixed deposit in banks, fixed interest bearing debt funds, other financial assets, real assets, etc. Investors either individual or institutional investors, aim to create an optimum portfolio for making profit out of it. In a portfolio there may be two or more stocks or other financial assets depending upon the investor's preference. For an investor there is no limit in the numbers

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of stocks or other financial assets to hold in a single portfolio. Portfolio is usually considered as helpful in reducing the risk of an investor. As portfolio is a combination of multiple stocks or other financial assets if any one or two out of five stocks perform negatively but the other three stocks performance is positive then the investor will be in a profitable position. It may however be noted that different types of portfolio can be formed based on the investors' attitude towards the risk and the amount of money involved. In spite of diversity in attitude towards risk, most investors committing large sums of money are risk averse (Reilly & Brown, 2006).

Selecting assets for the portfolio or asset allocation is thus one of the crucial decisions for an investor. There are multiple assets available in the market (equities, preference shares, money market instruments, real estate, gold, silver, certificates, funds, debt funds, etc.) from whom an investor can select and build his portfolio according to his preference. After deciding what type securities the investors want to have in his portfolio he can proceed to buy the individual securities. Every investor will agree that the asset allocation is one of the most important decisions while creating the portfolio. The investors also need to consider how much risk he is willing to bear accordingly he can select securities for his portfolio. There is a chance of getting a higher return if the investor is willing to bear higher risk but risk bearing may be affected by the investor's age, preference, health, financial condition, period of holding, purpose of holding, etc. There are generally two types of risk, viz. market risk and specific risk. The market risk occurs due to macro-economic factors and cannot be eliminated and it is a non-removable risk. The other element of the risk is called specific risk which are company specific and caused by some other micro factors. The unsystematic risk can be reduced as this risk is company specific in the way diversifying the securities or selecting multiple stocks in a single portfolio.

Overall the decision regarding adding the assets in the portfolio lies with the investor but there are certain elements which will impact the decisions such as the resources in terms of money the investor has, the sum of money the investor is willing to invest, the risk bearing capacity of the investor and the expected return against the risk undertaken. Another important area which an investor should look at is the liquidity of the asset where it can buy or sell easily. The Indian equity market is very much liquid so there is not much of a problem in buying or selling the stocks. In meeting investment objectives the creation of an optimum portfolio is not simple as it seems. It is not simply about combining unique individual securities with desirable risk-return characteristics but requires consideration about the relationship among the investments to create an optimum portfolio. Markowitz's portfolio construction model suggests that an investor should always choose to have their portfolio at an efficient frontier because that is the place where an investor will get their maximum return at a certain level of

risk or the best combination of risk and return. Efficient frontier implies the ultimate limit, which is constrained by the set of all assets in the portfolio. Portion of the boundary positioned above the point of minimum variance is called efficient, while part of the border that is located below the point of minimum variance is called ineffective. An individual investor will always construct a portfolio where his expected return meets after bearing a certain level of risk. This portfolio is also called 'optimal portfolio'.

Markowitz portfolio theory (1952, 1959) has been used for the present study to build an optimal portfolio in the Indian equity market. The core purpose of the study is to explain how to get maximum return with a certain level of risk in the way of diversifying the risk by adding different types of stocks in the portfolio. In the present study the selection criteria for creating an optimal portfolio are being discussed. Most of the funds were allocated to stocks and a risk-free investment (T-Bills). (The major aim of the present study is to construct an optimal portfolio which will maximize the expected returns at a certain level of risk).

Review of Literature

Ivanovic, et al (2013) constructed an optimal portfolio in the Croatia capital market using Markowitz's theory and found that optimal portfolio return was higher than the market return. Ivanova & Dospatliev (2017) tested the Markowitz portfolio optimization model in the Bulgarian stock market using four years data of 50 largest companies listed in the Bulgarian Stock Exchange. The study concluded that the model is valid in the Bulgarian stock market which perform better than any individual security. It is up to the investor how much risk he wants to bear for a given level of return. Raju &Jambotkar (2018) focused on constructing an optimal portfolio in the Indian stock market using selected 20 blue chips stocks listed in the NSE. The study used daily closing prices of the stocks from 1st January 2007 to 31st October 2017. The stocks were ranked on the basis of excess return high to low and then distinctive cut-off rate (Ci) was used under which highest Ci value stock was taken as the cut-off point C for stocks in constructing the portfolio. Only those stocks were selected which were having higher excess return to beta ratio then C. The study found nine stocks out of 20 stocks were fulfilling the criteria for adding to the optimal portfolio. After the selection of stocks an optimal portfolio is constructed and the funds were allocated according to their unsystematic risk and return.

Objectives

The objectives of this paper are:

- to calculate the maximum return with a certain level of risk in the way of diversifying the risk by adding different types of stocks in the portfolio.

- to construct an optimal portfolio in the Indian equity market using Markowitz's theory.

Research Methodology

The present study adopted the methodology of Ivanovic, Baresa& Bogdan (2013) for short listing of securities and construction of portfolios.

Variables used in the Analysis

Market Capitalization: It is the aggregate valuation of the company on the basis of the current market share price of the stock. The market capitalization of a company is determined by multiplying the current stock price with the total number of outstanding shares. Banz (1981) found that the return of larger market capitalization companies' stock is lesser than the smaller market capitalization companies' stock but the smaller capitalization companies are riskier than the larger capitalization companies. Overall, he confirmed that market capitalization is an important factor of portfolio returns.

Earnings per Share (EPS): It is the profit of a company which is allocated to each outstanding equity shares. It indicates the amount of money earned by each common stock for a company. EPS is calculated by dividing the total net profit of a company with the number of outstanding equity shares.

Price-to-Earnings Ratio (*P/E*): This ratio represents the company's per share earning capacity relative to its market price of the shares. High P/E value means stocks are overvalued and vice-versa. An investor should buy the stock at low P/E and sell at high P/E. Basu (1977) confirms the relationship between P/E ratio and return of a stock. He found that low P/E stocks generate more returns than higher P/E stocks. On the contrary, Park (2000) found that a higher P/E ratio all the time does not mean stocks are overvalued. That is why an investor should not use P/E ratio for buying and selling of stock.

Price-to-Book Ratio (*P/BV*): This ratio shows the relationship between current stock price and book-value of the stock. It is calculated by dividing the market price of the stock by the book value. Lower P/B ratio means stock is undervalued which suggests an investor should consider the stock for including in the portfolio. Higher P/B ratio suggests stock is overvalued. An investor however can not take a decision solely applying this ratio because it is not applicable across sectors like the IT sector which will have high P/B ratio due to their low physical assets. P/B>1 means stocks are overvalued.

Price to Sales Ratio (*P/S*): This ratio is a valuation ratio which compares a company's stock price to its revenues. P/S ratio is derived by dividing the current

market capitalization with the total sales over a period of time generally twelve months. Generally a smaller P/E ratio is preferred by an investor.

EV/EBIT and EV/EBITDA: These are two indicators which are used to determine the value of a company. EV is the Enterprise value, EBIT is Earning Before Interest and Tax and finally EBITDA is Earning Before Interest Tax Depreciation and Amortization. Low EV/EBIT and EV/EBITDA means stocks are undervalued relative to the overall industry and vice-versa. The enterprise value is a better indicator of the market capitalization for acquisition because it takes into account the debt owed by the acquirer takes over. The Enterprise value is calculated as follows:

$$EV = \textit{capital market value} + \textit{market debt value} - \textit{money and equivalents} \quad \ldots\ldots (2)$$

Return on Assets (ROA): The amount of revenue earned by a company with respect to the total assets invested for earning that revenue is called ROA. The ROA is calculated by dividing the company's total net profit with average total assets. The net income of a business is found by deducting business expenses from the total profits. Investors prefer companies with higher returns on assets.

Return on Equity (ROE): It is a measure of financial performance of a company in relation to the equity. It is obtained by dividing the net income by shareholders' equity. An investor generally prefers higher ROE.

Return on Capital Employed (ROCE): It is a financial ratio that represents return on capital employed (debt & equity) which determines a business's profitability and efficiency. A higher ROCE ratio means that the business is utilizing its fund more economically so an investor prefers higher ROCE. ROCE is determined by dividing the net profit by total capital employed i.e. debt & equity.

Sources and Collection of Data

The present study is based on secondary data. The NSE nifty 50 listed stocks were selected for the purpose of the study to construct an optimal portfolio. These 50 companies are the largest companies listed under the NSE. The 364-Days Treasury bill is selected as the risk-free fund. The data were collected from the NSE official website, Yahoo Finance, Moneycontrol.com, ticker.finology.in, RBI official website, etc. The other necessary information related has been collected from the official websites of the companies. For the present study monthly data has been used for a period of 5 years i.e. from August, 2015 to August 2020.

The sample size for the study is 50 as 50 stocks are listed in NSE Nifty 50 index. These 50 stocks are the largest companies which are listed with NSE as on 8th September, 2020. Th data has been analyzed using the MS Office Excel.

Results

The monthly historical returns of the stocks and the indices were calculated using the following formula:

$$R_{im} = \frac{P_{im} - P_{im-1}}{P_{im-1}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

R_{im} = Return of stock i in the month *m*

P_{im} = Price of the stock *i*in month *m*

The NSE Nifty 50 index is selected for the study as it gave the highest average return which consists of top 50 companies listed under the National Stock Exchange as on 14th September 2020. To create the optimal portfolio the best companies out of the 50 companies listed under Nifty 50 index were to be selected. As a first elimination criteria only, those companies are selected whose average monthly return is positive during the study period i.e. 5 years. After running the first criteria 7 stocks were excluded due to their negative monthly average returns. The next selection criteria is that the average return of the stocks should be more than the average return of risk-free funds. After running these criteria 33 stocks were left whose monthly average return is more than the risk-free funds. The third elimination criteria were high correlation of individual stocks with other stocks which would affect efficient diversification. Only those stocks were selected who were negatively correlated with other stocks and 14 stocks were left. To limit the stocks at 10 in the portfolio 4 stocks were again removed on the basis of their performance and to avoid too much concentration in a particular sector. Out of 14 companies 4 IT companies were there so finally on the basis of their financial performance and to prevent sectoral impact only 2 stocks were included in the portfolio. Other 2 stocks that were removed are Power Grid Corporation of India Limited and UPL Limited. Other important criteria were market capitalization and business transparency. Finally, the selected stocks for the construction of optimal portfolios have been presented in a tabular form in Table 1.

As mentioned in Table 1 the selected stocks belong to Private Banking, Energy, IT-software, FMCG, Chemical, Non-Ferrous, Cement & Construction Material and Paints. The selected stocks belong to seven different sectors which ultimately lead to effective diversification. As can be observed in the table 1, in the present study the highest capitalization stock is Reliance Industries Ltd. with Rs. 14,95,187.95 Cr. as on 22nd September 2020 and lowest capitalization stock is Pidilite Industries Ltd. with 72,365.62 Cr. Regarding the variable EPS, Nestle India has the highest EPS while Hindustan Zinc Ltd has the lowest EPS with a value of 15.14. In terms of Price-to-Earnings Ratio (*P/E*) the Hindustan Zinc Ltd.

Table 1: Financial indicators of selected stocks

	Market Capitalization (Rs. Crores)	EPS	P/E	P/B	P/S	EV/ EBIT	EV/ EBITDA	ROA (%)	ROE (%)	ROCE (%)
Private Bank										
HDFC Bank Ltd.	5,83,303.95	47.89	21.67	3.33	4.12	6.57	12.71	1.89	16.4	15.27
Energy										
Reliance Industries Ltd.	15,58,987.77	46.76	49.44	3.21	4.65	18.3	29.77	3.54	7.45	8.36
FMCG										
Hindustan Unilever Ltd.	4,93,370.71	29.19	71.73	49.65	12.69	53.42	47.91	36.55	86.11	117.25
Nestle India Ltd.	1,55,218.70	215.78	74.27	67.8	12.49	50.58	48.84	26.01	70.27	98.16
Chemicals										
Pidilite Industries Ltd.	73,877.31	17.14	84.84	16.38	11.68	47.14	57.07	13.88	25.53	33.53
Metal- Non Ferrous										
Hindustan Zinc Ltd.	90,231.69	15.14	14.36	2.2	4.95	7.56	9	15.88	18.41	22.06
Cement and Construction Materials										
Ultratech Cement Ltd.	1,15,586.08	173.03	23.05	2.95	2.83	16.16	16.67	7.73	16.5	12.53
Paints										
Asian Paints Ltd.	1,94,602.05	23.49	86.75	20.14	11.37	45.66	54.86	19.46	29.01	38.1
IT-Software										
HCL Technologies Ltd.	2,15,030.82	35.14	22.55	5.42	6.46	10.29	16.14	20.65	26.48	33.59
Infosys Ltd.	4,24,235.76	37.52	26.54	6.43	5.37	17.69	12.58	19.75	24.98	32.96

Source: Author's computation using the data collected from NSE, yahoo finance, money control.

has the lowest P/E ratio with 14.36 which means an investor is paying Rs. 14.5 for Rs. 1 of current profits whereas Asian Paint Ltd. has the highest P/E ratio with 86.75 which means an investor is paying Rs. 86.75 for Rs. 1 profit. High P/E ratio doesn't always mean stocks are overvalued. From table 1 it can be seen

that P/B values of the entire stocks are more than one which means that all the stocks included in the present study is overvalued. Aziz & Ansari (2014) confirms the value impact in the Indian stock market. He found that value stocks generate higher returns compared to growth stocks. The Hindustan Zinc Ltd. has the lowest P/B ratio of 2.2 and Nestle India Ltd. has the highest P/B of 67.8. As per Price to Sales Ratio (*P/S*) the most suitable stocks is Ultratech Cement Ltd. with 2.83. HDFC Bank Ltd is found to have the lowest EV/EBIT ratio with 6.57 whereas Hindustan Zinc Ltd has the lowest EV/EBITDA ratio with 9. Hindustan Unilever Ltd. is observed to have the greatest return on assets with 36.55% followed by Nestle India Ltd. with 26.01%, and HCL Technologies Ltd. with 20.65%. In terms of ROE Hindustan Unilever Ltd. and Nestle India Ltd. are found to have the highest value with 86.11% and 70.65% respectively. For the variable ROCE also Hindustan Unilever Ltd. with 117.25% and Nestle India Ltd. with 98.16% are the two stocks which have the highest ROCE.

Once the companies are selected it is necessary to select the risk-free funds. For the present study 364-Days T-Bill is selected as the risk-free fund.

Table 2: Expected returns, variances and standard deviations of the stocks and risk-free fund

	AP	HCL	HB	HU	HZ	INF	NI	PID	RIL	ULT	364-D
E(Ri)	1.33	0.87	2.14	1.73	1.30	1.21	1.91	1.72	3.10	0.85	0.51
σ^2	30.69	52.55	234.01	25.51	55.10	53.21	37.23	49.35	355.27	61.20	0.00
σ	5.54	7.25	15.30	5.05	7.42	7.29	6.10	7.02	18.85	7.82	0.05
E(Ri)/σ	0.12	0.10	0.05	0.11	0.09	0.09	0.10	0.09	0.04	0.10	9.95

Source: Author's computation using the data collected from NSE, RBI

From the Table 2, it can be observed that all the assets have positive expected returns. Among the stocks Reliance Industries Ltd. has the highest expected return value of 3.10 as well as the highest standard deviation value at 18.85, while risk-free fund has the lowest expected return value of 0.51as well as the lowest standard deviation value of 0.05. In the last row of table 2 we have Sharpe ratio which measures the performance of stock's premium and risk bearing for the premium. It uses per unit of risk as a reward factor. Higher the Sharpe ratio it is better for the investor. The standard deviation in the table 2 represents the risk.The standard deviation of the portfolio is the weighted average of the standard deviation of the securities in the portfolio only when the correlation is perfectly positive. Diversification will not be feasible if there is a perfect correlation between the assets of the portfolio. From the above analysis it can be concluded that the portfolio standard deviation is less than the assets standard deviation.

To show the effect of diversification on the standard deviation the Table 3 is built as an example of portfolio construction which includes two assets with

highest standard deviation (RIL & HB), portfolio with 3 assets (RIL, HB & UL) and lastly four assets (RIL, HB, UL & HZ). From table 3 it can be interpreted that diversification leads to reduction of risk. The portfolio standard deviation is the weighted average of the standard deviation of the assets in the portfolio only when the correlation is perfectly positive. If there is perfect correlation between assets, diversification may not be possible. From the above interpretation it can be said that the weighted average of the standard deviation of the securities in the portfolio is less than one whenever P<1.

Table 3: Diversification effect

2 Assets Portfolio	W_{RIL}	W_{HDFCB}	Σ_{Wi}	σ_p		
	0.50	0.50	1.00	17.10		
3 Assets Portfolio	W_{RIL}	W_{HDFCB}	$W_{ULTRACEMCO}$	Σ_{Wi}	σ_p	
	0.33	0.33	0.33	1.00	14.67	
4 Assets Portfolio	0.25	0.25	0.25	0.25	1.00	13.23

Source: Author's computation using the data collected from NSE

From Table 3 we can observe that the diversification which aims to minimize the specific risk is confirmed. The first portfolio which consists of two assets has SD of 17.10, the second portfolio which is a combination of three assets has SD of 14.67 and the last portfolio which is a combination of four assets has SD of 13.23. Similarly, for proving the rest of the asset's diversification effect in the portfolio construction the correlation matrix of the selected assets are shown in the Table 4.

Table 4: Correlation matrix

	AP	HT	HB	HU	HZ	IF	NI	PI	RIL	UC	Rf
AP	1.00										
HT	0.08	1.00									
HB	-0.07	0.16	1.00								
HU	0.32	-0.01	-0.04	1.00							
HZ	0.07	0.32	0.06	-0.11	1.00						
IF	0.14	0.60	0.20	-0.09	0.15	1.00					
NI	0.37	0.04	0.05	0.41	0.06	0.05	1.00				
PI	0.60	0.11	-0.07	0.32	0.05	0.12	0.50	1.00			
RIL	-0.02	0.31	0.83	-0.01	0.11	0.26	-0.01	-0.13	1.00		
UC	0.39	0.29	-0.03	0.17	0.37	0.14	0.19	0.41	0.10	1.00	
Rf	-0.01	-0.16	0.02	-0.12	0.17	-0.03	-0.13	0.03	-0.13	0.07	1.00

Source: Author's computation using the data collected from NSE

Based on the table 4 of correlation matrix, it has been observed that all the assets are weakly correlated with one another, with exception of few assets like PI which achieves correlation coefficient with AP at 0.60, IF with HT at 0.60, RIL with HB at 0.83 and lastly UC with PI at 0.41.

The variance of the portfolio is also calculated and is shown in the Table 5 as covariance matrix.

Table 5: Covariance matrix

	AP	HT	HB	HU	HZ	IF	NI	PI	RIL	UC
AP	30.18									
HT	3.11	51.68								
HB	-5.55	17.63	230.11							
HU	8.93	-0.19	-2.79	25.08						
HZ	2.81	16.97	6.40	-4.18	54.18					
IF	5.52	31.20	22.30	-3.30	8.19	52.32				
NI	12.41	1.95	4.93	12.45	2.47	2.12	36.60			
PI	23.13	5.70	-6.93	11.23	2.66	5.91	21.10	48.53		
RIL	-1.58	41.84	234.31	-0.53	15.22	35.79	-1.41	-16.44	349.35	
UC	16.77	16.31	-3.69	6.56	21.40	7.69	8.81	22.12	14.16	60.18

Source: Author's computation using the data collected from NSE

The n stocks and risk-free fund's variance of rate of return is illustrated in the (3):

$$\sigma_p^2 = \sum_{i=1}^{n} w_i^2 + 2\sum_{i=1}^{n=1}\sum_{j=i+1}^{n} w_i\, w_j\, Cov(R_i, R_j) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The variance of the portfolio has been calculated below in order to build the optimal portfolio which includes a similar number of stocks represented in the portfolio. First, the portfolio is designed with equal number of stocks, which means $W_i = W_j$ or $W_{ij} = W^2$ = on the basis of formula (3) the portfolio variance is calculated below:

= (0.09^2*30.18) + (0.09^2*51.68) + (0.09^2*230.11) + (0.09^2*25.08) + (0.09^2*54.18) + (0.09^2*52.32) + (0.09^2*36.60) + (0.09^2*48.53) + (0.09^2*349.35) + (0.09^2*60.18) + (0.09^2*0.00) + (2*09^2*3.11) + (2*09^2*-5.55) + (2*09^2*8.93) + (2*09^2*2.81) + (2*09^2*5.52) + (2*09^2*12.41) + (2*09^2*23.13) + (2*09^2*-1.58) + (2*09^2*16.77) + (2*09^2*0.00) + (2*09^2*17.63) + {2*09^2*(-0.19)} + (2*09^2*16.97) + (2*09^2*31.20) + (2*09^2*1.95) +

(2*09²*5.70) + (2*09²*41.84) + (2*09²*16.31) + {2*09²*(-0.06)} + {2*09²*(-2.79)} + (2*09²*6.40) + (2*09²*22.30) + (2*09²*4.93) + {2*09²*(-6.93)} + (2*09²*234.31) + {2*09²*(-3.69)} + (2*09²*0.02) + {2*09²*(-4.18)} + {2*09²*(-3.30)} + (2*09²*12.45) + (2*09²*11.23) + {2*09²*(-0.53)} + (2*09²*6.56) + {2*09²*(-0.03)} + (2*09²*8.19) + (2*09²*2.47) + (2*09²*2.66) + (2*09²*15.22) + (2*09²*21.40) + (2*09²*0.06) + (2*09²*2.12) + (2*09²*5.91) + (2*09²*35.79) + (2*09²*7.69) + {2*09²*(-0.01)} + (2*09²*21.10) + {2*09²*(-1.41)} + (2*09²*8.81) + {2*09²*(-0.04)} + {2*09²*(-16.44)} + (2*09²*22.12) + (2*09²*0.01) + (2*09²*14.16) + {2*09²*(-0.13)} + (2*09²*0.03)

$\sigma^2 = 17.70$

$\sigma = 4.21$

From the above result obtained it has been observed that the standard deviation of the portfolio which have equal numbers of proportion of assets is lesser than the standard deviation of individual stocks, but not as small as risk-free fund's standard deviation which has 0.05.

The portfolio rate of return is calculated as a weighted average of expected returns of securities in the portfolio. The weights are proportion of securities in the portfolio. The formula for calculating the expected return of portfolio is mentioned below:

$$E(R_p) = w_i E(R_i) + w_j E(R_j) \ldots\ldots w_n E(R_n) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Or generally for *n* securities in the portfolio

$$E(R_p) = \sum_{i=1}^{n} w_i E(R_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Expected return for portfolio with equal stock proportions:

$E(R_p)$ = (0.09*0.64) + (0.09*0.72) + (0.09*0.73) + (0.09*0.56) + (0.09*0.69) + (0.09*67) + (0.09*62) + (0.09*0.66) + (0.09*0.79) + (0.09*78) + (0.09* 51)

$E(R_p) = 0.66$

Based on the aforementioned equation, is the expected return, while *w* represents the proportion. Tags found in subscript *p* indicate portfolio, *i* and *j* indicates securities. Every security has to be assessed on the basis of contributions of expected return and risk of the entire portfolio.

Four portfolio combinations with various asset proportions are calculated. The first portfolio P_1 had equal shares for 10 stocks and 1 risk free fund which was 9.09% shares per asset. There were no restrictions or special aims. P_2 had the aim

to earn the maximum return with a given standard deviation. P_3 had the aim to achieve minimum standard deviation with a given level of earnings. P_4 had the aim to get maximum Sharpe ratio except that it had no further restrictions.

All the portfolios have a common condition for inclusion of every stock participates in portfolio construction:

$$\sum_{i=1}^{n} w_i = 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Short selling was not allowed, so all shares were positive sizes, as follows:

$$W_i = \geq 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Table 4: Portfolio optimization

Portfolios	P_1Equal *Wi*	P_2Max $E(R_p)$	P_3Min σ	P_4MaxSR
Constraining Variables	None	At σ < =	At $E(R_p)$	None
Value of Constraint	N/A	5.05	2.50	N/A
AP	0.09	-	-	-
HT	0.09	-	-	-
HB	0.09	-	-	-
HU	0.09	0.31	-	-
HZ	0.09	-	-	-
IF	0.09	-	-	-
NI	0.09	0.40	-	-
PI	0.09	0.10	0.18	-
RIL	0.09	0.19	0.69	-
UC	0.09	-	-	-
Rf	0.09	-	0.14	1.00
ΣW_i	1.00	1.00	1.00	1.00
$E(R_p)$	1.51	2.05	2.50	0.51
σ_p	4.25	5.05	12.72	0.05
$E(r_p)/\sigma_p$	0.36	0.41	0.20	10.43

Source: Author's computation using the data collected from NSE and RBI

As can be seen in the table 4, P_1 is a starting point in the calculation of the other portfolios. In portfolio P_1 where the weights of assets are equal the expected portfolio return is 1.51 and the standard deviation is 4.25.

Portfolio P_2 achieved standard deviation which is equal to the share which has the smallest deviation, which is HU. HU achieves deviation 5.05 and expected return of 1.73, while P_2 has expected return of 2.05 at the same level of risk. P_2 didn't aim at the deviation of the risk-free fund because it was almost insignificant.

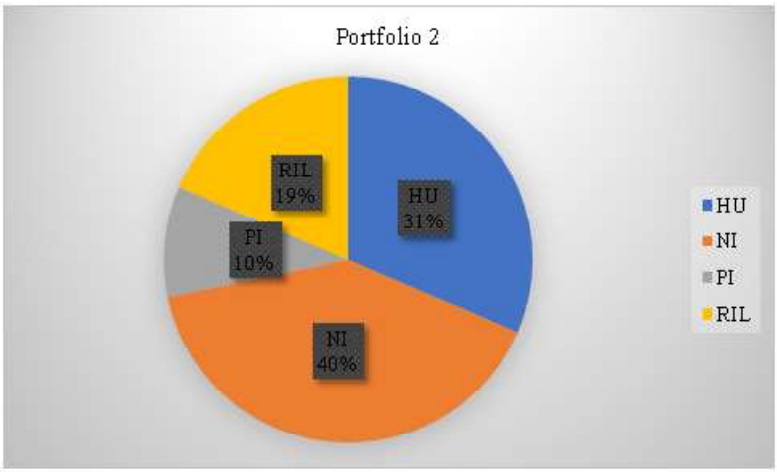

Figure 1: Asset shares in portfolio 2

Portfolio P_3 is a portfolio which has aimed to achieve minimum deviation and set minimum return of 2.50. From the offered assets it is not selected coefficient that achieves maximum return (RIL stock 3.10), because in that case all the assets would be allocated to the stock RIL. In order to achieve a high return, level is determined at 2.50, and at this level P_3 achieves a standard deviation of 12.72.

Figure 2: Assets share in portfolio 3

Portfolio P_4 had the main objective to maximize Sharpe ratio, and has made 10.73 there were no other restrictions. At the maximum of *Sharpe ratio* only one stock was there , the risk-free fund i.e. 365 Days T-Bill. At the maximization of *Sharpe ratio* and portfolio standard deviation of only 0.05, expected return achieves only 0.32.

Of all presented portfolios, portfolio P_2 represents an optimal portfolio and it is taken as the solution of this study. The portfolios are shown as two efficient frontiers.

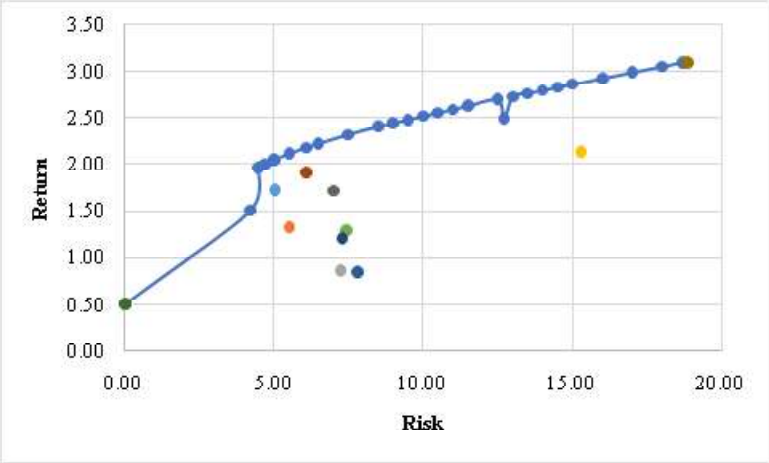

Figure 3: Efficient frontier 1

Figure 3 represents the efficient frontier 1 where two types of assets are included i.e. one is risky assets (stocks) and another one is risk-free asset (T-Bill). Efficient frontier 1 fulfill the objective of the present study in this paper.

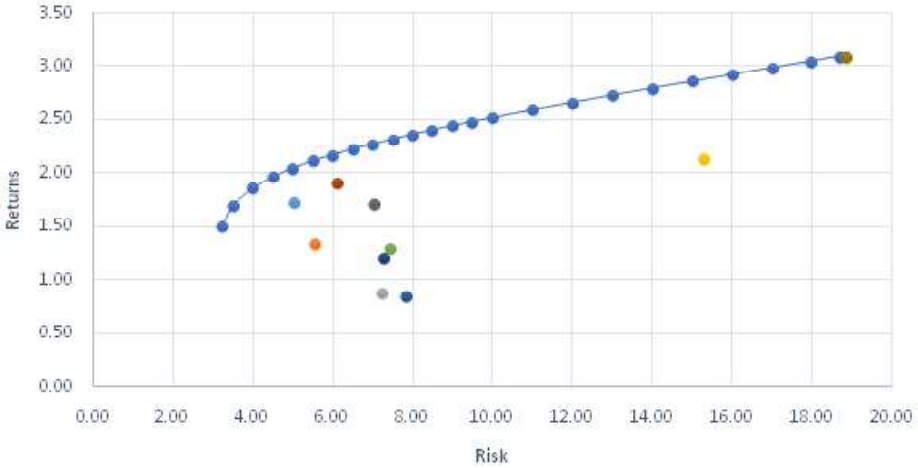

Figure 4: Efficient frontier 2

The collection of portfolios that consist only of risky assets-stocks is Figure 4 which is efficient frontier no. 2. Unlike efficient frontier 1 which consists of risky (stocks) and risk-free (Treasury bill) here in the efficient frontier 2 only risky assets i.e. stocks are included. The prime focused of the efficient frontier 2 is to compare the outcome with frontier 1 and see which one perform better at a certain level of risk. From the analysis it can be seen that frontier 1 risk factor can be as low as 0.05 whereas frontier 2 risk can be 3.24 beyond this point the risk cannot be mitigated. So, from the analysis it can be concluded that efficient frontier 1 which consist of risk-free asset and risky assets the risk can be as low as 0.05 with a return of 0.51, on the other hand efficient frontier 2 which consist of only risky assets the risk can be as low as 3.24 with a return of 1.51. It is up to the investor and his risk bearing capacity to choose any portfolio among the above-mentioned portfolios. As we can see if the investor selected only risky assets portfolio then the risk is very high but the return is very low but if the investor chooses a portfolio from efficient frontier 1 the risk can be very low at 0.05. For the present study we found our optimal portfolio on the efficient frontier 1 i.e. Portfolio number 2 which gives us the best return of 2.05 at a risk of 5.05.

Conclusion

Portfolio building as well as management is a very complicated job. An optimal portfolio lies in hand of an investor who will decide about the time period of investment. It may be short-term which is less than a year or may be long-term which is beyond one year; the maximum risk that he can bear; determining the right amount of money for the portfolio; right selection of assets; then allocation of assets, etc. The whole process of building an optimal portfolio is not an easy task as first it is necessary to decide about the risk and time period of the investment, then the right allocation of funds. An aggressive investor prefers to earn return at a higher risk so he will invest most of his funds in equity stocks rather than other types of assets whereas a conservative investor will invest most of his funds in low risk assets or risk-free assets which will generate a certain level of return at a very low risk.

The main aim of the present study was to construct an optimum portfolio in the Indian stock market which it achieved with the help of 10 equity stocks and one risk-free asset. The return of all the portfolios is higher than the Indian market average returns except one portfolio i.e. maximum Sharpe ratio portfolio. For the present study NSE Nifty 50 index was selected which consist of 50 stocks but finally 10 stocks selected as the sample of the study. These 10 stocks are shortlisted on the basis of their sound financial performance and fundamental financial performance and rest 40 stocks were rejected due to their weak performance. Selecting stocks through fundamental analysis and financial analysis is the best because it will help an investor to select the sound stocks for better returns at a

certain level of risk. The present study constructed an optimal portfolio with two different types of assets. The first asset for the optimal portfolio is company stock which will generate high return at high risk and second asset is 364-Days Treasury bill as a risk-free fund. The Treasury bill will generate fixed returns for the long term and which will help to reduce the risk of the portfolio. The present study can be used as a good base for future research in the field of modern portfolio theory.

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Causal Relationship Between CNX Bank Nifty Index & CNX Nifty Index

SHAILESH SINGH THAKUR AND D.D.BEDIA

Abstract: The study is an attempt to ascertain the long run and short run relationships between the movement of Nifty 50 and Bank Nifty indices of India for the period April 2015-March 2020 (daily closing values) by establishing a Vector Auto Regressive model between the series. The causality was checked by applying Granger Causality test and Orthogonal zed Impulse Response Functions was also applied to know the impact on one standard deviation change on each other. The tests showed the short-range relationships between the variables and granger causality was also found.

Key Words: Vector Auto Regressive Model, ADF, D-W test, CNX Nifty, CNX Bank Nifty, OIRF, WALD Granger Test.

Introduction

The present study attempts to empirically investigate the causal relationship between CNX Bank Nifty and CNX Nifty by analysing the impact of movement of CNX Nifty on CNX Bank Nifty or vice versa. Bank Nifty Index is positively correlated with the movement of Nifty in both bear and bull phase of market movements. The Leading and lagging behavior of Bank Nifty helps in measuring the weakness or strength of the trend of Nifty or vice versa (Prasanna, 2011). Hence, this gives the idea to check the long term and short-term relationship of both the time series namely Nifty and Bank Nifty with the use of VAR model. The similar procedure was applied by Sreekanth, &Veni, (2014)while examining the causal relationship between gold price and nifty–an empirical study in Indian context using the VAR Model. In the current study, the movement of both the indices of India for the period April 2015-March 2020 (daily closing values) was recorded to ascertain the long run and short run relationships. The econometric tools employed to study the relation included the Vector Auto regression model between the variables and Wald Granger Causality test. VAR (1, 1) methodology was applied to determine the short run relationships between the variables and

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Wald Granger Causality test was applied to check the Granger Causality between them (Hurvich, & Tsai, 1993). Problem of serial auto correlation was checked through Durbin Watson values. Augmented Dickey-Fuller unit root test was applied to remove the trend in the series. Orthogonal zed Impulse Response Functions graph (OIRF) was also plotted to check the impulse response viz one S.D. change in the movement of CNX Nifty brought change in CNX Bank Nifty. The results of the study revealed that the closing values of the Bank Nifty Index depended upon the closing value (lagged) of the Nifty Index as well as the lagged value of the Bank Nifty Index. Whereas the closing value of the Nifty Index depended upon the lagged value of the Nifty Index but did not depend upon the values of the Bank Nifty.

The CNX NIFTY 50 is the popular diversified equity index of NSE (National Stock Exchange) that comprises of 50 stocks from 13 sectors of the Indian economy (Table 1). It is a free float market capitalization Index. The index is used for the purposes of benchmarking of fund portfolios particularly for mutual funds, index-based derivatives, and index-based funds.

Table 1: Sectorial representation of Nifty index

Sector Representation	Approx Weighted %	Sector Representation	Approx Weighted %
Financial Services	40.39%	Pharma	2.15%
Energy	14.38%	Telecom	1.84%
IT	13.71%	Cement	1.74%
Consumer Goods	10.66%	Fertilizers	0.72%
Automobiles	5.71%	Services	0.67%
Construction	3.99%	Media& Entertainment	0.42%
Metals	3.61%		

Table *2:* Weightage of individual banks on bank Nifty

Bank Name	Approx Weighted %	Bank Name	Approx Weighted %
Axis Bank	8.193	IDFC First Bank	0.723
Bandhan Bank	2.658	IndusInd Bank	1.992
Bank of Baroda	1.324	Kotak Mahindra	17.473
Federal Bank	0.633	PNB	1.869
HDFC Bank	38.494	RBL Bank	0.441
ICICI Bank	15.715	State Bank of India	10.484

Bank Nifty Index is an important index which includes most liquid and large capitalized Indian banking stocks. The index was first launched in the year 2003.

The index provides the investors a benchmark that postulates the capital market performance of Indian banking stocks. It comprises twelve stocks from the Indian banking sector (Table 2).

Review of Literature

Eltony, (2001) estimated a vector auto regression model (VAR) and a vector error correction model (VECM) to examine the impact of oil price fluctuations on almost seven key macroeconomic variables for the Kuwaiti economy. The researcher tested quarterly data for the period 1984–1998. Sun, et al. (2010) tested the degree of different effects of monetary policy shock on different aspects of banks' balance sheets (deposits, loans, and securities) across bank categories such as aggregate banks, state banks, and non-state banks as well as on macroeconomic variables such as output, consumer price index, exports, imports, and foreign exchange reserves. They estimated VAR/VEC Models to discover the effect of China's monetary policy. They used monthly aggregate bank data and disaggregated data on bank and loan types from 1996 to 2006. Through VEC Models they uncovered the long-run relationships among the indicators of monetary policy, bank balance sheet variables and the macroeconomic variables in China. Prasanna (2011) found that the CNX bank nifty index performance in stock market shows the condition of Indian banking sector. They studied the banking index using bivariate GARCH (1,1) model for both CNX bank nifty and nifty futures values and found the long run relationships between them. Subha, &Musthaffa, (2014) studied the relationship between the future prices of the banking stocks with the changes in their underlying stock values. Sinha, (2015) analyzed the impact of derivative values of CNX Nifty on spot prices of the scripts constituting nifty, they used GARCH (1,1) model to assess the impact. Baumöhl, &Výrost, (2010) performed Granger causality analysis on stock market indices from various Asian, European, and U.S. markets. They used the daily data and found the causal relationship among them.

Research Methodology

The empirical part is focused on analysing the impact of movement of CNX Nifty Index on CNX Bank Nifty Index closing values traded on national stock exchange or vice versa. For the analysis purpose the researchers have used the daily closing value of the selected index data for the period from 01 April 2015 to 31 March 2020. To solve the purpose, a VAR(p) model for the selected data (bi-variate series) has been established.

Overall, we have 1233 observations for the abovementioned period. As dependent variable we have selected CNX Nifty Index against the CNX bank Nifty Index closing values. Correlation between Index values were examined through

correlation matrix; the results are shown in Table 3.

Table 3: Correlation matrix

	CNX Nifty Index	CNX Bank Nifty Index
CNX Nifty Index	1	0.905
CNX Bank Nifty Index	0.905	1

The results show that the closing values of index have positive impact on each other. So, when the CNX Nifty Index value is increasing, the CNX Bank Nifty Index values are also increasing or vice versa. To further examine the real impact on CNX Nifty on CNX Bank Nifty Index VAR analyses of each endogenous variable has been performed.

Data Analysis

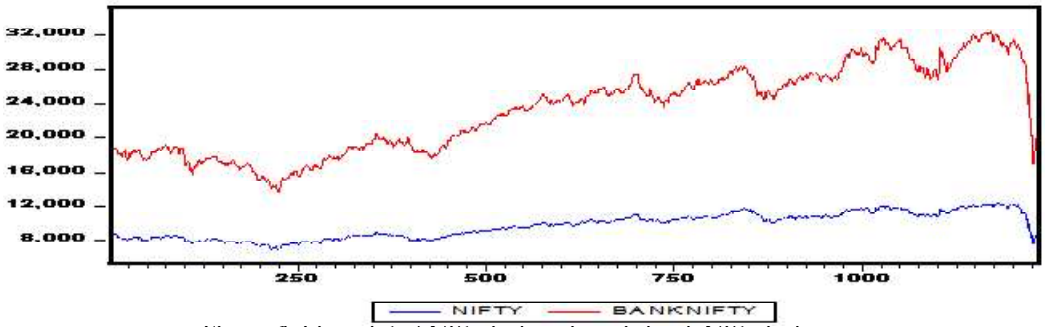

Figure *1:* Line plot of Nifty index vis a vis bank Nifty index

Table 4: Test for stationarity

Variable and Level	Test Applied	Lags	No of Obs.	p value	Results	Interpretation
Nifty	ADF	22	1233	0.4597	Presence of Unit Root	Series Non-Stationary
Bank Nifty	ADF	22	1233	0.7028	Presence of Unit Root	Series Non-Stationary
D1.Nifty	ADF	22	1233	0.000*	No Unit Root	Series Stationary
D1.Bank Nifty	ADF	22	233	0.000*	No Unit Root	Series Stationary

ADF = Augmented Dickey-Fuller Test, D1- Level variables at first difference, *Significant at 5% Critical Level

Results and Discussions

Augmented Dickey-Fuller unit root tests was applied to assess the stationarity and remove the trend in the series.

Tests for Stationarity of Series – Overall Sample 1233 (Daily Obs from April 2015 to 31 March 2020)

As evident from the results obtained from the Augmented Dicky Fuller (ADF) test, the Nifty Index and Bank Nifty Index are both non stationary time series. However, both the time series found stationary at first order difference. To establish a valid VAR model the series has been converted to stationary at first order difference without any trend.

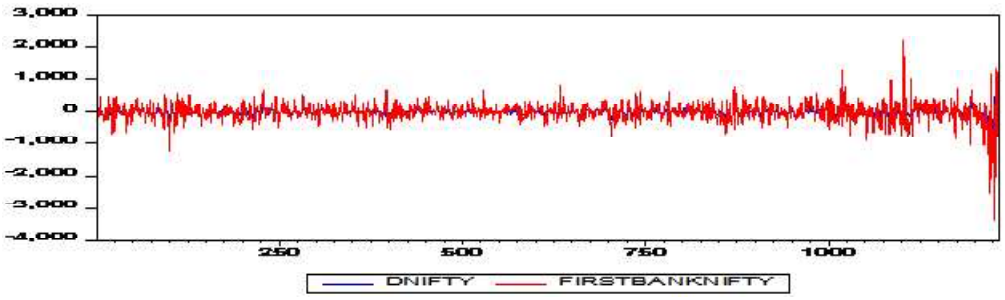

Figure 2: Line plot of Nifty Index vis a vis Bank Nifty Index after first order differentiation

Selection of Optimal Lag Order (overall sample)

Table 5: Lag Length Criteria

Lag	LL	LR	FPE	AIC	SC	HQ
0	-15108.99	NA	1.81e+08	24.69116	24.69951*	24.69430
1	-15104.38	9.186793	1.81e+08	24.69017	24.71522	24.69960
2	-15099.87	8.997010	1.81e+08	24.68933	24.73107	24.70504
3	-15098.25	3.221704	1.82e+08	24.69321	24.75166	24.71521
4	-15095.85	4.762169	1.82e+08	24.69583	24.77098	24.72411
5	-15083.56	24.34643	1.80e+08	24.68230	24.77414	24.71686
6	-15058 .19	50.21043	1.73e+08	24.64737	24.75591	24.68822 *
7	-15052.48	11.27314*	1.73e+08*	24.64458 *	24.76982	24.69171
8	-15050.80	3.326342	1.74e+08	24.64836	24.79030	24.70178

• indicates lag order selected by the criterion

LR:sequentia l modified LR test statistic (each test at 5% level) FPE:Final prediction error

AIC:Akaike information criterion SC:Schwarz information criterion

VAR Lag Order Selection Criteria

Endogenous variables:ONIFTY FIRSTBANK NIFTY Exogenous variables :C

Sample:1 1233,

Included observations :1224

For estimating the VAR model, the best possible lag order in the VAR model must be estimated. Table 5 represents the pre-estimation best possible lag order based on various information criteria. Based on AIC, FPE and LR information criteria, the optimal lag order comes out to be 07 (Asterisked AIC Criteria- Asterisked LR- Asterisked FPE).

Estimating VAR Results

The equation no 1 and 3 represents the standard Vector Autoregressive Model of the proposed study.

Dependent Variable – NiftyIndex

Endogenous Variables – NiftyIndex (with lags 1 to 7) and Bank Nifty Index (with lags 1 to 7)

$$\mathbf{Niftyndex_t} = \mathbf{a_1} + \sum_{i=1}^{7} \boldsymbol{\beta_i}\, \mathbf{NiftyIndex_{t-i}} + \sum_{j=1}^{7} \boldsymbol{\varphi_j}\, \mathbf{BankNiftyIndex_{t-j}} + \cup_{1t} \quad \textbf{.....(1)}$$

Actual Model Equation

The following equation no 2 has been generated with the help of E VIEWS version 10 to solve the VAR Equation.

NiftyIndex = C(1)'NiftyIndex(-1) + C(2)'NiftyIndex(-2) + C(3)'NiftyIndex(-3) + C(4)'NiftyIndex(-4) + C(5)'NiftyIndex(-5) + C(6)'NiftyIndex(-6) + C(7) NiftyIndex(-7) + C(8)'BankNiftyIndex(-1)+ C(9)'BankNiftyIndex(-2) + C(1O)'BankNiftyIndex(-3) + C(11)'BankNiftyIndex(-4) + C(12) 'BankNiftyIndex(-5) + C(13)'BankNiftyIndex(-6) + C(14) BankNiftyIndex(-7) + C(15) .....(2)

Table 6: Descriptive analysis

Observations· 1 225			
R-squared	0.058508	Mean dependent var	-0.124449
Adjusted R-squared	0.047615	S.D.dependent var	101.7924
S.E.of regression	99.33945	Sum squared resid	11940674
Durbin-Watson stat	1.996509		

The above equation no 2 is an equation to set VAR model to estimate the short run impact of Bank Nifty Index on Nifty Index. The seven-lag period was selected as per the lag length criteria applied above. The Durbin Watson test was also applied to check the serial correlation and the value of the DW test is close to 2. Therefore, it can be inferred that the data was not suffering from serial correlation. Accordingly, the significance value of the coefficient could be checked.

Table 7: Significance and value of the coefficients

Sample:9 1233, Included observations:1225, total system (balanced) observations 2450

	Coefficient	Std. Error	t-statistic	Prob.
C(1)	-0.098534	0.067394	-1.462049	0.1439
C(2)	0.146225	0.066864	2.186913	0.0288*
C(3)	0.024262	0.067147	0.361328	0.7179
C(4)	0.038322	0.067013	0.571863	0.5675
C(5)	0.125890	0.067265	1.871534	0.0614**
C(6)	-0.251065	0.067754	-3.705521	0.0002
C(7)	0.117838	0.068406	1.722625	0.0851
C(8)	0.040322	0.021902	1.841031	0.0657
C(9)	-0.031066	0.021876	-1.420098	0.1557
C(10)	-0.007245	0.021924	-0.330463	0.7411
C(11)	0.002014	0.021847	0.092187	0.9266
C(12)	-0.007805	0.021800	-0.358038	0.7203
C(13)	0.032754	0.021922	1.494142	0.1353
C(14)	-0.009328	0.021921	-0.425546	0.6705
a	-0.197809	2.839150	-0.069672	0.9445

*-Sig at 5% critical level, **-Sig at 10% critical level

Table 7 shows the VAR estimations for dependent variable Nifty Index and endogenous variables Nifty Index with lags 1 to 7, and Bank Nifty Index with lags 1 to 7. The sixth lag of Nifty Index with level variable Nifty Index is significant at critical level 1% with minus coefficient while the second lag is significant at 5% percent level with positive coefficient. The first lag of Bank Nifty Index with level variable Nifty Index is not significant at critical level 5%; but at 10% it is significant with positive coefficient while other coefficients are not significant.

Dependent Variable – Bank Nifty Index

Endogenous Variables – Bank Nifty Index (with lags 1 to 7) and Nifty Index (with lags 1 to 7)

$$\textbf{Bank Nifty Index}_t = a_2 + \sum_{i=1}^{3} \beta_i \textbf{ Bank Nifty Index}_{t-i} + \sum_{j=1}^{3} \varphi_j \textbf{ Nifty Index}_{t-j} + \cup_{2t} \ldots (3)$$

The following equation no 4 has been generated with the help of E VIEWS version 10 to solve the VAR Equation.

Equation: BankNiftyIndex = C(16)NIFTYINDEX(-1) + C(17)*NIFTYINDEX(-2) + C(

18)*NIFTYINDEX(-3) + C(19)*NIFTYINDEX(-4) + C(20)*NIFTYINDEX(-5) + C(21) *NIFTYINDEX(-6) + C(22)*NIFTYINDEX(-7) + C(23)*BankNiftyIndex(-1) + C(24) *BankNiftyIndex(-2) + C(25)*BankNiftyIndex(-3) + C(26)*BankNiftyIndex(-4) + C(27)*BankNiftyIndex(-5) + C(28)*BankNiftyIndex(-6) + C(29)*BankNiftyIndex(-7) + C(30).....(4)

Table 8: Descriptive analysis

R-squared	0.050607	Mean dependent var	0.349143
Adjusted R-squared	0.039623	S D dependent var	311.5148
S.E. of regression	305.2809	Sum squared resid	1.13E+08
Durbin-Watson stat	1.997700		

The above equation no 4 is an equation to set VAR model to estimate the short run impact of Nifty Index on Bank Nifty Index. The seven-lag period is selected as per the lag length criteria as applied above. The Durbin Watson test was also applied to check the serial correlation and the value of the DW test is close to 2 which concludes that the data was not suffering from serial correlation also. Hence, the researchers could go ahead for checking the significance value of the coefficient also.

Table 9: Significance and value of the coefficients

	Coefficient	Std. Error	t-statistic	Prob.
C(16)	-0.347773	0.207 109	-1.679177	0.0932
C(17)	0.4789 15	0.205479	2.330727	0.0198*
C(18)	-0.080376	0.206351	-0.389509	0.6969
C(19)	0.224952	0.205939	1.092324	0.2748
C(20)	0.562982	0.206714	2.723481	0.0065*
C(21)	-0.602723	0.208216	-2.894702	0.0038*
C(22)	0.436280	0.210219	2.075358	0.0381*
C(23)	0.154723	0.(7307	2.298771	0.0216*
C(24)	-0.118327	0.067227	-1.760113	0.0785**
C(25)	0.021271	0.067376	0.315704	0.7523
C(26)	-0.017700	0.067138	-0.263628	0.7921
C(27)	-0.081460	0.066994	-1.215921	0.2241
C(28)	0.115711	0.067368	1.717582	0.0860
C(29)	-0.043981	0.067365	-0.652882	0.5139
C(30)	0.357551	8.725014	0.040980	0.9673

*-Sig at 5% critical level, **-Sig at 10% critical level

Sample:9 1233, Included observations:1225, Total system (balanced) observations 2450

Table 9 shows the VAR estimations for dependent variable Bank Nifty Index and endogenous variables Nifty Index with lags 1 to 7, and Bank Nifty Index lags 1 to 7. The second, fifth and sixth lags of Nifty Index with level variable Nifty Index is significant at critical level 5% with positive coefficient. The first and Second lag of Bank nifty with level variable Bank nifty is also significant at critical level 5% with positive coefficient. However, the third lag with negative coefficient is significant at critical level 10%.

Granger causality Wald tests (Overall Sample – Jan 2000 to March 2020)

Table 10: VAR Granger causality/block exogeneity wald tests

Excluded	Chi-sq	df	Prob.
BANKNIFTY Index	7.545872	7	0.3743
All	7.545872	7	0.3743
Dependent variable: BANKNIFTY Index			
Excluded	Chi-sq	df	Prob.
NIFTY Index	31.40863	7	0.0001
All	31.40863	7	0.0001

*-Sig at 5% critical level, **-Sig at 10% critical level

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1 1233
Included observations: 1225
Dependent variable: NIFTY Index

Following to VAR estimations the Granger causality test was run to find out the direction of short run causality between the two variables. The tests indicate that at significance levels of 5%, the Nifty Index granger cause the Bank Nifty Index. The tests also indicate that for the short run, Bank Nifty Index does not granger cause the Nifty Index.

After this the Orthogonal zed Impulse Response Functions graph (OIRF) was also plotted to check the impulse response viz one S.D. change in the movement of CNX Nifty brought change in CNX Bank Nifty.

The Figure 3 represents the post-VAR, Orthogonal zed Impulse Response Functions graph (OIRF) for level variables NIFTY Index and Bank Nifty Index, the endogenous variables. OIRF shows the response of variable after one-unit Standard Deviation impulse shock in the other variable. The upper right-hand quadrant of the graph denoted by Nifty Index on Bank Nifty Index represents the response of Nifty Index on corresponding to One SD shock to impulse variable Bank Nifty Index for a 02 time periods positive (days) and 8 time period negative and at time period 9 it comes to level. It is evident that Nifty Index shock pushes

Bank Nifty Index towards upside in the short-time period (01 days) from 6 to 7 and thereafter pushes it down over negative region for one day and then drags it to normalcy from 8thtime period to 9 time period. The above shock impulse observation is in concurrence to VAR estimation results.

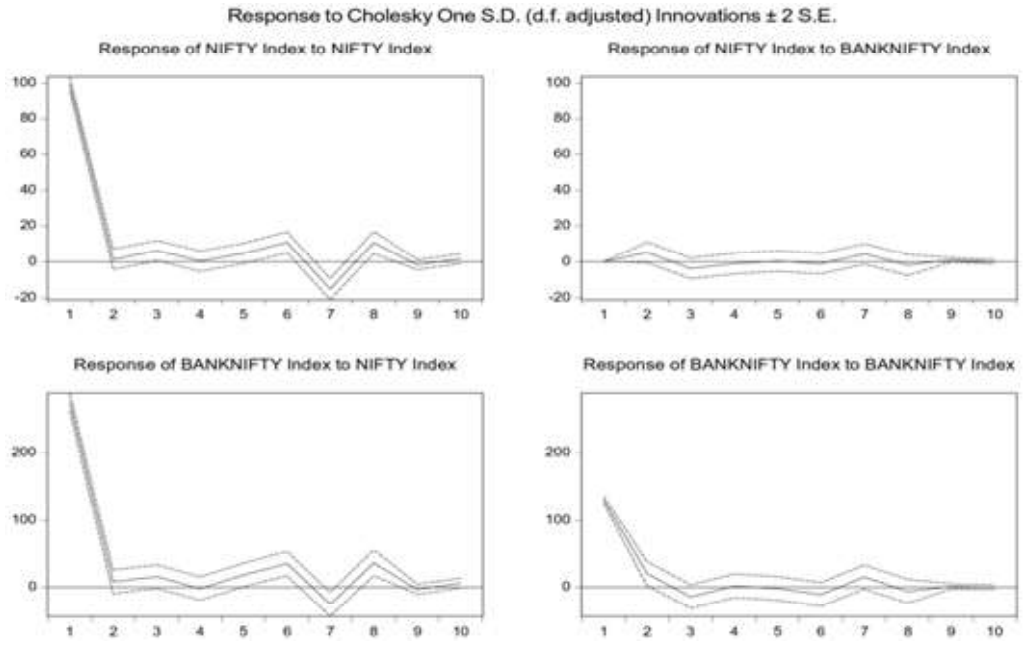

Figure 3: Impulse Response of One SD Shock on Impulse Variable Transferred to Response Variable

Findings

The findings of the study are:

Short term granger causality indicates that closing values of Nifty cause Bank Nifty Index. Short term granger causality indicates that Bank Nifty Index closing values are not causing Nifty Index. The Nifty index is most influenced by itsself-lag in the positive direction. The Bank Nifty index is influenced by the movement of its lag value as well as the lag values of Nifty Index also. A one-unit shock to Nifty Index values negatively impacts Bank Nifty Index, pushing it lower in the short term (2-9 days).

Conclusion and Implications

This study exclusively tests the short-run relationship between Nifty Index values and Bank Nifty Index values. Previous studies have tried to understand either long-run or short-run causality between either individual currency exchange rates

and oil prices or with the coupling of Indian Stock indices with other countries stock indices particularly US Stock market or European Stock Market, and thus there is obvious causality found among them because of the integrated financial market behavior. Our results are consistent with those of Prasanna (2011). Their study confirms that there is a long run association between the spot and futures prices of CNX BANK Nifty and CNX NIFTY future prices therefore returns exist for both the index futures. As evident from the review of the literature most of the study were performed on the impact of future derivative prices on the spot prices of the Bank Nifty Index or CNX Nifty Index, the present study is uniquely designed to assess the impact of CNX Bank nifty Index closing value over CNX Nifty Index closing value or vice versa.

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Dividend Payout and Volatility in Share Price of Indian Commercial Banks

KAPIL SHARMA AND J .K. JAIN

Abstract: This research attempts to study the interaction between level of dividend payment and volatility in the price of shares of Indian commercial banks. 10 public and 10 private sector Indian commercial banks whose average market capitalization was highest between 2009 –19 were taken. The variables of the research were dividend yield, dividend payout, share price volatility, growth, firm size, leverage, and earnings volatility. For data analysis Least Square Regression Method was applied. Results show that volatility in the price of shares is largely influenced by dividend payout and size of the firm. Share price volatility was not seen to be influenced due to dividend yield, growth and earnings volatility. Leverage however reported uncooperative association with share price volatility.

Key Words: Dividend Policy, Dividend Payout, Dividend Yield, Share Price Volatility, Indian Banks.

Introduction

Dividend decision deals with deciding upon the proportion of profits that is to be distributed to the equity shareholders. It has a direct bearing on firms other decisions such as financing, investment and liquidity decisions. It is this complex nature of dividend decision that makes it very important. Khan et al. (2011) focused on the importance of dividend decision for managers. It influences the shareholders objective of profit maximization by receiving dividends from the firm on their investment. Thus managers have the crucial task of striking a balance between payout ratio and retention ratio.

Gitman (2006) investors irrespective of their type are very sensitive to stock price movements. It is a very important indicator used by them to decide upon investing or not in a particular firm. Jo and Pan (2009) concluded that dividend payment is one of the parameters available to investors which help them in assessing about the good governance practices followed by the company.

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There are contradicting theories with respect to nature of interaction between dividend payout and volatility in the price of shares. Modiglani & Miller (1961) based on their research argued about in appositeness of dividend policy. They stressed that price of a firms share are not affected by the firms payment of dividends.

Lintner (1959) and Gordon (1962) proposed that investor's first preference is towards cash dividends and there is a linear interaction amongst payment of dividends and share price volatility. Although *Litzenberger* & *Ramaswamy's* (1979) objected this argument and postulated Tax Preference Theory which advocates that investors first choice is always companies with low payout ratio and higher capital gains as cash dividends attract more tax in comparison to capital gains. This is what leads to an inverse association between dividends and share price.

Research done till date, rather than creating a consensus have led to more questions on the issue. According to Allen et al. (1996) despite number of theories the issue of dividends is still one of the toughest questions in corporate finance. Major work done earlier on dividend policies and its association with share price volatility is primarily done in western countries. Not much work is done on this issue in Indian context and particularly with respect to Indian banking industry. Financial sector reforms in India since 1991 have led to major changes in all sectors of Indian economy including banking sector. The parameters on which banks used to make financial decisions prior to 1991 and the parameters they use today are not the same.

Literature Review

As discussed earlier lot of academic work has been done on studying interaction between dividends and share price at different point of time and in different economies. But their findings differed a lot resulting into no common grounds of understanding.

Dividend Policy

Miller & Modigliani (1961) were pioneer in stating that dividends have no bearing on the wealth of share holders. They opined that earning capacity (investment quality) of a firm significantly influences its value. Distribution of dividends results into fall in the price of the share which is equal to dividend distributed per share as on ex-date. Dividends do not have any consequential bearing on the shareholders returns in a perfect market. Black & Scholes (1974) concluded that expected returns and dividend yield are not strongly associated to each other. Further variability in the price of shares of a firm has no relationship with the changes in the dividend policy of the firm. According to Hakansson (1982) where

investors have similar views, market is fully efficient in terms of its time additive utility, dividends do not play a larger role in assessing firm's value. This is because the changes in the price of shares are not a resultant of dividends.

Uddin & Chowdhury (2005) in their study concluded that dividend declaration instead of providing value gain to investors lead to an approximate 20% loss in the value of share which starts thirty days before the dividend is announced and continues up to 30 days after the announcement. Barman (2007) affirmed results of Miller & Modigliani (1961), he supported that irrelevance theory of divided policy holds good only when the idea that every trader in market acts in a rational way and brings rationality to the market along with the assumption of irrelevant information is not accepted.

Lintner (1959) stressed that shareholders always try to mitigate risk, they view anticipated capital gains as uncertain and risky and it is this view of shareholders that cash dividends are always dearer to them in comparison to future capital gains. Firms use high dividend payout to increase the price of their shares and reduce the cost of their capital. Benishy (1961) and Allen, & Rachim, (1996) concluded that investors scrutinize less firms which are smaller in size. This leads to market being less informed about them resulting into their shares being more illiquid and prone to higher degree of price volatility. Gordon (1962) developed valuation models using price of the share in market and dividends. Based on his model he put forward that under prefect market conditions price of the share is influenced by dividend policy adopted by the firm. According to him shareholders attach premium to cash dividends and discount any expected future capital gains as they consider present to be more secure than future. Finally it was concluded that despite conditions of equal IRR and desired rate of return, dividend payout and price of share in market will exhibit a linear relation.

Allen & Rachim (1996) in their research involving companies listed in Australia between 1972 to 1985 came up with result that supported existence of a strong positive relationship between capital structure (debt/equity), volatility in the earning capacity of a firm and the price of its shares in market. Aivazian et al. (2006) focused on the importance of size of firm and its influence on dividend decisions. It was observed by them that size is an important component in dividend decisions. Large size firms are more prone to higher dividend payments (due to their higher level of assets) as compared to smaller size firms (due to their lower level of assets). Barman (2007) in his research indicated that a firms cost of capital increases alogwith increase in the outflow of cash as a result of higher dividend payment. He also added that dividend payment is in linear relationship with the price of firms share i.e. increases with higher payment and decreases with lower payment.

Azhagaiah & Sabari (2008) results were similar to those of Pradhan (2003) where it was established that price of shares in the market were subjected to the direction of payment of dividends by the firm and the level of retained earnings. According to Ahmed and Javid (2009) firm's decision to pay higher dividends are possible only when it has a sound profitability, stable earnings and higher amounts of availability of free cash flows.

Abdul et al. (2010) concluded that indications about underinvestment can be observed if there is a linear relation amongst amount of dividends paid and firms value. They observed that when the value of firm increases it is followed by a reduction in the level of investment, higher dividends and stable leverage. They also concluded that since management of such firms is conservative they look for only low risk projects leaving the balance cash available for shareholders in the form of dividends. Salih (2010) in his research confirmed findings of earlier researchers and opined that firms value is influenced by the amount of dividend distributed and has a significant association with the firms earning capacity, shareholding pattern, and its investment choices. Further payment of cash dividends is always the most preferred choice of the firms. Hussainey, et al. (2011) in his research conducted in UK emphasized on a negative association between dividend payments and variability in the price of shares of a firms. However a direct relationship exists between dividend yield and variability in the price of shares of firms. They finally concluded that firms in order to keep low volatility in their share price pay higher dividends as payout is one of the prime determinants of stock price changes.

Research Methodology

Objectives

- to examine influence of dividend payments and dividend yield on share price volatility of Indian commercial banks.
- to assess influence of earnings volatility, growth, size of the firm and leverage on share price volatility of Indian commercial banks.

Data Collection

10 public and 10 private sector banks whose average market capitalization was highest from 2009 – 2019 were taken. The study period selected covered both recession and post recession period and financial data of banks was collected from 'Prowess' database.

Table 1 : Banks

S. No	Public Sector Banks	Private Sector Banks
1	Allahabad Bank	Axis Bank Ltd.
2	Bank of Baroda	Bandhan Bank
3	Bank of India	Federal Bank Ltd.
4	Canara Bank	HDFC Bank Ltd.
5	Central Bank of India	ICICI Bank Ltd.
6	IDBI Bank Ltd	IDFC Bank Ltd.
7	Punjab & Sind Bank	IndusInd Bank Ltd.
8	Punjab National Bank	Karur Vysya Bank Ltd.
9	State Bank of India	Kotak Mahindra Bank Ltd.
10	Union Bank of India	Yes Bank Ltd.

Variables

A detailed analysis of past work done on the topic helped in identifying following variables:

Dependent Variable

Share Price Volatility (SPV): Rate at which price of share changes for a given time frame (2009 -19) is taken as a proxy for SPV. This method is based upon high, low, open and close prices of shares(s) for multiple period in a time series pattern which handles both opening jumps and movements. The method is more suited for markets which are very active and have greater chances of opening jumps Yang and Zhang (2000).

Independent Variable

Dividend Payout Ratio (DPR): Cumulative cash dividends distributed is divided by post tax net income of each year (2009-19) and resultant is then averaged out.

Dividend Yield (DY): Cumulative cash dividends distributed is divided by market value of each bank at the end of each year (2009-19) and resultant is then averaged out.

Control Variables

Growth (G): The growth factor is measured by the percentage change of assets or market-to-book ratio, which is the market value of equity divided by the book value of equity or equity market value divided by net worth. Titman and Wessels (1988) suggest that equity - controlled firms to invest sub-optimally.

Size (S): Natural logarithm of sales or total sales is the most widely used and in this research natural logarithm of assets is used.

Leverage (L): Debt Equity Ratio is used as a measure for leverage.

Earning Volatility (EV): is obtained by squaring the resultant of EBIT to Total Assets ratio for all the years (2009-19).

Analysis and Discussion

Descriptive analysis of variables are presented in Table 2. Volatility in the price of shares of Indian commercial banks was found to be 81.39% which is very high. The reason that can be attributed to it is the effect of US subprime mortgage crisis, failure of Lehman Brothers, global recession and other related events which had an effect on Indian banking industry also.

Dividend Payout Ratio during the period was 16.41% whereas Dividend Yield was only 2.17 percent. This indicates that although Indian banks did maintain a relatively good dividend payout but it was not translated into good dividend yield probably due to high volatility in share price. Volatility in Earnings was found to be at 4.9%, further Indian banking sector recorded a growth of 37.46% whereas leverage during the same period was 59.57%.

Table 2: Descriptive analysis

Variables	Mean	Median	Standard Deviation
Dividend Payout Ratio (DPR)	0.1641	0.1345	0.2907
Dividend Yield (DY)	0.0217	0.0195	0.0147
Earnings Volatility (EV)	0.0496	0.0375	0.0299
Growth (G)	0.3746	0.6197	2.0973
Leverage (L)	0.5957	0.2792	0.7264
Share Price Volatility (SPV)	0.8139	0.7631	0.3026
Size (S)	4.8137	3.7861	.04471

Model Construction

The research applies model discussed below. Least Square Regression method is used for studying the interrelationship between variations in the price of shares and dividend payout. For this the model used is as follows:

$$SPV = \alpha + \beta_1 DPR + \beta_2 DY + € \qquad \text{Model (1)}$$

Statistical result of association between variables is depicted in Table 3

Table 3: Association between variables (2009-2019)

Independent Variables	Coefficient	P-value
Adjusted R-squared	0.2317	
Dividend Payout Ratio (DPR)	0.0037	0.1407
Dividend Yield (DY)	4.7013	0.0412**
F-statistics	6.3741	
Intercept	0.6846	0.0000
P (F-statistics)	0.0019	

** indicate significance at 5% level

Value of Adjusted R2 is 0.2317 i.e. 23.17%, indicating that share price volatility of Indian commercial banks is described by Dividend Payout Ratio (DPR) and Dividend Yield (DY) up to 23.17% only indicating a low goodness of fit of the model. Thus we can conclude that there are other variables which influence volatility in the price of shares. Share Price Volatility of Indian commercial banks is positively and significantly related to Dividend Yield. However Dividend Payout Ratio is positively but not significantly related.

Schooley and Barney (1994) opined that dividend yield is based upon market price of stock (used as a denominator). It is a better measure than Dividend Payout Ratio which is more of an accounting measure and is subject to easy manipulations. Since Dividend Payout (DP) and Dividend Yield (DY) are closely interrelated to each other using only these two variables leads to the problem of multi – collinearity.

An extensive review of literature helped in identifying that there are other variables which influence dividend payout and changes in the share price. Leverage, firm size, growth and earnings volatility were identified as those variables. In this research they are taken as control variables to limit the problem of multi – collinearity. Thus the model was reworked as follows:

$$SPV = \alpha + \beta_1 DPR + \beta_2 DY + \beta_3 G + \beta_4 L + \beta_5 S + \beta_6 EV + € \qquad \text{Model (2)}$$

Statistical result of association between variables used is depicted in Table 4

Value of Adjusted R2 is 0.6383 i.e. 63.83% indicating that share price volatility of Indian commercial banks is explained by Dividend Payout Ratio (DPR), Dividend Yield (DY), Growth (G), Size (S), Leverage (L), and Earnings Volatility (EV) up to 63.83% only. Thus the goodness of fit of the Model 2 is high. Use of control variables give us results which are contradictory to results given by Model 1.

Table 4: Relationship between variables (2009-19)

Independent Variables	Coefficient	P-value
Adjusted R-squared	0.6383	
Dividend Payout Ratio (DPR)	0.0031	0.0786***
Dividend Yield (DY)	0.6813	0.6613
Earnings Volatility (EV)	1.3571	0.1524
F-statistics	12.426	
Growth (G)	0.0064	0.3391
Intercept	-1.6427	0.0000
Leverage (L)	-0.0017	0.0113**
P (F-statistics)	0.0000	
Size (S)	0.6102	0.0000*

***, **, * indicate significance at 10 %, 5% and 1% level respectively

Results of Model 2 show that independent variable Dividend Payout Ratio significantly influences share price volatility where as Dividend Yield is now insignificant. As far as control variables are concerned leverage is inversely significant with the share price volatility.

However Chin (2008) argued that in short term bad news causes increase in volatility in market price of shares and good news results in decrease. Size was another variable which was found to positively and significantly influence volatility of share price, larger the size of the bank more notable it is in affecting the share price. Analysis also reflected the no-significant interaction between share price volatility, variations in earnings and growth. This supports findings of (Baskin, 1989) however contradicts (Allen & Rachim 1996).

Conclusion

This research aimed to assess level of interaction amongst dividend payout and volatility in the price of shares of Indian commercial banks. The variables of the research were dividend yield, dividend payout, share price volatility, firm size, leverage, growth, and earnings volatility. Least Square Regression Method was used for analysis. The R2 of the model was 0.6383 i.e. 63.83% thus representing a high goodness of fit of the model. The variation in the price of shares of Indian banks during the study period was very high as it was 81.39% a probable cause can be global recession which affected Indian banking industry too. Results reveal that share price volatility of banks is largely influenced by dividend payout significantly. Size of the bank is another factor that influences price of shares.

However investment growth, dividend yield, and earnings volatility had very little effect on share price volatility. Moreover leverage has an inverse interaction with share price volatility.

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Comparative Study of Financial Performance of Equity and Hybrid Public and Private Sector Mutual Fund Schemes In India

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Abstract: The study examines the pecuniary performance of MF schemes. Sharpe, Treynor, Alpha, R^2, Information ratio, beta (β), Standard Deviation ($\acute{o}$), Treynor and Mazuy and Henriksson and Merton model were applied. The results exhibit at individual stage public sector MFS has outperformed in different categories and their sub-categories of equity, hybrid and debt. But, in overall context it has been found there is no significant differences between private and public sector as one fund offset the performance of other. On the other hand the study examines fund managers' ability in terms of stock selection and market timing by applying TM and HM model, ARCH and GARCH (1, 1). Results exhibit that majority of the scheme fund managers have the stock selection ability but assessment of market timing has moved in wrong direction. Comparative analysis result explains that the private sector fund managers are efficient in micro forecasting skill and have aggressive behaviour in terms of stock selection and market timing ability than public sector fund managers. It is also found that no fund manager can excel in both the activities

Keywords : Mutual Fund Schemes (MFs), Financial Performance evaluation, MFs Fund Managers', Net Asset Value (NAV), Financial Measures and Ability Model

Introduction

With the development of financial markets, diverse investment instruments have also proliferated along with it. Such instruments have provided an ample scope for the investors to affect multiple investments and enable them to earn reasonable returns with minimum risk. Mutual funds are such investment vehicles which have reformed the entire investment world. *(USSEC, 2010).* According to SEBI 1993 - "Mutual Fund means a fund established in the form of a trust by a sponsor to raise money through the sale of units to the public under one or more schemes for investing in securities in accordance with these regulations".

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One of the main reasons of not having substantial growth in mutual fund industry is lack of awareness and trust on policymakers and companies among investors. *Panda. and Tripathy (2002); Singh and Chander (2004); Desigan (2006); Parihar et al. (2009); Pandey (2011).*

Review of Literature

Risk measurement is considered an important tool to judge the performance of mutual funds. Markowitz (1952) & Tobin (1958) suggested risk measure in terms of variability of returns. Treynor (1965), Sharpe (1966) and Jensen (1968) compared the returns of professionally managed portfolios to that of some standard benchmark. Cumby & Glen (1990) and Lahbitant (1995) found funds under performing their benchmark. Firth & Zou, H. (2010).found the number of efficient funds higher in the year 2003 than in 2001 and 2002. Sawickiand (2000) use both conditional and unconditional, whereas Jensen's measures, as well as Treynor and Mazuy's market timing model examine the performance of MFs andfound weak evidence of positive performance and negative market timing performance.

However, it is claimed that by incorporating lagged information variables in the model conditional model looks better. Cuthbertson et al. (2010) examined market timing and security selection of German Equity Mutual Fund by using the false discovery rate (FDR) and Fama-French three-factor (3F) model. The study founds less than 1% of fund sexhibited positive alpha performance and 27% showed negative alpha performance andmajority mutual fund schemes displayed zero-alpha performance. Leite and Cortez (2009), Kour et al. (2011), Gudimetla (2015), Tan (2015) and Blake et al. (2015) also found no evidence of selective ability and market timing ability. Chander (2000) found the funds out performed while Singh & Singla (2000) found that funds under performed their benchmark, and Gupta (2001) found mixed results. Galagedera & Silvapulle (2002) found that funds were efficient in the long term. Gupta & Gupta (2004) and Rao et al. found funds outperforming their benchmark. Kumar & Adhikary (2015) found tax saving MFs has outperformed as compared to its market return and the performance of public sector tax saving MFs are not satisfactory. Ojha (2017) found majority of the schemes are giving less return than benchmark. Tripathy (2017) found performance persistence of mutual fund schemes are not evident in the market. Satish & Shakti (2016), Nala & Gautami (2018) found mutual fund return has direct relationship with benchmark return, and market timing Pathak (2018) ELSS fund has outperformed than benchmark

Prasad & Srinivas (2012) indicated that fund managers are successful in timing the market byrepining returns more than the market. Muruganandan (2013), Padmasani. (2013), Dhar,&Mandal (2014), Choudhary and Chawla (2015) found that the fund managers havefailed to time the market and registered negative selection ability. Kumar (2016) assessedthe performance of 51 mutual fund

schemes and found that Indian fund managers are having strong stock picking ability but unable to time the market. The study concludes that fund returns are sensitive to market actions. Pandow (2016) found the majority of fund managers have shown superior timing performance. Tripathy (2017) founds that the performance persistence of MFs is not evident in the market. If funds own pastperformance is compared, about 36% of the funds displaying this trait. Some studieslike Bollen & Busse (2001), Jiang and Yu (2007), Huang & Wang (2010) and Cao & Lo (2011) are the exception to the literature in the evaluation of the performance of fund managers who found significant market timing ability

Objectives of the Study

- To examine and compare the performance of open-ended mutual fund schemes for the private and public sector.
- To make a comparative analysis of mutual fund managers' stock selection and market timing ability for the private and public sector.

Hypotheses of the Study

H_0: There is no significant difference in the performance of open-ended equity mutual fund schemes between private and public sector.

H_0: There is no significant difference between private and public sector mutual fund managers' stock selection and market timing ability.

Methodology

The study is purely based on secondary data and the study focus to examine the performance of mutual fund schemes for this data has been collected from CRISIL database (CMFRF), RBI, NSE and different journal and magazine.

Table: 1: Variable description:

Sl.No	Variables	Definition	Source and Year	
1.	R_p	Return of portfolio	Daily NAV of selected schemes is drawn CRISIL database from 1st April 2013-31st March 2018.	
2.	R_f	Risk-Free return	91 days Treasury bill weekly return is taken from RBI website from 1st April 2013 to 31st March 2018 (average - 7.48%). After that convert weekly data into daily by taking the average of week and divide by 365.	
3.	R_m	Return of Market	Equity Categories	Nifty 500
			Hybrid Categories	Aggressive Hybrid: 65% of Nifty 50 and 35% of CRISIL Composite Bond Fund Index
				Conservative Hybrid: 75% of Nifty 50 + 25% of CRISIL Composite Bond Fund Index
4	Return calculated = (Closing value- Opening Value/Opening Value)*100			

Table 2: Econometrics statistical model and methods employed

Sl. No.	Objectives	Tools Used	Software used for Analysis
1.	Financial Performance of Mutual Fund Schemes between private and public sector	Risk and Return: Sharpe measure (SR) and Treynor measure (TR) Jensen Alpha (á): Stock Selection Ability R-Squared (R^2): Correlation between Fund and Benchmark Return Information Ratio: Measure portfolio return over benchmark return Beta (β) and Standard Deviation (σ): Measure Volatility and intensity of risk.	Microsoft Excel 2010
2.	Fund Manager ability in stock selection and Market Timing	Treynor & Mazuy and Henriksson & Merton Model by apply ARCH, GARCH (1,1)	Strata 12.0

Table 3: Description of measures and model

Sl. No	Measures	Description	Interpretation	Formula
1.	Sharpe Ratio	Sharpe ratio indicates excess return over the risk free return. It measures total risk associated with fund	The higher Sharpe indicates higher relative to amount of risk taken	$RVAR_p = \frac{R_p - R_f}{\sigma_p}$
2.	Treynor Ratio	Treynor ratio is similar to Sharpe ratio. It also measures excess return over the risk free return but it measures only the market (systematic) risk associated with fund through β	A higher Treynor ratio indicates better fund performance gives higher return with lower market risk of fund.	$RVOL_p = \frac{R_p - R_f}{\beta_p}$
3.	Jensen Alpha Ratio	Alpha measures the gap between fund's actual return and expected return through measuring β. It examine adequacy of	Higher alpha shows better fund performance correlates to the market due to fund manager wise decision through measuring systematic risk.	$RVOL_p = R_p - [R_f + b_p (R_m - R_f)]$

Contd...

Contd...

		portfolio diversification		
4.	Beta (β)	Beta is fairly used to measure the market risk (systematic risk). It indicates the level of volatility associated with the fund as compared to benchmark or stock market	Beta > 1 = High riskyBeta < 1 = Low riskyBeta = 1 = Average.	$\text{Beta } (\beta) = \frac{\text{Covariance of Index and Stock return}}{\text{Variance of Index return}}$
5	R-Squared	R-Squared (R^2) measures the correlation between fund's movement and benchmark index return. It describes the fund's volatility and market risk.	R–squared values ranges between 0 and 1, whereas 0 represents no correlation and 1 represents full correlation	$\text{Correlation} = \frac{\text{Covariance of Index and portfolio return}}{\sigma \text{ of portfolio return} \times \sigma \text{ of Index return}}$
6	Standard Deviation (σ)	σ Measures the total risk associated with fund. Itevaluate the volatility by measuring the degree to which fund fluctuates in relation to its mean return	Higher σ shows more volatile fund and vice versa. Hence lower should be good and safe i.e. near to its mean return	σ = Square root of variance
7	Information Ratio	Information ratio measures the portfolio return over the benchmark return through tracking error	Higher information is better.	$\text{Information Ratio} = \frac{\text{Active Return}}{\text{Tracking Error}}$

Result and Discussion

The financial performance of equity category schemes are examined and compared among ten categories of equity mutual fund schemes. The Table 4 demonstrates that public sector 'SBI blue chip fund has outperformed because it gives highest return with relative amount of risk taken i.e. total risk and systematic risk. As per TM model no fund manager has stock selection ability in term of á

but 2 schemes fund managers are ICICI Bluechip fund & UTI Mastershare unit scheme have market timing ability in term of gamma.

Large Cap Funds

Table 4: Comparison of financial performance and fund managers' ability of large cap funds

Sector	Private		Public	
Measures and Model	ICICI Prudential Blue-chip Fund – Growth	Axis Blue-chip Fund – Growth	SBI Blue Chip Fund	UTI Mastershare Unit Scheme– Growth
Financial measures				
AAGR	17.84	16.04	19.21	16.14
Sharpe	0.0535	0.0471	0.0605	0.0467
Treynor	0.0508	0.0451	0.0578	0.0443
Alpha	0.0091	0.0037	0.0148	0.0029
R-Squared	0.9429	0.929	0.9348	0.9461
$\hat{A}_p$	0.9299	0.9176	0.8858	0.9098
Treynor and Mauzy (TM) model				
Alpha (á)	-0.00228 (.725)	0.003995 (.576)	0.010689 (.094)	-0.00031 (.956)
Beta (â)	0.937931 (0)	0.922022 (0)	0.888766 (0)	0.001837 (0)
Gama (ã)	0.008892 (0)	-0.00127 (.591)	0.906401 (.525)	0.005165 (.001)

Large and Mid-Cap Funds

The comparative analysis of financial performance from Table 5 indicates that in the private sector Aditya Birla Sun Life Equity Advantage Fund regular plan is performed well because it gives highest return but it is more volatile fund because its beta is relatively high. In the overall context public sector Canara Robeco Emerging Equities - Regular Plan has outperformed in all the financial performance parameters i.e. it yields the highest return in terms of both per unit of total risk (SR) and market risk (TR), portfolio diversification (á) is efficient and more positively correlates (R2) and produce excess return than benchmark.

On the other hand as per TM model fund managers' ability indicates that á value 2 schemes of private (DSP Equity opportunity & Aditya Birla Advantage fund) & public (Canara Robeco Emerging equities & SBI large & Mid Cap) are statistically significant at 5% level of significance which means following schemes fund manager have stock selection ability (micro forecasting skill) and as per gamma (y) value only Franklin India equity fund (private) have market timing ability (macro forecasting skill) and private sector fund manager is efficient in market timing ability at macro level.

Table 5: Comparison of financial performance and fund managers' ability of large and Mid-cap funds

Sector	Private			Public		
Measures and Model	DSP Equity Opportunities Fund - Regular Plan– Growth	Aditya Birla Sun Life Equity Advantage Fund - Regular Plan – Growth	Franklin India Equity Advantage Fund – Growth	Canara Robeco Emerging Equities- Regular Plan – Growth	SBI Large and Midcap Fund - Regular Plan – Growth	UTI Core Equity Fund – Growth
Financial Measures						
AAGR	21.39	24.21	19.37	32.73	21.6	17.07
Sharpe	0.0614	0.0665	0.0603	0.0904	0.0643	0.0503
Treynor	0.059	0.0653	0.0589	0.0964	0.0627	0.048
Alpha	0.0181	0.0251	0.0154	0.0519	0.0205	0.0062
R-Squared	0.9198	0.8843	0.8914	0.7494	0.8956	0.9353
β_p	1.004	1.0363	0.8594	0.9374	0.9481	0.9037
Fund manager ability Treynor and Mauzy (TM) model						
Alpha (α)	.0216 (.017)	0.0387 (0)	0.0036 (.637)	0.0936 (0)	0.0359 (0)	0.00594 (.394)
Beta (β)	0.9981 (0)	1.015056 (0)	.86116 (0)	0.90347 (0)	0.9375 (0)	0.9091 (0)
Gama (γ)	-0.00266 (.458)	-0.01154 (.01)	-0.00596 (.038)	-0.0487 (0)	-0.0192 (0)	0.0003 (.933)

Multi Cap Fund

The Table 6 illustrates SBI Magnum Multi-cap fund has outperformed among others selected public sector category fund because it yields the highest 5 years AAGR (22.23%) and evaluation on the basis of Sharpe .0681, Treynor .0656, Alpha .0230 R^2 .9181, â .9372 and ó .9027 on the basis of average return and evaluation of financial performance parameter, SBI Magnum Multi-cap fund has outshined among the selected fund in the public sector fund. But in overall equity multi cap category private sector Aditya Birla Sun Life Equity Fund – regular plan (AAGR is 18.51%, Sharpe .0511, Treynor .0512, Alpha .0093, R^2 .8459 and along with this â .9184) provides the highest return with relatively less per unit of risk taken and its return is more positively closely relate with the benchmark return.

It is evident from TM model 2 schemes of private (Principal Multi Cap growth & Aditya Birla Equity Fund) & 1 scheme of public (SBI Magnum Multi Cap fund) are statistically significant at 5% in stock selection and as per gamma (y) value

of TM none of selected schemes fund manager are statistically significant in market timing ability whereas 2 schemes of private (Principal Multi cap and Reliance Multi Cap) and 2 Schemes of public (SBI Magnum Multi cap & Canara Robeco Equity Diversified) fund managers are negatively significant that means they have ability of market timing but doing in wrong direction along with this 1 scheme of private and 1 scheme of public is in insignificant i.e. they do not have market timing ability. Hence private sector fund managers are more efficient in stock selection and market timingas per TM (á,y).

Table 6: Comparison of financial performance and fund managers' ability of multi cap funds

Sector	Private			Public		
Measures and Model	Principal Multi Cap Growth Fund – Growth	Aditya Birla Sun Life Equity Fund - Regular Plan – Growth	Reliance Multicap Fund – Growth	SBI Magnum MultiCap Fund – Growth	Canara Robeco Equity Diversified- Regular Plan – Growth	UTI Equity Fund – Growth
Financial measures						
AAGR	22.52	23.6	18.51	22.23	16.19	17.83
Sharpe	0.0614	0.0701	0.0511	0.0681	0.0425	0.0539
Treynor	0.0591	0.0673	0.0512	0.0656	0.0406	0.0515
Alpha	0.0195	0.0254	0.0093	0.023	-0.0004	0.0094
R-Squared	0.9206	0.9258	0.8459	0.9181	0.9297	0.9355
B_p	1.0834	0.9677	0.9184	0.9372	1.008	0.9037
Fund Manager Ability Treynor and Mauzy (TM) model						
Alpha (α)	0.03461 (0)	0.026526 (0.001)	0.019139 (0.114)	0.034902 (0)	0.01311 (0.103)	0.01138 (0.09)
Beta (β)	1.06921 (0)	0.961937 (0)	0.910051 (0)	0.929171 (0)	0.98567 (0)	0.909606 (0)
Gama (γ)	-0.02178 (0)	-0.005 (.245)	-0.01431 (.007)	-0.01574 (0)	-0.01755 (0)	-0.00143 (.657)

Mid Cap fund

Comparative analysis of Table7 portrays in private sector Franklin India Prima Fund (AAGR 27.56%, Sharpe .0907, Treynor .0931, Alpha .0423, R^2.8086, â 0.08130) has earned highest return with relative amount risk taken. In overall performance context in the mid cap category public sector SBI Magnum Mid Cap fund has outperformed because it yields higher return with relative amount of per unit of risk premium taken (as per SR and TR) i.e. AAGR 28.23%, Sharpe .0911, Treynor .1016.

Table 7: Comparison of financial performance and fund managers' ability of mid cap fund

Sector	Private		Public	
Measures and Model	Franklin India Prima Fund-Growth	Reliance Growth Fund – Growth	SBI Magnum MultiCap Fund-Growt	Canara Robeco Equity Diversified-Regular Plan –Growth
Financial measures				
AAGR	27.56	21.59	30.49	28.23
Sharpe	0.0907	0.0571	0.0869	0.0911
Treynor	0.0931	0.0574	0.0918	0.1016
Alpha	0.0423	0.0164	0.0466	0.0467
R-Squared	0.8086	0.8423	0.7627	0.6847
B_p	0.813	1.0027	0.9176	0.7715
Fund Manager ability Treynor and Mauzy (TM) model				
Alpha (α)	0.052441 (0)	0.038583 (0.002)	0.074183 (0)	0.072415 (0)
Beta (β)	0.824469 (0)	0.986708 (0)	0.927572 (0)	0.778709 (0)
Gama (γ)	-0.02077 (0)	-0.02536 (0)	-0.04917 (0)	-0.04815 (0)

On the other hand fund manager efficiency examination result reveals that all the selected fund in both private and public sector are positively significant as per á and negatively significant as per gamma (y). This may propound that the fund manager are inclined more towards micro forecasting or stock selection, parallel to macro forecasting or market timing. Hence, performance of both public and private sector are at par.

Small Cap Fund

From the Table 8 it is evident to that in the category of small-cap fund public sector, SBI small cap fund has outperformed almost in all the parameters, it yields highest five years annual average return (AAGR) with a similar amount of risk premium (SR, TR) taken. The portfolio diversification is adequately diversified (á), along with this, fund is able to produce excess return than benchmark index return.

On the other hand the efficiency of selected schemes fund manager are examined through TM model and it portrays that both the selected schemes are positively significant as per alpha and negatively significant as per gamma coefficient @ 5 % level of significance. Therefore, it is apparent that the fund managers of selected schemes are efficient in stock selection (micro) but in market timing ability they are efficient but moving toward wrong direction.

Table 8: Comparison of financial performance and fund managers' ability of small cap funds

Measures and Model	Private Aditya Birla Sun Life Small cap Fund - Regular Plan – Growth	Public SBI Small Cap Fund – Growth
Financial measures		
AAGR	29.4	37.86
Sharpe	0.0871	0.1084
Treynor	0.0944	0.1285
Alpha	0.0474	0.0738
R-Squared	0.7252	0.6066
B_p	0.8896	0.8442
Fund Manager ability Treynor and Mauzy (TM) model		
Alpha (α)	0.095188 (0)	0.076845 (0)
Beta (β)	0.878574 (0)	0.874897 (0)
Gama (γ)	-0.04854 (0)	-0.02705 (0)

Value/ Contra Fund:

Table 9: Comparison of financial performance and fund managers' ability of value/ contra funds

Measures and Model	Private		Public	
	Franklin India Prima Fund - Growth	Reliance Growth Fund - Growth	SBI Magnum MultiCap Fund – Growth	UTI Value Opportunities Fund - Growth
Financial Measures				
AAGR	26.24	30.78	15.71	14.64
Sharpe	0.0728	0.0788	0.0447	0.0401
Treynor	0.0737	0.0862	0.0438	0.0382
Alpha	0.0319	0.0467	0.0024	-0.0027
R-Squared	0.8309	0.7122	0.8875	0.9423
$\hat{A}_p$	0.9767	1.0352	0.8783	0.9273
Fund Manager Ability Treynor and Mauzy (TM) Model				
Alpha (á)	0.048718 (0)	0.07003 (0)	0.014211 (0.097)	-0.00584 (.368)
Beta (â)	0.960325 (0)	0.973131 (0)	0.867114 (0)	0.931295 (0)
Gama (ã)	-0.0256 (0)	-0.04139 (0)	-0.01068 (0)	0.001883 (.395)

Through the outlook of the Table 9 it is evident that in the private sector Aditya Birla Sun Life Pure Valued Fund with AAGR 30.78%, Sharpe .0788, Treynor

.0862, α .0467, R^2 .7122, IR .0792, Beta 1.0352 and ó 1.1321 outreached from other selected fund. whereas in the public sector both selected fund SBI Contra and UTI Value provides very least return in similar to private category are 15.71% and 14.64% respectively and as per IR of both SBI contra and UTI value fund generates negative return similar benchmark index return, as well as the alpha value of SBI contra fund, is positive .0024 but UTI value fund is negative -.0027. Evaluation as per risk and return relationship SBI contra fund is best because its Sharpe is .0447 and Treynor .0401. Whereas, UTI Value Fund its Sharpe is .0401, Treynor .0438. Apart from this UTI Valued fund is more volatile fund â .9273 and ó .8816.is high in comparisons to SBI Contra fund â is .8723 and ó .8605. Therefore, through outlook of all parameters in public category SBI Contra fund is the best.

The efficiency of fund manager (stock selectivity (á) and market timing ability (y)) of value/contra fund are examined through TM model at 5% significance level. In the private sector (Tata Equity & Aditya Birla pure valued fund) are statistically significant in stock selection ability (á) but negatively significant in market timing ability (y). Similarly in public sector as per TM model both the scheme SBI contra and UTI Value Opportunity fund are insignificant in terms of stock selection ability (á) and UTI Value Opportunity fund is also insignificant in market timing (y) but SBI Contra fund manager have market timing ability (y) but moves wrong direction.

Focused Fund

Table 10: Comparison of financial performance and fund managers' ability of focused funds

	Private	Public
Measures and Model	DSP Focused Fund - Regular Plan – Growth	SBI Focused Equity Fund - Regular Plan – Growth
Financial Measures		
AAGR	18.37	20.62
Sharpe	0.0494	0.0699
Treynor	0.049	0.0809
Alpha	0.0076	0.0269
R-Squared	0.8669	0.6369
β_p	0.9547	0.6758
Fund Manager Ability Treynor and Mauzy (TM) Model		
Alpha (α)	0.00149 (.894)	0.060769 (0)
Beta (β)	0.971476 (0)	0.663081 (0)
Gama (γ)	0.005351 (.323)	-0.04116 (0)

In the category of focused fund only two funds are selected for evaluation one from each sector under private sector DSP Focus fund (AAR 18.37%, Sharpe .0494, Treynor .0490, Alpha .0076, R2 .8669, 5ØýÞ .9547) and in public sector SBI focused fund (AAR 20.62%, Sharpe .0699, Treynor .0809, Alpha .0269, R2 .6369, 5ØýÞ .6758). It is found that public sector fund has outperformed by providing high return with less risk premium taken and the portfolio diversification as per market trend is quite efficient and generates excess return than the benchmark and less volatile fund.

On the other hand, as per the TM model private sector (DSP Focused Fund) fund manager is inefficient in both stock selection and market timing ability, whereas public sector (SBI Focused Equity Fund) fund manager is efficient in both activities, model they have stock selection ability in right direction but market timing ability in wrong direction.

Thematic Infrastructure Fund

Table 11: Comparison of financial performance and fund managers' ability of thematic infrastructure funds

Sector	Private		Public	
Measures	Reliance Power and Infra Fund - Growth	ICICI Prudential Infrastructure Fund – Growth	SBI Infrastructure Fund – Growth	UTI Infrastructure Fund - Growth
Financial Measures				
AAGR	19.46	17.81	17.77	17.04
Sharpe	0.0445	0.0416	0.041	0.0374
Treynor	0.0475	0.0426	0.0431	0.0372
Alpha	0.0072	0.0016	0.0022	-0.0046
R-Squared	0.7478	0.8116	0.7702	0.865
B_p	1.12	1.0685	1.0527	1.1676
Fund manager ability Treynor and Mauzy (TM) model				
Alpha (α)	0.045967 (.01)	-0.01176 (.402)	-0.00525 (.744)	-0.01089 (.437)
Beta (β)	1.073393 (0)	1.032449 (0)	1.033968 (0)	1.156712 (0)
Gama (γ)	-0.05415 (0)	-0.00476 (.476)	-0.0055 (.325)	0.001747 (.822)

In thematic infrastructure fund under the public sector, SBI Infrastructure Fund (AAR 17.77%, SR.0410, TR .0431, α .0022, R^2 .7702, 1.027) performed well, and portfolio diversification of UTI infrastructure fund is not efficient as per market condition (α). On the other hand in private sector Reliance Power & Infra fund (AAR 19.46%, SR .0445, TR .0475, α .0072, R^2 .7478, IR .0199, β 1.12) has

outperformed almost all parameter of financial evaluation not only in private but also in public sector by providing highest return with a relative amount of risk premium taken in terms of both total risk (SR) and market risk (TR), and portfolio diversification is quite efficient on the basis of market trend (α) and efficient to generates excess return than benchmark index return (R^2). Here it is found that all selected thematic infra fund takes high risk but not revert return parallel amount risk while the other equity categories funds gives high return with relative less risk premium taken.

On the other hand fund manager analysis exhibit that under the private sector Reliance power & Infra fund manager have skill in stock selection (α) but in market timing ability (y) it has skill but moves toward wrong direction and ICICI Prudential Infra fund is insignificant in stock selection and market timing ability. Whereas in public sector SBI & UTI Infrastructure fund is selected and TM model portrays that the fund manager does not exhibit stock selection ability (á) and move in wrong direction in assessing market timing (y).

Equity Linked Saving Schemes (ELSS):

Table 12: Comparison of financial performance and fund managers' ability of equity linked saving schemes

Measures and Model	Private			Public		
	DFC Tax Advantage (ELSS) - Growth	L&T Tax Advantage Fund – Growth	Sundaram Diversified Equity - Growth	Canara Robeco Equity Tax Saver-Regular Plan-Growth	UTI Long Term Equity Fund (Tax Saving)- Growth	SBI Magnum Tax Gain Scheme- Growth
Financial Measures						
AAGR	23.42	20.52	18.27	16.82	16.59	18.33
Sharpe	0.0708	0.0629	0.0512	0.0466	0.049	0.0528
Treynor	0.0717	0.0604	0.0491	0.0447	0.0465	0.0505
Alpha	0.0271	0.0181	0.008	0.0035	0.005	0.0089
R-Squared	0.8323	0.9257	0.924	0.9258	0.9457	0.9299
B_p	0.8869	0.9374	0.9885	0.9587	0.9118	0.9363
Fund Manager ability Treynor and Mauzy (TM) model						
Alpha (α)	0.0406 (0)	0.0220 (.006)	0.0194 (.019)	0.0132 (.095)	0.0109 (.075)	0.0073 (.332)
Beta (β)	0.8994(0)	0.9337 (0)	0.9800 (0)	0.9446 (0)	0.9166 (0)	0.9368 (0)
Gama (γ)	-0.0189 (0)	-0.0067 (.114)	-0.0090 (.002)	-0.0148 (0)	-0.0051 (.033)	-0.0026 (.477)

In ELSS fund under the public sector SBI Magnum fund Tax gain scheme (AAR 18.33%, Sharpe .0528, Treynor .0505, Alpha .0089, R2 .9299, 5ØýÞ .9363) has performed well. On the other hand in private sector IDFC Tax Advantage fund (AAR 23.42 %, Sharpe .0708, Treynor .0717, Alpha .0271, R2 .8323, IR .0589, 5ØýÞ .8869) has outperformed not only in private but also entire all selected funds in ELSS category funds because it revert high return in both total risks (SR) and market risk (TR) and portfolio diversification is quite efficient based on market trend (á) and efficient to generate excess return than benchmark (IR).

In private sector all selected schemes fund manager have stock selection ability (á) and have market timing ability (y) but moves in wrong direction as per TM model however L&T tax advantage fund manager does not exhibit market timing ability. On the other hand, in public sector all the selected scheme fund managers do not exhibit stock selection ability (á) as per TM and in market timing ability (y) all selected fund are negatively significant as per TM, however SBI Magnum Tax gain scheme fund manager is inefficient in market timing as per TM.

Exchange Traded Fund (ETF):

Table 12: Comparison of financial performance and fund managers' ability of exchange traded funds

Measures and Model	Private			Public		
	Kotak Nifty ETF	Franklin India Index Fund - NSE Nifty Plan- Growth	Reliance Index Fund - Nifty Plan– Growth	SBI Nifty Index Fund - Growth	UTI Nifty Index Fund - Growth	SBI - ETF SENSEX
Financial Measures						
AAGR	14.15	12.97	13.01	12.79	13.62	14.03
Sharpe	0.0383	0.034	0.0339	0.0332	0.0365	0.0387
Treynor	0.0362	0.0322	0.0321	0.0314	0.0345	0.0371
Alpha	-0.0047	-0.0086	-0.0087	-0.0094	-0.0064	-0.0037
R-Squared	0.9531	0.9524	0.9529	0.953	0.9528	0.9275
B_p	0.9765	0.9671	0.9709	0.9728	0.9691	0.944
Fund Manager Ability Treynor and Mauzy (TM) model						
Alpha (α)	-0.0299 (0)	-0.0334 (0)	-0.0339 (0)	-0.034 (0)	-0.0308 (0)	-0.0250 (.001)
Beta (β)	0.9947 (0)	0.9853 (0)	0.9905 (0)	0.9910 (0)	0.9864 (0)	0.9553 (0)
Gama (γ)	0.0211 (0)	0.0207 (0)	0.0207 (0)	0.0203 (0)	0.0204 (0)	0.0201 (0)

The Table 12 delineates that in the private sector Kotak Nifty ETF provides the highest return with parallel least amount of risk taken. In the public sector SBI ETF Sensex fund has outperformed in the public sector as well as in private among all selected exchange traded funds, SBI ETF fund provides highest return i.e. 14.03%, parallel to least level of risk. i.e. $\hat{A}_p$ .944.

On the other hand selected schemes fund managers' potential are examined in terms of stock selection and market timing ability at 5% level of significance through TM model and it was found that - all selected funds managers'are negatively significant in stock selection (á) and positively significant in market timing ability (y).Therefore, it can be stated that the fund manager of selected schemes are efficient in market timing ability (macro) but they are efficient in stock selection (micro) and moving toward the wrong direction.

Test of Significance

Table 13: Overall performance of all categories of equity mutual fund schemes

Measures	Equity Mean		t-test	P- Value
	Public	Private		
Annual Average Return	0.0729	0.0765	-0.9022	0.1886
Sharpe	0.0562	0.0573	-0.3115	0.3792
Treynor	0.058	0.0583	-0.0537	0.4788
Jensen Alpha	0.0144	0.0163	-0.4398	0.3323
R-Squared	0.8652	0.8703	-0.2402	0.4062
Information Ratio	0.0228	0.0374	-1.7366	0.0486

For different categories (equity, hybrid, and debt) of mutual funds, performance measures - Sharpe ratio, Treynor, etc. have been calculated. To compare the overall performance of mutual funds of private and public sectors, the mean value for all schemes under public and private sectors of all sub-categories of each category has been calculated separately. To check the difference between public and private t-test has been applied.

The Table 13 shows that, the P-value of the test statistic for evaluation of the difference in the mean value of each measure of financial performance for all categories is greater than 0.05 (at 95% confidence level). Therefore the null hypothesis has not been rejected. It is apparent to say that "there is no significant difference in the performance of open-ended mutual fund schemes between the private and public sector".

When we individually analyse and compare the performance of different categories of equity, mutual fund schemes, it was found that in different category different sector has outperformed but in overall performance perspective, there is no significant difference between them. This may be because one fund performance offset the performance of others, among themselves.

Conclusion

The financial performance of selected MFs result exhibits that overall performance of both public and private sector is same. The equity category funds are divided into ten sub categories among them public sector schemes have outperformed in 5 equity categories i.e. Large Cap, Large & Mid Cap, Mid cap, Small Cap, Focused Fund, on the other hand private sector schemes is have performed well in 5 equity categories i.e. Multi Cap, Value Contra fund, Thematic Infrastructure fund, ELSS fund, Exchange Traded funds (ETFs), hence the performance winning ratio of both the sector are similar (5:5). When we analysed the specific individual equity categories of mutual fund schemes, in them either public or private sector has outperformed. Apart from this, it is also observed that majority of mutual fund schemes which have outperformed in their categories are less volatile (less risky) except in Equity - Small cap fund (Public-SBI Small cap fund), Value contra fund (Private-Aditya Birla Contra fund) and Thematic Infrastructure fund (Private-Reliance Power & Infra fund) these funds are more volatile because of its category nature. From the analysis the study has found that performance persistence of mutual fund schemes are evident in the market.

On the another hand fund managers' ability performance exhibit that private sector fund managers are efficient in good forecasting skill and have aggressive behavior in terms of stock selection and market timing ability than public sector fund managers. It is also found that no fund manager is equally efficient in both the activities (ability). It supports the arguments of Tripathi (2017). The result also showed that the majority of the schemes fund managers do not exhibit the market timing ability as per the model.On the basis of result of the study it can be concluded that the mutual fund managers in India are not seriously engaged in any market timing activities and relied onlyon stock selection skills, among them private sector fund managers are quite efficient than public sector fund managers.

Implications of the Study

This study has multiple implications. Investors are required to consider some statistical measures Sharpe, Treynor, Alpha, R^2, Information ratio, beta and standard deviation while taking investment decision in MFs to minimize their risk and maximize return. Secondly on the basis of study the conservative

(moderate risk appetite) investors make investment in Large & mid cap fund (Canara Robeco), followed by mid cap (SBI Mid cap) and in multi cap fund (SBI mid cap), on the other hand the aggressive (high risk appetite) investors make investment in Small Cap fund (SBI small fund) followed by focused fund (SBI focused fund). Finally the study provides insights to the MFs fund managers to focus on those schemes which are not performing and to formulate efficient portfolio allocation strategies in a better way to manage fund in broad market movements.

This study is not free from the limitation as it restricted only to take 44 equity schemes NAV for five years, hence the result may lead to certain level of bias. Research is continuous process that provides opportunities for future researchers, however, further research can be carried out by taking more schemes in other category (Hybrid & Debt) along with some other parameters like expense ratio,exit load etc. and researcher may apply DEA techniques, Fama- French three factor models and Carhart four factor models for the analysis.

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Working Capital Efficiency of Pharmaceutical Sector during Economic Situations

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Abstract: The study aims to measure the working capital efficiency, identify the determinants of working capital efficiency of domestic and multinational pharma companies during boom, recession and recovery periods. The paper is based on the sample of top 50 pharma companies listed at BSE consisting of 25 domestic and 25 multinational pharma companies which has been selected on the basis of market capitalization. The study covers a period of 14 years consisting of three economic situations: i) boom Period (2004-05 to 2007-08), ii) recession period (2008-09 to 2009-10), iii) recovery period (2010-11 to 2017-18). The mean working capital efficiency index has been computed by multiplying the mean performance index and mean utilization index. The multiple regression model was tested for auto-correlation and collinearity. The findings of the study suggest that there is no statistically significant impact of the economic situations on the working capital efficiency of domestic companies and multinational pharma companies. The results show that the independent variables have the power to influence the dependent variable i.e. efficiency index. Further in order to enhance the working capital efficiency during the boom and recovery periods, the companies are required to improve sales, reduce the cash conversion cycle, improve the operating cash-in-flows and reduce the current assets during the boom and recovery periods. In the recession period, the companies shall have to depend on higher current assets.

Introduction

Working Capital Management (WCM) has been recognized as grey area of corporate finance (Jain & Godha, 2014).WCM involves the management and control of current assets individually (i.e. inventories, accounts receivables, cash) and collectively. That the prosperity and progress, stability and financial health of a business or industrial organization largely depend upon the efficient management of the various facets of the working capital (Mathur, 2003). Ali & Ali (2012) also stated that WCM refers to applying investment and financing decisions to current assets. Ray (2014) in his study mentions that the share of current assets to total assets varied from 40% to 83%.The current assets in

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manufacturing firms account for over half of their total investment in the business (Raheman, 2007). A small cut in current assets can substantially increase the profitability of the firms because of its twin impact i.e. on one side the holding cost of the current assets shall decline leading to higher profits and on the other side the size of the investments (in denominator) shall reduce. Another study specified that over 75% of the companies that are incurring loss or struggling financially can be profitable and liquid if the WC blocked in current assets is released. Chiou et.al. (2006) demonstrated that many businesses closed due to bad WC management. Perhaps due to such reasons 70%-80% of the time of finance executives' time is consumed by the WC decisions.

The resources available with every country and economic identity are always scarce and costly. Therefore they must be put to efficient utilization in order to attain the objectives of the concern. There are multiple alternatives to augment the efficiency of the organizations. Among these alternatives are: i) to improve the turnover of all the components of the current assets, ii) increase the sales with the available current assets, iii) proportionately reduce all the components of current assets if the sales targets are unachievable because of the charged business environment. Efficient WCM is very important to create value for the shareholders (Abdul et al 2011). Efficient management is also said to be conducive for avoiding the financial difficulties (Ramiah et.al 2014). Besides enhancing profitability and improving firm value, the efficient management of working capital also helps to avoid financial crises (Kaur & Singh, 2013).

Review of Literature

Some studies showed WCM have a significant impact on profitability of the companies. These studies concluded that managers could enhance the profitability of firms by improving the account receivables ratio, inventory turnover ratio and creditors' turnover ratio. (Agha, 2014; Erik. 2012; Quayyum, 2011; and Bagchi &Khamrui, 2012). Other studies examined the relationship between efficiency level of WCM and ROA of the firms. The result of the studies portrayed that there is inverse association between ROA, current ratio, cash conversion cycle and net WC (Nazir & Afza 2009; Sen & Oruc 2009; Ramachandaran & Janakiraman; 2009; Zariyawati et al. 2009; Mathuva 2010 & Quayyum, 2011).

Simon Sunday *et.al.* (2017) also mentions that host of the studies have already recognized WC as a non-focus area. Fewer studies have been carried on the WCM of pharma industry in India especially during different economic situations. The study by Enqvist *et.al* (2014) states that a narrow number of studies link business cycles to working capital. The research study on the Indian pharmaceutical sector which examines the impact of selected variables on the

efficiency index during different economic situation was not found. Therefore the present study aims at filling this gap.

Objectives of Study

The present study has been carried with the following objectives:

- To measure the working capital efficiency of the domestic and multinational pharmaceutical companies during boom, recession and recovery periods.
- To assess the determinants of working capital efficiency of the domestic and multinational pharmaceutical companies during boom, recession and recovery periods.
- To examine the impact of selected variables on the working capital efficiency of the domestic and multinational pharmaceutical companies during boom, recession and recovery periods.

Research Methodology

Universe & Sample Size: The universe of the present work consists of all the pharma companies listed in BSE healthcare sector. A sample of top 50 pharma companies listed at BSE consisting of 25 domestic and 25 multinational pharma companies has been selected on the basis of market capitalization. The study is based on the secondary data which is collected from: Prowess Database, Annual Reports of the respective pharma companies and MoneyControl.com.

The entire secondary data is tested for normality by applying:

a) **Kolmogorov-Smirnov (KS) Test**: The result showed that the values of data of some of the companies justified test of normality of data while the values of data of some of the other companies did not show bell shaped curve**.**

b) **Logarithm:**Because of the non-justification of the test of normality by KS test.The values of the entire data were converted into log values so as to normalize the data.

The study covers a period of 14 years consisting of three economic situations: i) Boom Period (2004-05 to 2007-08), ii) Recession Period (2008-09 to 2009-10), iii) RecoveryPeriod (2010-11 to 2017-18).

Tools of Analysis

A. Financial Tools

Performance Index (PI): Performance index depicts the performance in the management of the sales and current assets over the specified period of time. It is said that if performance index is more then one, the firms have efficiently

managed its working capital. It means that if the proportionate increase in sales is more than the proportionate increase in current assets during a specified period (Bhattacharya, 1997; Ghosh and Maji 2003 & 2004; Kaur & Singh 2013; Kasiran et.al 2015).

$$PI_{WCM} = \frac{I_S \sum_{i=1}^{n} \frac{W_{i(t-1)}}{W_i}}{N}$$

I_S - Sales index defined as $S_t / S_{t-1,}$ W_i - Individual group of current assets - Number of current assets group, and I = 1, 2, 3 …N

Utilization Index (UI): Utilization Index expresses the ability of the company to utilize all current assets for the objective of generating sales. If the increase in all current assets is accompanied by more than proportionate increase in sales , the degree of utilization of current assets with respect to sales stands improved and vice-versa (Bhattacharya, 1970; Ghosh and Maji, 2003 & 2004; Kaur & Singh, 2013; Kasiran et.al 2015).

$$UI_{WCM} = \frac{A_{t-1}}{A_t}$$

Where A = current Assets/sales.

Efficiency Index (EI): EI is the multiplication of PI and UI (Bhattacharya, 1997; Ghosh and Maji, 2003 & 2004; Kaur & Singh, 2013; Kasiran et.al 2015). It is computed by multiplying the PI with UI. Thus the formula for calculating the EI is as follows:

$EI_{wcm} = PI_{wcm} * UI_{wcm}$

B. Statistical Tools: The following statistical tools have been applied to analyze the data obtained from the financial tools:

i) **Multiple Regression:** The following Regression model has been applied as:

$EI_{Boom/recession/recovery} = Intercept + â_1 Sales + â_2 CR + â_3 CCC + .â_4 OCF + .â_5 ROA + â_6 LEV + å$

ii) Collinearity test: The Collinearity test is applied through SPSS. The values of Tolerance and VIF (Variance Inflationary Factor) are calculated for each indicator. The values of tolerance range from 0 to 10.00 and the values closer to 10.00 in the regression tables show less multi collinearity in variables.Variance Inflationary Factor (VIF) should be less than 50.00 (Majeed

et al., 2013).

iii) **Durbin Watson test**: Durbin Watson (DW) test is applied to diagnose first order auto correlation problem. If the value of DW test is closer to 2 then regression model is the appropriate method (Neter, et al. 1996). Problems of high correlation among independent variables are captured through correlation matrix, which remain below the limits in all regression models.

Ms excel and SPSS have been used for the analysis of data.

Hypotheses of Study

$H_{01:}$ There is no significant difference in the efficiency index of domestic and multinational pharma companies during boom/ recession and recovery periods.

$H_{a1:}$ There is significant difference in the efficiency index of domestic and multinational pharma companies during boom/ recession and recovery periods.

H_{02}: The regression coefficients of all the determinants of working capital efficiency index are equal to zero of domestic and multinational pharma companies in the boom period/ recession period/ recovery period.

H_{02}: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$

Analysis and Findings

Table number 2-7 reveals that in all the periods, there is no multicollinearity as all the values of VIF (variance inflated factor) of all the selected variables are less than 5. As the values of the Durbin-Watson is in the normal range of 2 so there is no auto-correlation among the variables.

Efficiency of Domestic and Multinational Pharma Companies

The analysis of Table no.1 reveals that as the respective p values of efficiency index i.e.0.85 and 0.35 are greater than the á =0.05; so null hypothesis H_{01} is supported which signifies that there is no significant difference in the efficiency of the domestic and multinational pharma companies during the boom, recession and recovery periods.

a) Proposed Regression Model for Domestic Pharma Companies During Boom Period:

The Table 2 shows that unstandardized positive coefficients are .010, .011 and .021 for sales, operating cash flows and ROA respectively. The unstandardized negative coefficients are .35, .027 and .050 for current ratio,

OCF, CCC and leverage respectively. The value of the R- square 0.52 reveals that variations to the extent of 52% in the efficiency index are explained by these factors collectively. It is inferred that the current ratio assumes to be influencing factor of efficiency index as the p value .010 is lesser than the value of á = 0.05.

The proposed regression model for the efficiency index of DPCs in the boom period is as:

$EI_{Boom} = 1.047+s.010\ Sales -.035\ CR-.027\ CCC+.011OCF+.021\ ROA-.050\ LEV+ \sum$

The value of $F_{6, 18,.05}= 30$ as output of ANOVA as presented in Table 2 is greater than the critical value of 2.66, the null hypothesis of the regression coefficients equal to zero all stands rejected. The alternate hypothesis that all regression coefficients are unequal to zero is suppported. So this leads to infer that the independent variables have the power to explain variations in the efficiency index.

Since the selected variables impact the E.I. in their own way, the strategy emerges for the management is that the managements should: i) optimize the value of the sales, operating cash flows and ROA ii) to reduce the current ratio, CCC and leverage so as to improve the efficiency index iii) the other related variables which has influence to the extent of 48% (i.e.1-r^2 =1-52%) should be identified and managed.

b) Proposed Regression Model for Domestic Pharma Companies During Recession Period:

As shown in Table 3, the positive unstandardized coefficients are 0.006, 0.003, 0.008 and 0.002 for the sales, current ratio, cash conversion cycle and operating cash flows respectively. The unstandardized negative coefficients are 0.002 and 0.003 respectively for ROA and leverage. The R- square is .167 which explains that during recession 16.7% of the variations in efficiency index are explained by the selected variables and remaining 83.3% (i.e. 1-r^2=1-16.7%) are explained by other variables. All these selected independent variables are not significant in the recession period as the p values of these factors are greater than the value of α = 0.05.

The proposed regression model for the efficiency index in the recession period is as:

$EI_{recession}$ = 10.001+0.006Sales +0.0003 CR+0.008 CCC+0.002 OCF-0.002 ROA-0.003 LEV +∑

The output value of $F_{6, 18, .05}$= .81 of ANOVA as shown in Table 3 is lesser than the critical value of 2.66, the null hypothesis of the regression coefficients equivalent to zero stands supported. This means that the independent variables have not the power to explain variations in the efficiency index.

The analysis provides strategy to the managers that: i) maximize the value of the variables i.e. sales, current ratio, cash conversion cycle and operating cash flows which has positive coefficients, ii) minimize the impact of the variable which has negative coefficient i.e. leverage, iii) besides the selected factors which influence efficiency index to the tune of 83.3%, the managements should identify the other variables.

c) Proposed Regression Model for Domestic Pharma Companies During Recovery Period:

As summarised in Table 4, the value of the R^2 is.607which means that 60.7% of the variations in the efficiency index are explained by the dependent variables. The unstandardized positive coefficients .137,.010,.036,.017 and .204 for the sales, current ratio, cash conversion cycle, operating cash flows and leverage respectively. All the variables during this period have positive coefficients. The sales assumes to be significant as p value.010 is lesser than $\alpha = 0.05$.

The proposed regression model for the efficiency index is as:

$EI_{Recovery}$= 1.313+.137 Sales+.010 CR+.036 CCC+.017 OCF+.019 ROA+.0204 LEV + $\sum$

The output value of $F_{6, 18, .05}$= 4.62 of ANOVA as shown in Table 4 is greater than the critical value 2.66, the null hypothesis of the regression coefficients equal to zero stands rejected. The alternative hypothesis that not all regression coefficients are equal to zero is supported. This means the independent variables i.e. sales, current ratio, cash conversion cycle. OCFs, ROAs and leverage have the ability to explain variations in the efficiency index.

The strategies suggested by the analysis to the finance managers are as: i) optimize value of the all the variables as all the variables have positive coefficients, ii) the other variables which also impact efficiency index to the tune of 39.3% (i.e.1-r^2=1-60.7%) should be identified and managed by the management.

d) Proposed Regression Model for Multinational Pharma Companies During Boom Period:

As depicted in Table 5, the value of the R^2 is 0..607 which means that 60.7% of the variations in the efficiency index are explained by the dependent variables. The unstandardized positive coefficients .137,.010,.036,.017 and .204 for the sales, current ratio, cash conversion cycle, operating cash flows and leverage respectively. All the variables during this period have positive coefficients. The sales assumes to be significant as p value.010 is lesser than $\alpha = 0.05$.

The proposed regression model for the efficiency index is as:

$EI_{Recovery}$ = 1.313+.137 Sales+.010 CR+.036 CCC+.017 OCF+.019 ROA+.0204 LEV + $\sum$

The output value of $F_{6, 18, .05}$= 4.62 of ANOVA as shown in Table 5 is greater than the critical value 2.66, the null hypothesis of the regression coefficients equal to zero stands rejected. The alternative hypothesis that not all regression coefficients are equal to zero is supported. This means the independent variables i.e. sales, current ratio, cash conversion cycle. OCFs, ROAs and leverage have the ability to explain variations in the efficiency index.

The strategies suggested by the analysis to the finance managers are as: i) optimize value of the all the variables as all the variables have positive coefficients, ii) the other variables which also impact efficiency index to the tune of 39.3% (i.e.1-r^2=1-60.7%) should be identified and managed by the management.

e) Proposed Regression Model for Multinational Pharma Companies During Recession Period:

The positive unstandardized coefficients are .010, .013, 0.003, .012 respectively for the sales, cash conversion cycle, operating cash flows and ROA. The unstandardized negative coefficients are 0.001 and .024 for current ratio and leverage. The value of R- square is .053 which explains that 5.3% of the variations in efficiency index are explained by the selected variables and remaining 94.7% (1-r^2=1-5.3%) are explained by other variables. All these selected independent variables are not significant in the recession period as the p values of these factors are greater than the value of $\alpha = 0.05$.The proposed regression model for the efficiency index in the recession period is as:

$EI_{recession}$ = 1.024+.010 Sales-0.001 CR+.013 CCC+0.003 OCF+.012 ROA-.024 LEV +$\sum$

As the output value of $F_{6, 18, .05}$=.168 of ANOVA as shown in Table 6 is lesser than the critical value of 2.66, so the null hypothesis of the regression coefficients equal to zero stands rejected. The alternate hypothesis that all

regression coefficients are not equal to zero is supported. This means that the independent variables have validity to explain variations in the efficiency index. The analysis provides strategy to the managers that: i) maximize the value of the variables i.e. sales, cash conversion cycle, operating cash flows and ROA which has positive coefficients, ii) minimize the impact of the variables which has negative coefficient i.e. current ratio and leverage, iii) besides the selected factors which influence efficiency index to the tune of 5.3%, the corporate should identify focus to and manage the other variables.

f) Proposed Regression Model for Multinational Pharma Companies During Recovery Period:

The value of the R^2 is .541 which means that 54.1% of the variations in the efficiency index are explained by the dependent variables. The unstandardized positive coefficients.042, .010, .026, .062 and 0.001 for the sales, cash conversion cycle, operating cash flows and leverage respectively. All the variables during this period have positive coefficients. The sales, OCF and ROA assumes to be significant as the respective P values .016,.023 and .011 are lesser than the value of á = 0.05.

The proposed regression model for the efficiency index of recovery period is as:

$EI_{Recovery}$ = .88+.042 Sales-.019 CR+.010 CCC+.017 OCF+.062 ROA+0.001LEV + å

As the output value of $F_{6, 18, .05}$= 3.53 of ANOVA as shown in Table 7 is greater than the critical value of 2.66, so the null hypothesis of the regression coefficients equal to zero stands rejected. The alternate hypothesis that all regression coefficients are not equal to zero is supporteed. It is revealed that the independent variables i.e. sales, current ratio, cash conversion cycle. Operating cash flows, return on assets and leverage are valid to explain variations in the efficiency index.

The strategies suggested by the analysis to the management are as: i) optimize value of all the variables except current ratio as all the variables have positive coefficients, ii) minimize the investment in current assets so as to reduce the current ratio, iii) the other variables which also impact efficiency index to the tune of 45.9% (i.e.1-r^2=1-54.1%) should be identified and controlled by the managements of pharma companies.

Conclusions and Implications

The study is highly useful for the different stakeholders of the pharmaceutical companies in the different ways.

As the efficiency of the domestic and multinational pharma companies is not significantly influenced by the economic situations so the suppliers of raw materials can fearlessly continue to extend credit to these companies. The managements of such companies can budget their production and sales as the efficiency during recession is higher even as compared to boom period.

The prospective investors of the capital market can continue to invest in the shares of the company: i) as unaffected working capital efficiency shall ensure profits and consequently dividends to the shareholders; ii) as the profits and earnings per share is expected to be stable so the market price of the investment in the capital market shall not fluctuate. There are least chances of conversion of the loans of financial institution into NPA as the working capital efficiency assures ample cash inflows to the pharma companies empowering their repayment capacity.

On the basis of the regression models, the study recommends a common strategy for the DPCs and MNPCs during the boom period. The strategy is to maximize the value of the sales, operating cash flows & return on assets and minimize the value of the current ratio, cash conversion cycle & leverage. During the boom and recovery both the sectors (i.e. domestic pharma companies or multinational pharma companies), should slash down the current ratio so as to optimize the efficiency index. During recession, the pharma companies' sales shall have to increase the current ratio besides increasing the sales, cash conversion cycle and operating cash flows. This means that higher investment in current assets is required to sustain the efficiency level in the recession period.

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Testing the Goodness of Organizational Citizenship Behaviour (OCB) Measures in Banking Sector: Development of a Scale in Indian Context

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Abstract: The present study aims at the development of a concrete measure of OCB for Indian banking industry which would be the preparedness or baseline of the further researches. Twenty-four (24) items western scale (five sub-scales) of organizational citizenship behaviour developed by Podsakoff et. al. (1990) and seven (7) items eastern scale (two parts, i.e., protecting company resources with 3 items, & Interpersonal harmony with 4 items) by Farh, et al., (1997) have been adopted in the study. Sample size of 350 (by stratified random sampling in 4:1 proportion for bank type & 1:1 ratio for employees' cadre) have been collected through structured questionnaire (with informed consent form) from Varanasi district (UP) India. Goodness of OCB measures have been tested into five phases i.e., Internal consistency, Exploratory Factor Analysis, Common method variance, Convergent and Discriminant validity. Finally, five factors comprising 27 items out of thirty-one items (31) are found valid in Indian context. The study will help to design a sound HR policies by bankers which will influence the organizational citizenship Behaviour and ultimately increase the job outcomes of employees. The study is an addition to the generic Indian OCB scales developed by Chaitanya and Tripathi, (2001) and Bakhshi et. al. (2009) in Indian context.But, 27 item OCB scales developed in this study with the mixture of eastern and western culture exclusively for banking industry would be helpful to understand the OCB level of their employees.

Keywords: Organizational Citizenship Behaviour, Banking Sector, Scale development, Measures, Reliability and Validity.

Introduction

Most of the studies on Organizational Citizenship Behaviour (OCB) are from North America (e.g., Farh et al., 1997), however it has also gained consideration in other Asian perspectives. Moreover, the dimensions of OCB have acknowledged relatively incomplete attention in other frameworks (Paille, 2009). Podsakoff et.

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al., (2000) argued that research on OCB dimension in another cultural context is important. Researchers had suggested that the dimensions of OCBs might be different under different cultures (Markus and Kitayama, 1991;Farth, et al., 1997; Law, Wong & Chen, 2007; Mijares&Didona 2015). After reviewing the extensive literature on the theme, it is found that the study of organizational citizenship behaviour (OCB) have been conceptualized over the years by western scholars, but the two most popular conceptualizations are those developed by Organ (1988, 1990) and Williams and Anderson (1991). Dimensions of Organizational Citizenship Behaviour are being conducted in two different context in India i.e., re-examination of western constructs by different scholars in manufacturing and service industry (e.g., Dash & Chaudhuri, 2015; Sharma et al., 2011; Singh & Kolekar, 2015; Thiagarajan & Kubendran, 2012b; Agrawal, 2016; Nayak &Barua, 2016; Thambe & Shanker, 2014), secondly, by developing or modifying western scale Singh and Kolekar (2015); Neeta (2013); Bakhshi et al (2009); Chaitanya and Tripathi (2001); Sharma and Jain (2014).

Moreover, eastern scholar slike Farh, Earley& Lin (1997) developed the organizational citizenship behaviour with 20 items (grouped under 5 dimensions, namelyconscientiousness, identification with the company, altruism toward colleagues, protecting company resources, & interpersonal harmony). A study by Babin et al. (2000) found that culture is an antecedent of OCBs. Researchers also suggested that the dimensions of OCBs might be different under different cultures (Farth, et al., 1997; Law, Wong & Chen, 2007). Researchers like Markus and Kitayama (1991) indicated that people from Eastern cultures host different perceptions compared to people from the Western culture. Moreover, Gautam et al. (2005) are of the view that change in geographic context along with cultural variations may lead to differences in citizenship behavior exhibited at workplace.

Organizational Citizenship Behavior Context and Significance of the Study

Presently, there are 12 public sector banks, 44 foreign banks, and 44 regional rural banks in the country. In the private sector, there are 22 banks including the new banks formed after 1991. Due to the rising NPAs in the country, several mergers are being proposed in the banking sector with the number of banks reducing over the years. But the Indian banking sector is being exposed to several challenges, firstly mounting NPA, as out of total NPAs in the country more than 70% are from corporate sector (e.g., Kambar, 2019; Numer and Devika, 2019; Mittal and Suneja, 2017; Mishra and Pawaskar, 2017; Singh 2016). Secondly, rising banking frauds in multi-forms includes accounting, demand drafts, bill discounting, fraudulent loans and cheque kiting frauds etc.(e.g. Bandyopadhyay2019; Bernard et. al. 2019; PTI, 2019). Finally, the banking sector does not have the infrastructure to reach out to the market at the bottom of the pyramid (BOP). Many economists state that the infrastructure will always be

inadequate owing to a large population(Tiwari, 2019; Dinkar, 2006; Bartel, 2004; Burgess et al. 2005; Burgess et al., 2005).But there is a need for better supervision and monitoring framework. Nevertheless, the banks have many immediate opportunities mainly:

- Targeting Markets at BOP: The opportunity that is waiting to be exploited is digital banking in rural areas. The dominant logic of the banks that the rural population does not want to be equipped with the technology must be kept aside in order to come up with some innovative way to use these opportunities (e.g., Ananth &Öncü ,2013; Bapat, and Yogalakshmi, 2016; Karnani, 2005).

- Reduction of Transaction Costs and Time: According to Accenture, the world banking sector will save up to $20 billion by 2022 by implementing blockchain. Currently, these remittances take anywhere between half a day to 3 days and banks are hoping to reduce the transaction times and the costs too will reduce by 10-40% (Press Trust of India, 2018; Martin, 2018; Das, 2019).

- Peer-to-Peer (P2P) Debt Financing: It enables individuals to borrow and lend money without using an official financial institution as an intermediary. The current regulations will allow the market to shape during this period and depending on how things turn out in the future, RBI might loosen some regulations. Overall, the situation for this market is optimistic with some caution (e.g., Dhawan, 2018; Kalyanaraman, 2019, Shroff et al. 2019).

- Artificial Intelligence and Big Data:The banking sector is one of the first adopters of this technology and is exploring and implementing technology in various ways. A significant amount of progress is required on the NLP front in order to effectively reach a wider range of the population. For successful and effective implementation of AI, identification of right cases for use of AI with the help of experts and data scientists will be the key for the Indian banking sector(Vijai. 2019;Dhanrajani,2019; Padhi, 2019; Baruah, 2019).

On the above backdrop, it is very significant on the part of the organization to see that the employees not only fulfil their job description successfully but also are provided with enough possibilities which drives them to take the 'extra mile' for the overall well-being of the organization (Mazumder and Barman, 2018). Such special behaviour/effort encompasses organizational spontaneity (George & Brief,1992), spontaneous behaviour(Katz & Kahn,1966),cooperation (Barnard,1938),and organizational citizenship behaviour (Organ, 1988). The roots of construct could be traced back to Barnard (1938) and Katz (1964).Barnad (1938, p.38) underscored the theoretical and practical importance of individuals' willingness in contributing efforts for the cooperative system. He described this

willingness as a posture tending to produce various constructive gestures (Katz,1964). The concept has been latter refined and strengthened by a number of researchers (Podsakoff et al, 2000; Jahangir, 2004; Khalid and Ali, 2005; Turnipseed and Rassuli, 2005; Chi-Cheng, et al, 2011; Yaghoubi, et al, 2011; Sahafi, et al, 2011) in different sectors of the economy. A stable expansion has been observed in OCB researches since Bateman & Organ (1983)from different fields of management, non-traditional areas of hospital and health administration, community psychology, economics, and cross-cultural studies (Farh, et al, 1997; Chen, et al., 1998; Hui, Law & Chen, 1999; Farh, et al, 1990; Farh, et al, 2004; Kim & Mauborgne, 1996; Lo &Ramayah, 2009; Podsakoff et al., 2009; Wang et al., 2013).

Although there are a number of ways in which OCBs have been conceptualized over the years by western scholars, the two most popular conceptualizations are those developed by Organ (1988, 1990) and Williams & Anderson (1991).Organizational citizenship behaviors are positive, voluntary employee behaviours often revealed by activities of employees in the workplace(Yen et al., 2008).Good citizenship behaviors are characterized by employees' qualities of conscientiousness, altruism, courtesy, and sportsmanship(Organ, 1988).OCB has theoretical foundations in Social Exchange Theory that explains the work behaviour of individuals based on trust(Habeeb, 2019). Antecedents of OCB have been theorized and tested empirically on individual level like job satisfaction(Sridhar &Thiruvenkadam, 2014;Krishnan et al. 2010), job embeddedness (Wijayanto and Kismono, 2004; Cho and Ryu, 2009), employee engagement(Rurkkum and Bartlett, 2012; Saks, 2006), organizational commitment(Wagner and R ush ,2000), Gautam et al. 2005; Pourgaz et al. 2015), public service motivation (Caillier 2016; Kim 2006),self-efficacy(Dominguez et al. 2013; Chen and Chang , 2012), and trust of management (Lester and Brower , 2003; Wech, 2002; Mackenzie, et al, 2000), whereas antecedents of OCB related to the organizational level are human resource activities (Organ et al., 2006; Sun et al., 2007; Fu, 2013)transformational leadership (Kim 2012; Ritz et al. 2014), culture(Mohanty &Rath, 2012; Patra &Aima, 2018; Patterson et al, 2004),organizational justice(Fu et al, 2013;Awang et al. 2015), psychological contract (Marks, 2001; Karagonlar et al., 2016; Guest, 2016), customer satisfaction (Ocampo et al., 2018), and organizational politics (Vigoda-Godat ,2007; Vigoda-Godat and Drory 2006)etc.Organisational citizenship behaviourshave several positive outcomes as superior performance (Podsakoff, et al, 2009; Yen et al., 2008) and organizational effectiveness(Podsakoff & MacKenzie,1997), reducing friction, and increasing efûciency (Bateman& Organ,1983; et al,1983), enlarging employee engagement (Cinar et al, 2013); promote the excellence of the employer without expecting a reward (Cem et al,2015), and work-related employee behaviours(Zeinabadi& Salehi, 2011).

OCB Scales and their Dimensions: Major Empirical Evidences (National and International Context)

There have been many attempts at categorizing dimension of OCB. A study of Smith et al (1983) suggested OCB to be divided into altruism and generalized compliance. Williams & Anderson (1991) suggested OCB to be divided into Behaviour that benefits the organization (OCB-O) and behaviour that benefits specific individual but indirectly also benefits the organization (OCB-I). Graham (1991)capturedOCB with3traits, i.e.,loyalty, obedience, and participation. Organ (1988) suggested five factors of OCB,but this is mainly based on empirical evidences obtained from several other studies (i.e., Bateman & Organ, 1983; Smith et al., 1983). The five dimensions of OCB identified by Organ are altruism, civic virtue, conscientiousness, courtesy, and sportsmanship. Later, he expanded this model (Organ, 1990) to include two other dimensions (peacekeeping and cheerleading). Podsakoff et al (1990) developed a scale to measure OCB based on the dimensions suggested by Organ. Moorman & Blakely (1995) developed a scale (of 19 items) incorporating dimensions like, Individual initiative, Interpersonal Helping, Loyal Boosterism, and Personal industry. Podsakoff & Mackenzie (1997) considered OCB in three dimensions namely helping Behavior, sportsmanship and civic virtue. Farh, et al (1997) came out with a global scale measurement on organizational citizenship behaviour. On the other hand, Van Dyne et al (1994) considered obedience, loyalty, and participation as the dimensions of OCB. Farh et al (2004) have identified nine major dimensions of OCB consisting altruism, conscientiousness, sportsmanship, courtesy, civic virtue, functional participation, advocacy participation, loyalty and voice.A study by Luthans (2011) found three dimensions of organizational citizenship Behaviour namely loyalty, service delivering, and participation, and concluded that all the dimensions lead to high performance and increase work effectiveness. But the framework by Organ (1988), encompassing ûve dimensions has become widely accepted, consistently encompassing immense number of researches(LePine et al., 2002).

There has not been much research reported by Indian scholars towards dimensionality of organizational citizenship behaviour except adoption of western scale.Chaitanya & Tripathi (2001) explored 18-item measurement scales with 6 dimensions, i.e., Sportsmanship, Civic Sense, Altruism, Conscientiousness, Courtesy, and Organizational Perception (towards OCB) in Indian context. Kumar (2005) explored 29 items of OCB measures through three broad stages, i.e., item generation, scale development and assessment of psychometric properties (reliability and validity) of non-governmental organizations. Bakhshi& Kumar (2009) developed 30-item measurement scale for Indian organizations on 5 dimensions, i.e., sportsmanship, conscientiousness, helping co-workers, courtesy, & civic virtue. Gupta & Singh (2012) identified a three-factor conceptualization

Table I: Major OCB scales and dimensions

Global Researches				Indian Researches			
Authors		Dimensions (Items)	OCB Measures Used	Authors	Dimensions (Items)	Used	OCB Measures
1.	Podsakoff et al (1990)	5 (24)	Organ (1988)	1.	Chaitanya & Tripathi (2001)	6 (18)	Organ (1988)
2.	Williams & Anderson (1991)	2 (14)	Smith et al (1983)	2.	Kumar & Shah (2015)	5 (24)	Podsakoff et al (1990)
3.	Podsakoff &MacKenzie (1994)	3 (14)	Organ (1988, 1990)	3.	Bargava& Baral (2009)	8 Items	Lee & Allen (2002)
4.	Farh, Earley& Lin (1997)	5 (20)	Developed by authors	4.	Bakhshi et al (2009)	5 (30)	Bakhshi& Kumar (2009)
5.	Lam, Hui & Law (1999)	5 (24)	Podsakoff et al (1990)	5.	Baral &Bhargava (2010)	8 Items	Lee & Allen (2002)
6.	Yen &Niehoff (2004)	5 (22)	Farh et al (1997)	6.	Krishnan & Singh (2010)	3 (17)	Williams & Anderson (1991)
7.	Lee et al (2011)	6 Items	Organ (1988)	7.	Singh & Singh (2010)	5 (24)	Podsakoff, Mackenzie, Moorman & Fetter (1990)
8.	Lin & Liu (2016)	5 (20)	Farh, Earley& Lin (1997)	8.	Swaminathan & Jawahar (2013)	5 (20)	Organ (1988)
9.	Argentero et al (2008)	5 (24)	Podsakoff et al(1990)	9.	Tambe&Shanker (2014)	5 (24)	Podsakoff, MacKenzie, Moorman & Fetter (1990).
10.	Becton & Field (2009)	3 (31)	Allen et al (2004)	10.	Singh &Kolekar (2015)	5 (30)	Bakhshi& Kumar (2009)
11.	Lin & Liu (2016)	5 (20)	Farh, Earley& Lin (1997)	11.	Dash & Chaudhuri (2015)	4 (17)	Special measures developed for this study
12.	Hazzi&Maldoan (2017)	2 (16)	Smith et al (1983)	12.	Agrawal (2016)	6 (36)	Podsakoff et al(1990), Van Dyne, Graham & Dienesch (1994).

consisting of 'organization orientation', 'punctuality' and 'individual-orientation' factors with 15 items showed excellent fit with data through Confirmatory Factor Analysis (CFA). Sharma & Jain (2014) also developed 36-item measurement scale for Indian manufacturing sector. The dimensions for their scale were altruism, organizational compliance, sportsmanship and loyalty. Dash & Chaudhuri (2015) extracted four factors consisting of 17 items which can be termed as conscientiousness, sportsmanship, encouragement and helping co-workers for Indian banks. The extracted factors were checked thoroughly for content, construct, convergent and discriminant validity and also reliability. A summary of several OCB dimensions isshown in Table -1.

Materials and Methods

Participants:Sample size determination has been done after a rigorous research of its own (e.g., Krejcie & Morgan, 1970; DeVaus, 2002; Sampling and Surveying handbook, 2002), followed by selecting 350 respondents (employees from 117 bank branches) of Varanasi (UP, India)using stratified random sampling technique (in 4:1 proportion for bank type & 1:1 ratio for employees' cadre) as detailed in Table-2. The respondents include managerial, non-managerial employees in the public and private sector banks situated in Varanasi district, of UP state.

Table-2: Sampling distribution

Banks	Job Position		Total sample	Remarks
	Managerial	Assistant		Public: Private [1] (4:1)
Public	140	140	280	
Private	35	35	70	Managerial: Assistant[2](1:1)
Total	175	175	350	

1. The proportion between public and private bank employees is 4:1.

2. The proportion between Managerial and Assistant employees in both the banks is 1:1.

Procedures: The pilot test was conducted under an administered situation with aggregate 75 responses comprising 35 employees and 40 customers from 10 branches of public and private banks. A letter has also been sent to all banks (respondents' bank branches) asking for permission in carrying out this research. Once the bank indicated their interest to participate in the study, the researcher contacted individually in 94 branches of 10 public sector banks and 17 branches of 10 private banks and provided them with a description of the research (Informed consent Form) and delivered the set of printed questionnaires to the branch manager or to employees.The study applied the mixed scale developing approaches of Cohen and Swerdlik (2002) i.e., testconceptualization; testconstruction; test try out; item analysis, and test revision and Schwab (1980)

four stages namely defining the theoretical construct, item generation, scale development and scale evaluation.

Measures: The western scale includes 24 OCB items (Podsakoff et al., 1990)using recommendations (Churchill, 1979; Schwab, 1980) comprising 5 sub-scales (i.e.,5 items each of courtesy, altruism, sportsmanship, & conscientiousness and 4 items of civic virtue) as shown in Table:3.Seven (7) items eastern scale (two parts, i.e., protecting company resources with 3 items, & Interpersonal harmony with 4 items) by Farh et al., 1997(Table: 4)have been used for scale development in Indian context.The OCB measures were rated on a 5-point Likert scale, as(Sekaran and Bougie, 2010) observed that a wide scale will allow respondents enough flexibility to answer the questionnaire.

Table-3: Western measures

I. Altruism	1.	I help others who have heavy workloads
	2.	I share my knowledge and expertise with other employees
	3.	I help others who have been absent on duty
	4.	I willingly help others who have work related problems
	5.	I help to orient new people even though it is not required
II. Courtesy	6.	I try to avoid creating problems for co-workers
	7.	I consider the impact of my actions on co-workers
	8.	I do not abuse the rights of others
	9.	I take steps to prevent problems with other co-workers
	10.	I am mindful of how my behaviour affects other people's job
III. Sportsmanship	11.	I am the classic "squeaky wheel" that always needs greasing.
	12.	I do not consume a lot of time complaining about trivial matters
	13.	I do not tend to make "mountains out of molehills"
	14.	I always focus on positive side, rather than the negative side.
	15.	I never find fault with what the organization is doing.
IV. Conscientiousness	16.	I believe in giving an honest day's work for an honest day's pay
	17.	My attendance at work is above the norm
	18.	I do not take extra breaks
	19.	I obey company rules and regulations even when no one is watching
	20.	I am one of the most conscientiousness people in this organization.
V. Civic Virtue	21.	I keep abreast of changes in the organization
	22.	I attend meetings that are not mandatory, but are considered important
	23.	I attend functions that are not required, but help the company image
	24.	I read and keep up with organization announcements, memos, and so on

Table- 4: Eastern measures

VI. Company Resources	25. Conducts personal business on company time (e.g., trading stocks, and shopping etc.). (R)
	26. Uses company resources to do personal business (e.g., company phone, copy machines, computers, and cars). (R)
	27. Views sick leave as benefit and makes excuses for taking sick leave. (R)
VII. Interpersonal Harmony	28. Uses illicit tactics to seek personal influence and gain. (R)
	29. Uses position and power to pursue selfish personal gain. (R)
	30. Often speaks ill of the supervisor (manager) or colleagues behind their backs. (R)
	31. Takes credits, avoids blames, and fights fiercely for personal gain. (R)

Note: (R) signifies reverse scaling.

Data Analysis:The collected data were analyzed using statistical software SPSS (20th version) into five phases. At the first stage, the Cronbach's alpha coefficients (Internal consistency) were calculated for determining the scale reliability (George & Mallery, 2003). In the second stage, the exploratory factor analysis (EFA) was conducted through principal component analysis (PCA) using varimax rotation method for assessing the factorial structure of the scale (Turnipseed &Murkison, 2000; Coyle- et al, 2000). Thirdly, to minimize the influence of method biases, common method variance through Harmon's one-factor test (Podsakoff & Organ, 1986; Craighead et al., 2011) was complied. Thereafter, convergent validity through a 'within factor' analysis(Hair et al., 2006)have been applied to gain a more exhaustive decision of the dimensionality of the concept. Finally, discriminant validity using inter-correlations among major constructs (Campbell & Fiske, 1959)was used to understand the strength of correlations of identified constructs.

Results

Internal Consistency: Reliability coefficient exhibitsaccuracy of the test in predicting a certain set of items to capitulate interpretable statements concerning individual differences(McCoach, 2002; Cronbach, 1951).And in order to reach internal consistency, minimum acceptable value is 0.70 (Nunnally, 1978). George & Mallery (2003) provide the following rules of thumb to measure reliability through Cronbach alpha: "> 0.9 - Excellent, > 0.8 - Good, > 0.7 - Acceptable, > 0.6 – Questionable, > 0.5 – Poor, and < 0.5 – Unacceptable". The reliability of the scale was determined by Cronbach alpha and the value was found to be 0.825, which is usually good for a social science questionnaire (Table-5). It should also

be noted that while a high value for Cronbach's alpha indicates good internal consistency of the items in the scale, it does not mean that the scale is uni-dimensional. Factor analysis is a method to determine the dimensionality of a scale (Gliem&Gliem, 2003). The cut off for composite reliability is the same as any measure of reliability and score between 0 .6 and 0.7 is a good indicator of construct reliability (Hensele &, Sarstedt, 2013). Composite reliability more concern on individual reliability referring to different outer loadings of the indicator variables (Hair et al, 2017).

Table 5: Reliability statistics

Cronbach's Alpha	No. of Items	Mean	Variance
.825	31	5.853	.232

Exploratory Factor Analysis: The study identified thirty (30) items out of thirty-one (31) which composed seven factor solutions through Exploratory Factor Analysis (EFA), explains 62.59% of the total variance(Table: 6). Six items loaded in the first factor (named as harmony and resources) projects Eigenvalue of 6.131 and total variance explained is 15.41%. Variables under the second factor are made of six items whose Eigenvalue is 4.95 and total variance explained is 12.90%, (named as conscientiousness). Six items are loaded on factor-3 (named as civic virtue) with Eigenvalue of 3.24 and the total variance explained rate is 10.44%. Factor-4 retained the original (05) items of courtesy having Eigenvalues of 1.880 and total variance explained is 10.24%. Factor-5 (named as altruism) loaded four items with Eigenvalues of 1.30 which explained 7.13% of variance. Factor-6 composed with three items (named assportsmanship), explained 4.70% of variance with Eigenvalues of 1.27. One item which composed Factor-7 with Eigenvalue of 1.045 which explained3.37% of variance. Last two factor namely (Factor-6) have been discarded as poor internal consistency and Factor-7 not been considered as single item (Table:6).

Common Method Variance (CMV): It can be considered as a third variable that impacts the estimated relationship among variables in a systematic way, i.e., either inflates or deflates the estimated relationship among variables of interest (Jakobsen & Jensen, 2015).The main CMV's sources include the use of only one type of item context, respondent, measurement context, and item characteristics (Reio, 2010; Podsakoff et al., 2003). The estimated impact of one variable on other variable is at risk of being biased due to CMV which is the systematic variance shared among the variables (Jakobsen and Jensen,2015), and is usually introduced to the measures by the method of measurement rather than the theoretical constructs represented by the measures (Jakobsen & Jensen, 2015; Podsakoff, et al, 2012; Podsakoff, et al 2003). A Harman one-factor analysis is a post hoc procedure that is conducted after data collection to check whether a single factor is accountable for variance in the data (Chang et al., 2010).

Table 6: Factor loadings and communalities on the OCBS with varimax rotation

Item No.	Dimensions (Items)	FACTOR (Newly Extracted)	Components						
			Harmony and Resources	Conscientiousness	Civic virtue	Courtesy	Altruism	Sportsmanship	Communalities
		Eigen values	(06)	(06)	(06)	(05)	(04)	(03)	
		Variance Explained (%)	6.132	4.946	3.458	1.883	1.295	1.269	
		Cronbach's Alpha	15.413	12.898	10.441	10.235	7.125	4.694	Extraction
			.934	.830	.810	.798	.680	.435	
A	Altruism								
1	Helping others		.040	.053	.105	.103	.794	-.056	.660
2	Information sharing		.133	.130	.055	.263	.703	-.068	.606
3	Serving Absentee's		-.041	-.169	-.031	.209	.576	.326	.513
4	Serving willingly		.018	.060	-.068	.453	.575	.176	.575
5	Positioning new people		.005	-.219	.193	.343	.243	.517	.529
B	Courtesy								
6	Avoiding glitches		.035	-.027	.193	.708	.102	-.020	.552
7	Effect actions		.017	-.061	.096	.679	.245	.311	.631
8	Regarding rights		.015	.198	-.030	.685	.045	.051	.515
9	Avoiding problems		.057	.096	.205	.763	.150	-.038	.660
10	Watchful Behaviour		-.005	.022	.227	.715	.209	-.041	.609
C	Sportsmanship								
11	High-pitched wheel		-.199	.447	.145	-.186	-.080	.476	.529
12	Evading complaints		-.089	.738	.052	.005	-.015	.211	.600
13	Dramatic Behaviour		-.012	.767	.012	.052	-.053	.236	.650

14	Optimistic Behaviour	.056	.784	.122	.051	-.034	.032	.638
15	Ignoring fault	-.026	.336	.273	.079	.038	.613	.572
D	Conscientiousness							
16	Honest work pays	.025	.767	.200	.139	.124	-.194	.701
17	Attendance	.034	.642	.410	.091	.087	-.101	.608
18	Additional breaks	-.014	.511	.519	-.015	.294	-.119	.632
19	Conforming company's rules	-.038	.522	.516	.041	.034	-.213	.589
20	Careful Personality	-.024	.196	.671	.048	.088	.046	.501
E	Civic Virtue							
21	Stay abreast of	.046	.159	.730	.163	.018	.071	.593
22	Presence in meeting	-.060	.055	.734	.116	.091	.237	.624
23	Presence in functions	.030	.000	.736	.110	.002	.160	.581
24	Updated with information	.084	.193	.587	.238	-.188	-.019	.481
F	Protecting Company Resources							
25	Time Theft	Single variable factor loading ignored						
26	Ethical Behaviour	.792	-.076	.036	-.126	.090	-.140	.678
27	Justification of Sick leave	.845	-.008	-.007	-.040	.048	-.017	.719
G	Interpersonal Harmony							
28	Illegal tactics	.845	-.017	.045	.076	.039	-.009	.724
29	Self-centered personal gain	.936	.028	-.021	.055	-.033	-.022	.882
30	Bad-mouthing	.902	-.014	.001	.041	.014	.042	.817
31	Tasteless role	.888	.026	-.005	.132	-.001	.017	.807
Total Variance Explained?							64.60	
KMO (Kaiser-Meyer-Olkin Measure of Sampling)?							.84	
Bartlett's Test of Sphericity (Approx. Chi-Square)?							5.519E3	

The study applied Harmon's one-factor test, which is the most commonly applied statistical remedy to test for common method bias (Podsakoff & Organ, 1986; Craighead et al., 2011). Nevertheless, data showed are not affected by the common method variance through Harman's one factor test and examined the unrotated factor solution involving all variables of interest (31 items) in an exploratory factor analysis. The generated PCA output revealed 11 distinct factors whereas the first unrotated factor captured only 17.42% of the variance in data. Thus, the no single factor emerged and the first factor did not capture most of the variance(Table:7). Therefore, these results suggested that CMV is not an issue in this study.

Table-7: Harman's single factor test

Extraction method: principal axis factoring

Factor	Initial Eigenvalues			Extraction sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.13	19.78	19.78	5.40	17.42	17.42
2	4.95	15.96	35.74			
3	3.46	11.16	46.89			
4	1.88	6.07	52.97			
5	1.30	4.18	57.14			
6	1.27	4.09	61.23			
7	1.05	1.37	64.61			

Convergent Validity: It test the degree to which indicators of a particular construct converge or share a high proportion of variance in common (Hair et al., 2010).A 'within factor' factor analysis was carried out for convergent validity togetan in-depth judgment on(construct) dimensionality (Hair et al., 2006). Each factor presents uni-dimensionality. The 1st factor (Harmony & Resources)elucidates 75.89% of variation (KMO 0.90), 2nd factor (Conscientiousness) explains 56.91% of variation (KMO 0.83), 3rd factor(Civic Virtue)details 51.43% of variation (KMO 0.84), 4th factor (Courtesy)explains 57.18% of variation (KMO 0.83), and6th& final factor(Altruism)details 53.71% of variation (KMO 0.72). Hence, convergent validity was evidenced through the analysis (Table:8).

Discriminant Validity: It explains about the extent to which a construct is truly diverse from other constructs by empirical stands. Testing for discriminant validity can be done using different methods: Q-sorting (Storey, et al., 2000) , chi-square difference test (Segars, 1997), the average variance extracted analysis (Fornell and Larcker, 1981) and Monte Carlo Simulation criterion of HTMT (Henseler, Ringlle and Sarstedt (2015). It tries to establish a specific correlation (neither 0 nor 1) in order to achieve relatively distinction between constructs (Campbell &

Fiske, 1959).Conferring to Henseler, et al (2016) in order to achieve discriminant validity, the HTMT score should be below 0.85 (Henseler et al.,2015). The Table:9 illustrates discriminant validity established among all the factors evident through their respective correlation coefficients.

Table-8:Within factor analysis

Description	Harmon and Resources (Factor-1)	Conscientiousness (factor-2)	Civic Virtue (Factor-3)	Courtesy (Factor-4)	Altruism (Factor-5)
KMO	0.90	0.83	0.84	0.83	0.72
Variance Explained	75.89	56.91	51.43	57.18	53.71
Eigen values	4.55	3.42	3.09	2.86	2.15

Table-9: Inter-correlations of the major constructs

Variables	Harmony & Resources	Conscientious-ness	Civic Virtue	Courtesy	Altruism
Harmony & Resources	1				
Conscientiousness	-.022	1			
Civic Virtue	.020	.475**	1		
Courtesy	.063	.170**	.340**	1	
Altruism	.068	.054	.162**	.503**	1

Note: ** Correlation is significant at the 0.01 level (2-tailed).

Discussions

Psychometric Properties (Reliability and Validity) Analysis: In eastern scale of Farh et. al. (1997), the study identifies two negative OCB dimensions, specifically from cultural perspective (i.e., personal use of organizational *resources*, and harm to interpersonal harmony),with maximum loadings in single factor (Factor-I, Harmony & Resources). Only one item form eastern scale has been removed because of single factor loading. It has been found that part (conscientiousness, civic virtue, courtesy, and altruism) of the OCB construct (measured) from western context has also been used for studies in banking sector (with different factor structure) Majority of sportsmanship (03) and conscientiousness (03) items are loaded in the single factor, accordingly factors have been named as Conscientiousness since the maximum factor loading (Factor-2). Civic virtue(Factor-3) has been composed with six items, whereas two items shifted from Conscientiousness. Two factors namely Altruism andCourtesy retained almost same items as developed by Podsakoff et al (1990). Finally, sixth factor have been composed with residuals as one item from Altruism and two items from Sportsmanship and named as Sportsmanship, since the maximum factor loading, later on it has been discarded because of poor internal consistency. The

psychometric evaluation of the OCBs in the present study indicates reasonable construct validity/divergent and discriminant validity except the factor-6 whereas it shows poor reliability coefficient and it has been discarded. Ultimately, five factors consisting 27 items found valid and their details listed in Table-10.

Table-10: Modified OCB Scales for Indian banking industry

I.	Harmony &Resources	1.	Uses illicit tactics to seek personal influence and gain. (R)
		2.	Uses position and power to pursue selfish personal gain. (R)
		3.	Often speaks ill of the supervisor (manager) or colleagues behind their backs. (R)
		4.	Takes credits, avoids blames, and fights fiercely for personal gain. (R)
		5.	Uses company resources to do personal business (e.g., company phone, copy machines, computers, and cars). (R)
		6.	Views sick leave as benefit and makes excuses for taking sick leave. (R)
II.	Conscientiousness	7.	I do not tend to make "mountains out of molehills"
		8.	I always focus on positive side, rather than the negative side.
		9.	I never find fault with what the organization is doing.
		10.	My attendance at work is above the norm
		11.	I do not take extra breaks
		12.	I am one of the most conscientiousness people in this organization.
III.	Civic Virtue	13.	I do not take extra breaks
		14.	I am one of the most conscientiousness people in this organization.
		15.	I keep abreast of changes in the organization
		16.	I attend meetings that are not mandatory, but are considered important
		17.	I attend functions that are not required, but help the company image
		18.	I read and keep up with organization announcements, memos, and so on
IV.	Courtesy	19.	I try to avoid creating problems for co-workers
		20.	I consider the impact of my actions on co-workers
		21.	I do not abuse the rights of others
		22.	I take steps to prevent problems with other co-workers
		23.	I am mindful of how my behaviour affects other people's job
V.	Altruism	24.	I help others who have heavy workloads
		25.	I share my knowledge and expertise with other employees
		26.	I help others who have been absent on duty
		27.	I willingly help others who have work related problems

Note: (R) signifies reverse scaling.

It has been found that part of the OCB construct (measured) from western context has also been used for studies in banking sector but the factor structure was different. Sportsmanship have been excluded from the OCB dimensions as found inappropriate for Indian culture. Few Indian studies(e.g., Bakhshi et al., 2009; Gupta, Kumar, & Singh, 2012; Habeeb, 2019; Vaijayanthi, Shreenivasan, & Roy, 2014) concluded that western measures may not be perfect in Indian setting, accordingly they have modified OCB measures. Whereas majority of India studies (e.g., Shanker, 2016; Kumar and Shah, 2015; Agrawal, 2016; Nayak &Barua, 2016)established all 5 OCB dimensions (for Indian organization), i.e., conscientiousness, courtesy, civic virtue, altruism, & sportsmanship. But scale development in the presently is a unique since the study combined the two popular dimensions of Podsakoff et al(1990) and Farh et al., (1997) to identify whether altruism, civic virtue, sportsmanship, conscientiousness, and courtesy, protecting company resources (western context) and interpersonal harmony (Eastern counterpart) are applicable in Indian culture. Finally, the study found western etic and eastern emic dimensions show perfect combination of measuring organizational citizenship behavior.Rauf and Kumar (2015) stated that protecting company resources and interpersonal harmony (Asian dimensions) needs to be validated in Indian sample. Moreover, Paine and organ (2000) also advocate that different cultures/nations may interpret or evaluate the OCB differently. Thus, culture and sector centric OCB measures developed by the scholar will produce scientific results in banking sector in India.

Limitations and Practical Implications

There are three major constraints of this study that limit the generalizability of its findings. First, organizational citizenship behavior was measured by 24 item scale of Podsakoff et. al., (1990) as a representation of western context and emic dimensions of Farh et. al., (1997) containing two factors- protecting company resources (3 items) and Interpersonal harmony (4 items) as eastern setting. These diversified scales could further be investigated for their psychometric properties. Second, construct validity namely convergent validityof the scale has been performed by within factor analysis (Hair et al., 2006) anddiscriminant validity by inter-correlations (Campbell & Fiske, 1959). Therefore, it is suggested to perform the CFA for better understanding of construct validity.Finally, in response to paradigm shift of customer expectations, monitoring requirements, know-how, demographics, and shifting economics, much of the landscape will change significantly. As the study is cross sectional study in nature, permanency of OCB dimensions might not be the identical. Thus, longitudinal study may be conducted to understand its stability over period of time.

Despite of the above limitations, the study adopted robust methodology for construct development and their validation. Initially, Exploratory Factor Analysis

(EFA) and correlation matrix were applied to form OCB, and ensure their construct validity (convergent and discriminant). Secondly, Cronbach alpha analysis conducted to test the reliability of the dimensions. Finally, Common Method Variance (CMV) have been measured using Harman's one factor test, because all items in a self-report study are being measured using a single factor method (namely, a single survey instrument), their observed values may share variance above and beyond the true co-variation among them. Therefore, scale developed (27 items) in the study found to be perfect for Indian banking organization and it is suggested that bankers/policy makers can use this scale for any further studies with regard to development of OCB. The study would be great helpful to frame a sound HR polices that can enrich the job performance of banking employees.

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Developing The Model For Electronic Human Resource Management Practices In Indian Banking Industry

R. Padmaja and M. Rifaya Meera

Abstract: Human resources management practices play a vital role in achieving the goals and maintain the competitive advantage of an organization. E-HRM includes the process and transmission of digitized information of the human resource. This study aims to develop the model for e-HRM Practices in Indian banking industry. This research adopts simple random sampling technique to select a sample of 330 bank employees. The five factor construct or model variables has been filtered by Cronbach's alpha / reliability statistics, exploratory factor analysis and it can be measured by confirmatory factor analysis and furthermore it can be structured by pooled confirmatory factor analysis. The paper concludes that the five factors model designed for the study significantly affects the electronic human resource management practices.

Keywords: E-HRM Practices, Banking, Exploratory Factor Analysis, Confirmatory Factor Analysis.

Introduction

E-HRM is the use of technology in HR activities to make it easier for employees and employers to communicate. It keeps track of payroll, personal details about employees, performance management, training, recruiting, and strategic orientation. The way HR departments keep records and share information is evolving as a result of technological advancements. It significantly reduces paperwork and allows for quick access to large amounts of data.Human resource management is very important for all the sectors to be developed. No exception for the banking sector. Employees are the real assets of the banking sector. Initially the Human resource practices of the banks were done manually. But nowadays due to technological enhancement all the Human resource management practices are done electronically. Right from the appointment of the employee up to the

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retirement of the employee all the data both personal and official are stored in database. Recruitment, selection, training, leave management, leave application, claims, salary, settlement, leave for concession, performance appraisal, employee profile etc., are maintained and managed with the help of the specially designed software. The method of maintaining and managing may differ based on the type of the bank.

Proper Human Resource Management can only help in retaining the employees and make them work better. In addition, the employee can keep track of his or her accomplishments without having to go through lengthy legal procedures. It makes use of intranet or other web-based technologies. It can also be used to put various HR tactics into action. E-HRM may beused to distribute authorization for various HR functions. Bank employees now-a-days are facing many challenges in their work environment. Hence proper managing of the human resource in banking sector is considered very essential. Virudhunagar District consists of almost all the public and private sector banks. Totally there are 131 public sector bank branches and 69 private sector bank branches. Thus there is a more scope for E-HRM practices of the bank employees in the study area.

Literature Review and Model Development

To realize the things behind the significance of electronic human resource management and its practices in the development of the banking industry and also to edging the methodology for the existent research, the review of preceding studies is indispensible. There are plentiful researches which discuss and analyses the human resource management practices through electronic mode in banking industry. Rathi and Parimalarani. (2020) made a research on impact of digital transformation on employment in banking sector. They have analyzed the digitalization of the banks and the opportunity of employment because of the technological enhancement. Secondary data was used for the analyses. It was concluded that the technological enhancement in the banking sector may result in the massive increase in unemployment. It was inferred that the workforce demand will be reduced as the digitalization minimize the nature of work of employees. Srihari (2020) studied about the effect of E-HRM on job satisfaction: A case study on Indian IT and ITES industry. It was analyzed the impact of electronic human resource management on job satisfaction. The electronic human resource management practices was categorized as e-hiring, e-rewards and recognition, e-payroll process, e-performance management, e-employee self-service and e-learning and development. The sample of 684 employees was selected from 30 different IT and ITES based companies in Bengaluru city. The collected data were analysed using multiple regression analysis and correlation. The study concluded that E-HRM practices have positive link with the job satisfaction.

Jisha and Veerakumaran. (2019) in their article digitalization and job satisfaction among bank employees: Acomparative study of Public and Private sector banks considered about the job satisfaction of digitalization of public and private sector banks. The research found that the employees of public and private sector banks were satisfied after the implementation of digitalization. The study suggested that customer relationship management of the banks can be improved in order to reduce various work pressure on the bank employees. Rushit and Jegan (2019) made an attempt to analyseE-HRM Practices in commercial banks: An empirical study in Kanniyakumari District. The study using judgement sampling method 215 respondents were selected out of which 146 were from public sector banks and remaining 69 were private sector bank employees. Confirmatory Factor Analysis, Multiple Regression and cronbach's Alpha were used for the analyses. It was concluded that the implementation of E-HRM practices in the banks is at the moderate level.

Shaumya and Anton (2018), studied about the impact of Electronic Human Resource Management (e-HRM) practices on bank's environmental performance. The study was undertaken in the Batticaloa region of Sri Lanka. The primary data for the study were collected using self-administrated questionnaire. Data were collected from 155 employees of selected commercial banks in the study area. Disproportionate Stratified Sampling method was used to identify the sample respondents. The researcher used multiple regression technique in which it was found that communication have a positive and significant impact on employee performance. Muhammad et.al., (2017) made a research on factors affecting to employee's performance on islamic banks, in which they analyzed about the factors affecting employee performance. 60 employees were selected from 8 Islamic banks of Pakistan using random sampling technique. Normality of the data was verified before the application of Multiple regression analysis and multicollinearity test. The results interpreted that there is a negative significant relationship on communication towards performance of employees and positive relationship between motivation and employee's performance. It was suggested that non-monetary benefits may help in motivating the employees. Anchal and Garima (2017), studied the E-HRM: Emerging HR Practices in Private Banks. This study is carried out in Lucknow city. The data are collected from the employees of HDFC, ICICI and IndusInd Bank using convenience sampling method. The alternate hypothesis is accepted that E-HRM plays a significant role in improving HR activities. It is concluded that the duplicacy of work and workload of the administration can be reduced by implementing E-HRM at all levels.

Kannan and Mohana (2016), made a study on impact of E-HRM in private sector banks of Coimbatore District. In this study simple random sampling method is used to identify the sample respondents in the Coimbatore district. Percentage

analysis, Chi square test and t-test were used for the analyses purpose. Hypothesis is framed that there is no significant relationship between E-HRM application serve as self-service and level of expertise in HR using E-HRM. T-test is used to test the hypothesis and the results revealed that the calculated value is more than the table value the hypothesis is accepted. It was suggested that the optimum use of E-HRM can be updated on routine basis. Preeti (2015) attempt to study the impact of E-HRM system on organizational Performance: A Case study on banking sector. The study intends to find the cause and effect relationship. Data are collected from 100 respondents from two public and private sector banks namely CBI, SBI, ICICI and HDFC. Hypotheses are framed and tested using chi square test. The results interpreted that there is exists a significant positive relation with the employee performance. The study found that both the public and private sector were at higher level in the banks of the study area.

Based on the reviews collected by the researcher, the research gap is identified. There are only a limited number of research studies based on the E-HRM practices of bank employees. Many studies have highlighted the attitude, satisfaction and impact of E-HRM. Research based on employee performance and work force agility are only limited. There is no study related to E-HRM practices and the impact of it over employee performance. So far there is no research that measures the E-HRM practices of the bank employees on employee performance which is measured through work force agility as a mediator or moderator. Moreover, model based research was not done on this research theme.

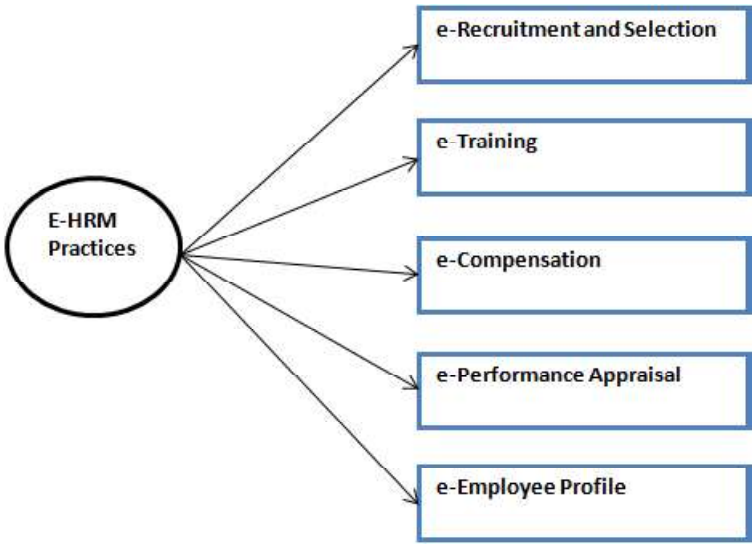

Figure 1: Proposed model of E-HRM practices

From the review of existing studies it can be known that the human resource management practices are very important for the employee rendezvous. For making a better selection of employees there are some factors have to be concentrated more, these factors here decided as factors of E-HRM Practices. The factors e-Recruitment and Selection, e-Training, e-Compensation, e-Performance Appraisal and e-Employee Profile are taken from the literature as factors of e-HRM practices for this study to develop the model for the same. From the identified factors, the researcher has developed a theoretical model for the e-HRM Practices ofthe Indian banking industry. Figure 1 shows the theoretical model for e-HRM Practices.

Research Methodology

The study is both descriptive and analytical in nature. It includes both the primary and the secondary data.This research is mainly depends on primary data. The primary data are gathered from the respondents with the help of a well-structured questionnaire.Totally there are 11 public sectors and 11 private sector banks are there in the Virudhunagar District. 15 respondents are selected from the total 22 public and private sector banks in the study area (15×22=330). Totally 330 sample respondents are selected for the study. The measures for e-HRM Practices in the current paper were adopted from various previous literatures. In the present paper have five dimensions and the each dimension held some number of statements viz., the first dimension consists of 11 statements, second dimension consists of 8 statements, third dimension consists of 13 statements, fourth dimension consists of 9 statements and the last dimension consists of 10 statements,in totaling 51 statements. To secure the total score for the respondents five points are given for strongly agree, four points are agree, three points for no opinion, two points for disagree and one point for strongly disagree responses.

This study clutches 4 stages of analysis which includes the first step as reliability proving, the second step is applying exploratory factor analysis, then the third step be authenticate the statements through confirmatory factor analysis and the ultimate step is determining the discrete model with the help of pooled confirmatory factor analysis.

Results and Discussion

Statistical techniques were applied to assess the reliability and validity of the survey and to obtain more clarity regarding the influence of the selected variables on the e-HRM. As already said earlier, it is four stage analysis of study. At first, the researcher measures the reliability of the variables taken into account. According to Du Plessis (2010) when calculating cronbach's alpha, results exceeding 0.60 will reflect the higher level of acceptability. The reliability statistics for the interview schedule are presented in Table 1.

Table 1: Reliability statistics

Constructs	Cronbach's alpha
e-Recruitment and Selection	0.853
e-Training	0.791
e-Compensation	0.836
e-Performance Appraisal	0.750
e-Employee Profile	0.768

Source: SPSS output

It is apparent form Table 1 that the reliability statistics or a Cronbach's alpha for the five different constructs were computed using the reliability procedure in IBM SPSS v22. The reliabilities of all the constructs used in this study are found as the above said standard set by Nunnally (1978), i.e. 0.60. Therefore the researchers came to the result that all the statements in constructs are reliable.

Exploratory Factor Analysis

Table 2: Results of pattern matrix

Factor Loadings									
e-Recruitment & Selection		e-Training		e-Compensation		e-Performance Appraisal		e-Employee Profile	
ERS2	.943	ET9	.907	EC8	.800	EPA9	921	EEP9	.987
ERS7	.999	ET13	.592	EC1	.704	EPA7	.848	EEP8	.534
ERS11	.827	ET10	.575	EC2	.697	EPA8	.984	EEP3	.611
ERS13	.774	ET6	.758	EC3	.647	EPA1	.720	EEP2	.605
ERS12	.738	ET3	.603	EC6	.575	EPA3	.596	EEP10	.833
ERS5	.633	ET7	.561	EC14	.565	EPA4	.580	EEP11	.660
ERS9	.619	ET5	.532	EC3	.542	EPA5	.556	EEP7	.572
ERS10	.598	ET4	.519	EC9	.502	EPA10	.525	EEP6	.540
ERS8	.591			EC4	.833	EPA2	.519	EEP4	.531
ERecSel3	.535			EC5	.733	EPA9	.720	EEP5	.511
ERecSel1	.511			EC1	.617			EEP12	.509
				EC2	.549			EEP1	.619
				EC7	.546				

Extraction Method: Maximum Likelihood

Rotation Method: Oblimin with Kaiser Normalization.

The rotated factor matrixes for the variables relating to the factor which are most influence in the e-HRM Practices of the Indian banking industry are given in Table 2. In the extant study, the maximum likelihood method with Direct Oblimin Rotation method was used to recognize the weighty set of factors for the e-HRM Practices.

Confirmatory Factor Analysis

Confirmatory factor analysis has used to determine the data validity of the five components of e-HRM Practices in Indian Banking Industry. The models have strong fit and the results are shown in following figures and tables. The confirmatory factor analysis (CFA) results showed that all the items were accepted. Moreover that the items correlated significantly to the factor itself with factor loadings ranging more than 0.30 (Hair et al, 2006). The first dimension e-recruitment and selection CFA model is shown in figure 2.

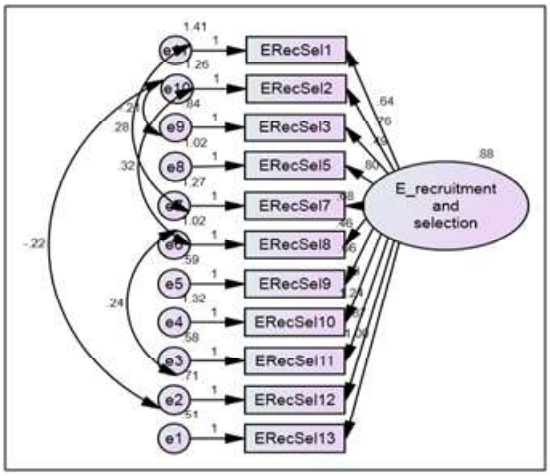

Table 3: First order CFA results of e-recruitment and selection

Name of Category	Name of Index	Index value	Level of acceptance	Comments
Absolute Fit	RMSEA	0.076	<.08	The required level is achieved
	GFI	0.947	>0.90	
Incremental Fit (or) Relative Fit	AGFI	0.910	>0.90	The required level is achieved
	CFI	0.939		
	TLI	0.914		
	NFI	0.910		
Parsimony Fit	Chi.Sq/df (CMIN)	2.881	<3.0	The required level is achieved

Source: AMOS output

The goodness of fit indices for e-Recruitment and Selection are presented in Table 3. E-Recruitment and selection is conceptualized with first order construct consists of thirteen items and all the items loadings are more than the acceptable value of 0.5, all the fit indices fall in the accepted range. The value of GFI (0.947) is more than 0.90. The value of AGFI (0.910) is more than 0.90. The RMSEA value (0.076) less than 0.08. The value of CFI obtained (0.939) greater than the threshold value 0.90.

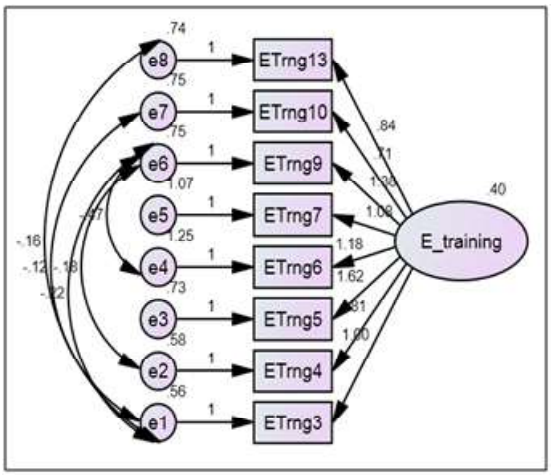

Figure 3: CFA model for e-training

Table 4: First order CFA results of E-training

Name of Index	Index value	Level of acceptance	Comments
RMSEA	0.061	<.08	The required level is achieved
GFI	0.975	>0.90	
AGFI	0.939	>0.90	The required level is achieved
CFI	0.972		
TLI	0.948		
NFI	0.952		
Chi.Sq/df (CMIN)	2.231	<3.0	The required level is achieved

Source: AMOS output

Table 4 shows the first order confirmatory factor analysis done on E-Training. The measurement model of E-Training yield CMIN/DF value is 2.231. The Goodness of Fit Index (GFI) is 0.975 and Adjusted Goodness of Fit Index (AGFI) is 0.939. The Root Mean Square Error Approximation (RMSEA) is 0.061, the Tucker Lewis Index (TLI) is 0.948, and the Comparative Fit Index (CFI) is 0.972. The Bentler-Bonett Normed Fit Index (NFI) is 0.952.

The third element of the Electronic Human Resource Management is e-Compensation. The measurement model of e-Compensation completed through AMOS graphics is shown in figure 4.

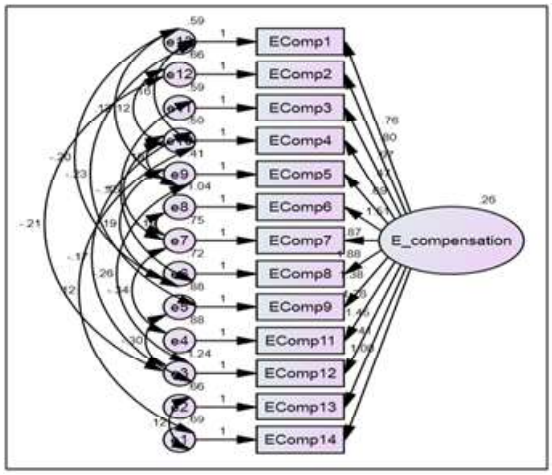

Figure 4: CFA Model for e-training

Table 5: First order CFA results of e-compensation

Name of Index	Index value	Level of Acceptance	Comments
RMSEA	0.073	<.08	The required level is achieved
GFI	0.940	>0.90	
AGFI	0.916	>0.90	The required level is achieved
CFI	0.940		
TLI	0.903		
NFI	0.911		
Chi.Sq/df (CMIN)	2.738	<3.0	The required level is achieved

Source: AMOS output

The value of GFI (0.940) is greater than 0.90. The value of AGFI (0.916) is more than the threshold value 0.90. The RMSEA value (0.073). The value of CFI obtained (0.940) greater than the recommended value that is 0.90. Besides, NFI (0.911), TLI (0.903) values are greater than the suggested index 0.90 and Chi-square/ degrees of freedom (CMIN) value (2.738) is less than 3.0.

The measurement model of E-Performance Appraisal done through AMOS graphics is shown in figure 5.

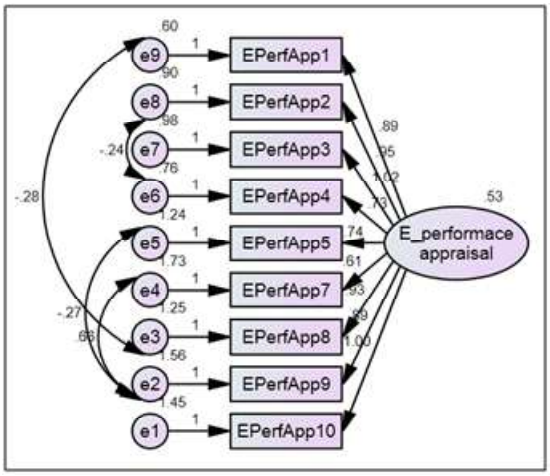

Table 6: First order CFA results of e-performance appraisal

Name of Index	Index value	Level of Acceptance	Comments
RMSEA	0.032	<.08	The required level is achieved
GFI	0.979	>0.90	
AGFI	0.959	>0.90	The required level is achieved
CFI	0.985		
TLI	0.976		
NFI	0.945		
Chi.Sq/df (CMIN)	1.346	<3.0	The required level is achieved

Source: AMOS output

The CMIN/DF ratio is 1.346, which is within the threshold range of less than 3, which are analytic of an acceptable fit. (Carmines and Mclver, 1981). The Goodness of Fit Index is 0.979 and Adjusted Goodness of Fit Index is 0.959. The Root Mean Square Error of Approximation is 0.032, which falls within cut-off value of 0.08 (Hu and Bentler, 1999). The Comparative Fit Index is 0.985 while the Tucker Lewis Index is 0.976 and the BentlerBonett Normed Fit Index is 0.945.

The measurement model of e-Employee Profile done through AMOS graphics is shown in figure 6.

The standardized estimates output is offered in the above graphical image. The first order CFA results are represented in Table 7.

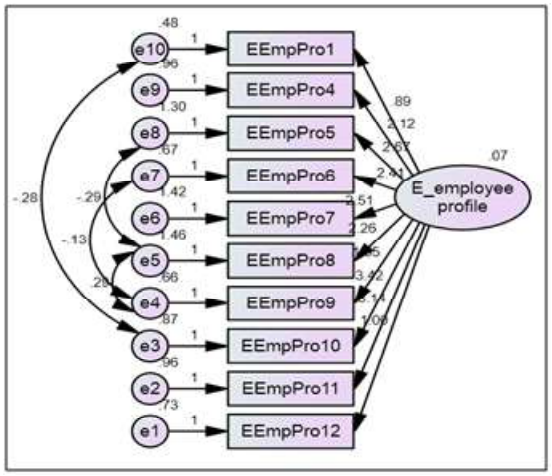

Table 7: First order CFA results of e-employee profile

Name of Index	Index value	Level of Acceptance	Comments
RMSEA	0.066	<.08	The required level is achieved
GFI	0.958	>0.90	
AGFI	0.926	>0.90	The required level is achieved
CFI	0.929		
TLI	0.897		
NFI	0.887		
Chi.Sq/df (CMIN)	2.419	<3.0	The required level is achieved

Source: AMOS output

Table shows the first order confirmatory factor analysis done on e-Employee Profile. Table 7 reveals that the model is good enough since all the values fall within the acceptable ranges. The measurement model of E-Employee Profile yield CMIN/DF ratio of 2.419. The Goodness of Fit Index (GFI) is 0.958 and Adjusted Goodness of Fit Index (AGFI) is 0.926. The Root Mean Square Error Approximation (RMSEA) is 0.066, the Tucker Lewis Index (TLI) is 0.897 and the Comparative Fit Index (CFI) is 0.929. The Bentler-Bonett Normed Fit Index (NFI) is 0.887.

The final step of the analysis i.e. pooled confirmatory factor analysis has been applied. It shows the all the individual model as converted to a structural model. It can be seen in figure 7 and its results are shown in Table 8.

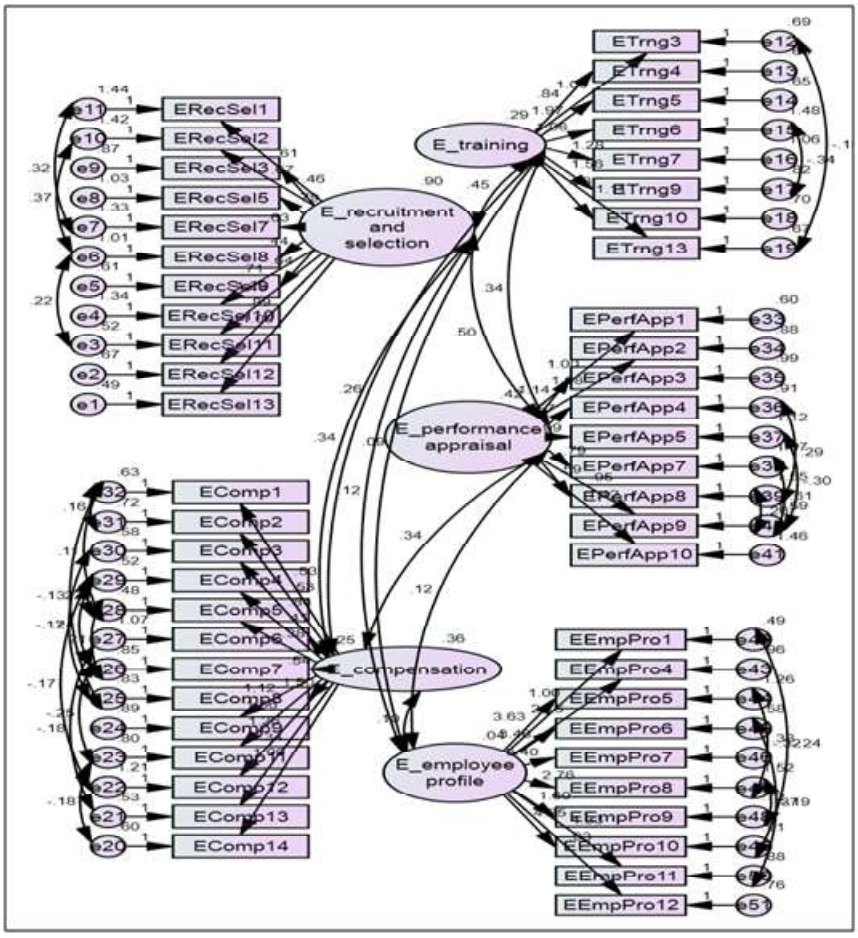

Table 8: Fit indices of structural model

CMIN	Df	CMIN/Df	GFI	AGFI	TLI	CFI	RMSEA
3500.601	1190	2.942	.955	.915	.902	.918	0.079

Source: AMOS Text output

As it can be seen from Table 8, Goodness of fit of the ultimate structural model indicated reasonable or good fit or RMSEA=0.079. Hair et al., (2009) recommended 0.05<RMSEA<0.08 is for good fit. In this study, CFI (Comparative Fit Index) = 0.918proves reasonable fit of this study. Hu and Bentler (1999) suggested that a rule of thumb for the CFI and the incremental fit indexes is that values greater than roughly 0.90 may indicate reasonably good fit of the researcher's model. The GFI was the first standardized fit index (Joreakog and Sorbom, 1999). GFI=1.00 indicates faultless model fit. Therefore, a GFI=0.955 be a sign of reasonably good fit of the researcher's model in this study. The AGFI of

0.915 indicate reasonably good fit of the customer retention model. The NNFI (Non-normed fit index) or TLI (Tucker Lewis index) has been recommended by bentler and bonett (1980). It is the value of 0.90 or better for good fit. Thus, a TLI=0.902 for this study implies fine fit. From the above goodness of fit index or evaluation, confirmatory factor analysis for the final measurement reasonably supported the e-HRM Practices model fit.

Conclusion

This research study was conducted to develop the model "e-HRM Practices in Indian Banking Industry". Research indicates that all the five constructs are the important factors that can evident the e-HRM Practices in Indian banking industry. The results of this study show that the five factors is a direct path and is a factor that significantly affects the model and have a strong impact.

This research can be simulated in the same manner with a large sample size. This research concludes that e-HRM Practices is significant in the present model and will adapt to this model in any financial sector with needy statements. Although the pooled CFA provides a good fit to the model, future research could use a different design and to examine the Structural Equation Modeling (SEM).

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Impact of Culture on Service Quality: Evidence from Indian Restaurant Industry

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Abstract: Companies are increasingly investigating the role of cultural dimension on service quality. The present study examines the effect of culture on service quality within fast food restaurant industry in Delhi-NCR.Data was analyzed using Confirmatory Factor Analysis and SEM. The results of the study describes the impact of culture on service quality which are critical for the managers to understand the behaviour of undergraduate students with reference to fast food. Both Power Distance Orientation and Collectivist Orientation were found to have influence on service quality.

Keywords: Hofstede Cultural Dimensions, Service Quality, Indian Fast-Food Industry, Culture, Consumer Behaviour

Introduction

Service sector has witnessed a phenomenal growth in recent decades. Contribution of the services accounted for 63% of the world GDP in the year 2017. In the last century, there was a huge shift from producer's viewpoint to the satisfaction of customer's needs and desires which resulted in more focus on services to achieve profitability. With so much dependency of the world on services, it is difficult to ignore this sector from business viewpoint as well as from the viewpoint of academic research.

As competition is growing in the business world, companies are finding it quite challenging to satisfy and retain the customers. Since all organizations have some degree of service (Zeithaml, 2009), services have become the point of differentiation to gain a competitive advantage and, as a result, service quality is playing a crucial part in customer satisfaction (Parasuraman et al., 1985). According toSzymanski & Henard (2001), customer satisfaction is more important for diverse business and for the firms operating in global market. As most of the

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companies entering global markets try to adopt theories and practices which were successful in their home country, Verhage et al. (1990) warned that marketers need to be very careful in entering global markets as different cultures have altogether different complexities as compared to their home countries.

With rise in disposable income, the dining habits and pattern of fast-food consumption have completely changed in the 21st century. It all started in 1996 when Mc Donald, one of the major fast-food brands, decided to enter India. Soon, other major brands also entered India. Some of the researchers had projected 18% growth rate for Indian fast-food industry by 2020. At this rate, India could be compared to USA. With major MNCs having already entered the Indian market or seeking to enter India, this is the right time to analyze the relationship between culture and service quality in the Indian market for the fast-food industry. The present study is an attempt to find the relationship between cultural dimensions (Power Distance and Collectivism) and service quality for the fast-food industry in the Delhi-NCR region. However, service industry has suffered huge losses due to Covid-19 pandemic and the projections are bound to go haywire.

Culture influences behaviour. Influence of culture on marketing has increased more than ever in the present day globalized world (Peñaloza & Gilly, 1999). The impact of culture can be seen on almost all aspects of marketing, marketing entry modes, retailer practices, internet usages and shopping practices. According to Usunier (1993), culture is the sum of all behaviour and norms shared by a social group.It is understandable that people from various backgrounds may have different perceptions and expectations of service. Behavior of humans is highly affected by the culture they belong to (Schiffman & Kanuk, 2007). The effect of culture on the personality of a person is so natural that it is not even realized and generally taken for granted and it is visible only when we come across people from some other cultural background. Culture provides a framework within which an individual takes decision. Culture creates a framework inside which people as well as house-hold construct their structure of life or perhaps display personal lifestyle.

Restaurant industry is a part of service industry. Researchers have already established the link between culture and service quality. India is considered as a high-Power Distance country. In high power distance cultures, the customers consider service providers superior to them.Frazier et al., (1989) also concluded that sellers are more powerful than customers in India. As weak customers are not important for powerful restaurant service providers in High Power Distance countries, customers in such countries are more likely to keep their expectations low and accept substandard services from the restaurants without complaining. Cultures high on Collectivism focus more on obedience and group conformity.

Further collectivist culture love to make intimate and long-lasting relationship and, as a result, they expect empathy from the service providers (Acharya et al., 2009).

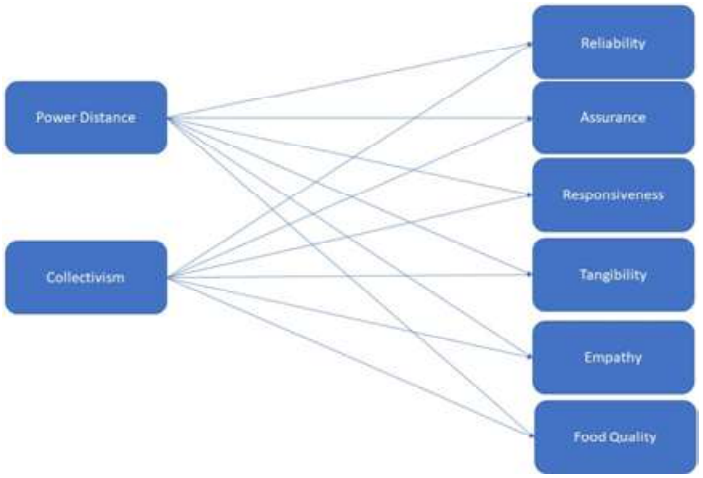

Figure 1: Research framework

Review of Literature

Service Quality

Grönroos (1984)explained that service quality is determined by comparing perceived service quality to measured service quality. Evaluating service is not easy as service is both intangible and heterogenous. As a result, most of the times, customers are looking for tangible proof of services(Laroche et al., 2004).

Several researchers have developed instruments to measure service quality.However, the most accepted scale is the SERVQUAL developed by Parasuraman et al., (1988). The researchers came out with 5 dimensions of service quality based on 22 item instrument which are as following:Reliability (ability to perform the service precisely), Assurance (behaviour and knowledge of employees), Responsiveness (providing quick service), Tangibles (physical facilities) and Empathy (caring attitude towards customers).

Culture

Different researchers have defined culture differently (Sian et al., 2010). Hofstede et al. (2010) defined culture as "the collective programming of the mind". According to Ferraro & Briody (2017), culture is all encompassing as to how people behave as members of their society. The different definitions of culture highlight the fact that culture touches every aspect of our life.

According to Rand & Tsoukatos (2007), most of the research on culture is based on Hofstedework (1990,1991). Hofstede's cultural dimension framework is widely used in the field of psychology and marketing (Steenkamp, 2001). Hofstede conducted a survey of 60,000 people in seventy countries and initiallycame out with four cultural dimensions and later on fifth dimension was also added. To limit the scope of the study, only two dimensions have been used in the present study i.e. Power Distance (This dimension reflects how society accepts and expects unequal power distribution in society.) and Individualism Vs Collectivism (This dimension describes the relationship which the individuals have within their family/group. In an individualistic culture, people are concerned about their immediate family members and close friends, whereas in collectivist culture, group preferences are treated above individual preferences.)

Culture and Service Quality

The impact of culture is visible on all marketing activities like advertising(Laroche et al., 2001), shopping practices (Ackerman & Tellis, 2001)and it is also visible quite significantly in global marketplaces. Researchers have already found that variations exist regarding service expectations among different cultures (Zhu et al., 2007)and accordingly, the behaviour of the customers to evaluate the services and their expectations related to service delivery vary. Despite the fact that researchers have attempted to investigate the relationship between cultural dimensions and service quality, the issue has not been abundantly explored in India due to the complexities of Indian culture.

Research Methodology

Sampling

A focus group interviews were conducted by the researchers who acted as moderators. Data was collected from the undergraduate students of Delhi-NCR. A total of 261 responses were received, out of which 5 responses were discarded for response error. Table 1 shows the demographic profile of the respondents. The Table clearly depicts that the majority of the respondents spend close to Rs 3000 per month on dining out.

Measurement

A questionnaire was created using a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was divided into three parts. Part A consisted of questions for assessing the cultural background of the respondents. Cultural Dimension scale was adopted from Yoo et al. (2011). Part B of the questionnaire was developed based on three models namely, SERVQUAL, DINERSERV and CFFRSERV used in the study conducted by Saneva &

Chortoseva (2018). The questionnaire consisted of questions for assessing the service quality for fast food restaurants. The questionnaire consisted of 29 attributes grouped in 6 factors, Tangibility, Reliability, Food Quality, Responsiveness, Assurance and Empathy. In Part C, questions related to demographic profile of the respondents were included.

Table 1: Demographic profile of the respondents

Age		
	Number	Percentage
Less than 20	87	34%
20-30	131	51%
Above 30	38	15%
Total	256	100%
Gender		
	Frequency	Percentage
Male	149	58%
Female	107	42%
Total	256	100%
Family Income (in Rs)		
	Frequency	Percentage
Less than 20000	16	6%
20001-40000	26	10%
40001-60000	51	20%
60001-80000	36	14%
Above 80000	127	50%
Total	256	100%
Monthly Dining out expenditure (in Rs)		
	Frequency	Percentage
Less than 1000	67	26%
1001-3000	52	20%
3001-5000	102	40%
Above 5000	35	14%
Total	256	100%

Analysis

Data Screening

Data was scanned for any missing responses and variable P1 had 3, A2 had 5 and E4 had 2 missing values. Since the responses were on a 5-point Likert scale, the data was imputed using the median. Further, data was checked for any unengaged responses and response from 5 respondents were dropped as they had given the same response for all questions. Thedata for outliers was not checked as the responses were captured using 5-point Likert scale. However, data was also checked for skewness and kurtosis and all the values were found to be within the range.

Exploratory Factor Analysis

An Exploratory Factor Analysis (EFA) was conducted with 40 items. The result of Kaiser-Meyer-Olkin (KMO) Test, as shown in Table 2, proved that samples were adequate to run EFA.Bartlett's test of sphericity also indicated sufficient correlation for Principal Component Analysis (PCA). Total eight factors were retained which had eigenvalues over 1 and explained 72.629% of the variance.

Table 2: KMO and bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.902
Bartlett's Test of Sphericity	Approx. Chi-Square	7226.479
	df	780
	Sig.	.000

Measurement Model

Confirmatory Factor Analysis (CFA) was used to analyse the measurement model. The CFA fit was excellent (÷2 = 1169.734, df = 712, 2/df = 1.643, p.000, CFI = 0.933, RMSEA = 0.050). Table3: Confirmatory Factor Analysis (CFA)

Constructs and Items	Mean	SD	SL
Tangibility			
T1	2.86	1.042	.814
T2	2.79	1.396	.705
T3	2.88	1.008	.770
T4	2.96	1.053	.790
T5	2.93	0.905	.850
T6	2.81	1.062	.696
Power Distance			
P1	3.15	1.206	.768

Contd...

P2	3	1.042	.767
P3	3.02	1.47	.783
P4	2.96	1.139	.788
P5	3.06	1.037	.746
Food Quality			
F1	2.88	0.931	.696
F2	2.95	0.981	.751
F3	2.86	1.058	.735
F4	2.82	1.195	.706
F5	2.88	0.861	.679
Assurance			
A1	2.91	0.948	.755
A2	2.95	0.891	.756
A3	2.78	1.029	.741
A4	2.84	0.988	.717
A5	2.93	0.905	.747
Reliability			
Rel1	2.79	0.968	.789
Rel2	2.83	0.987	.762
Rel3	2.73	0.971	.805
Rel4	2.75	0.997	.756
Rel5	2.55	0.977	.747
Responsiveness			
Res1	2.6	1.077	.818
Res2	2.6	1.05	.864
Res3	2.64	1.039	.863
Empathy			
Emp1	3.06	1.035	.877
Emp2	3.1	1.164	.864
Emp3	3.2	1.097	.879
Emp4	3.17	1.096	.853
Emp5	3.17	0.92	.818
Collectivism			
C1	3.29	1.081	.795
C2	3.54	1.039	.789
C3	3.48	1.044	.754
C4	3.46	1.043	.780
C5	3.38	1.278	.686
C6	3.39	1.478	.772

Overall Impact: ÷2 = 1169.734, df = 712, ÷2/df = 1.643, p < .000, CFI = 0.933; RMSEA = 0.052
Note: SL= Standard Loading, M = Mean, SD = Standard Deviation.

Validity and Reliability

The value of AVE was determined for each construct to measure convergent validity. For discriminant validity, the construct correlations were evaluated using the square root of the AVE for each construct. All AVE values were greater than 0.50, as seen in Table 4, and the square root of AVE for each construct was greater than its correlation with the other constructs. As a result, there was no problem with convergent or discriminant validity. The reliabilities for each construct were greater than 0.70, satisfying the overall reliability criteria.

Table4:Reliability and discriminant validity

	á	AVE	MSV	Max R(H)	T	C	E	P	Rel	A	F	Res
T	0.9	0.913	0.639	0.378	0.921	0.799						
C	0.89	0.898	0.596	0.288	0.902	0.445***	0.772					
E	0.92	0.915	0.685	0.032	0.921	-0.095	-0.042	0.828				
P	0.92	0.922	0.705	0.453	0.937	0.615***	0.375***	-0.124†	0.84			
Rel	0.9	0.895	0.63	0.384	0.896	0.245***	0.435***	0.069	0.404***	0.794		
A	0.86	0.862	0.557	0.384	0.867	0.225**	0.415***	0.061	0.437***	0.620***	0.746	
F	0.9	0.901	0.645	0.453	0.905	0.609***	0.536***	-0.016	0.673***	0.498***	0.514***	0.803
Res	0.86	0.856	0.665	0.083	0.86	-0.124†	0.199**	0.180*	0.147*	0.258***	0.288***	0.196**.82

Note: á = Cronbach's alfa, AVE= AverageVariance Extracted, MSV= Maximum Shared Variance, P= Power Distance, C = Collectivism, T= Tangibility, Rel = Reliability, F = Food Quality, E = Empathy, A = Assurance, Res = Responsiveness.

Hypotheses

Power Distance

Hofstede (2001) proposed the definition of Power Distance as "The extent to which the less powerful member of the institutions and organizations within a country expect and accept that the power is distributed unequally" (p.98).There is considerable behavioural difference between the cultures high on Power Distance and the cultures low on Power Distance. In their research, Frazier et al. (1989) compared Western and Indian markets and came to the conclusion that sellers in India have more power than customers. Dash et al. (2009) observed that "Powerful service providers treat weak customers in high power distance cultures as non-existent, who, in turn, are more dependent on powerful service providers due to their power disadvantage" (p. 340). As a result, weaker customers are more tolerant of such behaviour by the service providers. Rand & Tsoukatos (2007) discovered an inverse association between power distance and insurance consumer responsiveness and reliability. Customers who have a high-

Power Distance score believe they are unimportant and have low expectations from service providers. As a result, consumers embrace power imbalances and perceive themselves as weak as compared with the service providers. Based on the literature, following hypotheses are proposed:

H_1: Power Distance negatively effects Tangibility.

H_2: Power Distance negatively effects Reliability.

H_3: Power Distance negatively effects Responsiveness.

H_4: Power Distance negatively effects Assurance.

H_5: Power Distance negatively effects Empathy.

H_6: Power Distance negativelyeffects Food Quality.

Collectivism

People in culture high in collectivism act and behave in a group, whereas people in culture low in collectivism (i.e Individualism) behave in an individual manner(Hofstede et al., 2010). The socializing patterns in a culture which is high in collectivism demands people to follow group norms, obedience, sacrifice etc. On the contrary, culture high on individualism displays creativity and independence(Dash et al., 2009).Furrer et al. (2000)argued that the key traits of individualistic tendency are independence and self-confidence. Suchcustomers do not need any assurance from service providers. On the other side, according to(Kueh & Voon, 2007)people in culture high on collectivism have a greater need for the service provider to show empathy, assurance and responsiveness.

Based on the literature, following hypotheses are proposed:

H_7: Collectivism positively effects Tangibility.

H_8: Collectivism negativelyeffects Reliability.

H_9: Collectivism positively effects Responsiveness.

H_{10}: Collectivism positively effects Assurance.

H_{11}: Collectivism positively effects Empathy.

H_{12}: Collectivism positively effects Food Quality.

Structural Model

The model fitness indices:÷2 = 1291.930, df = 727, ÷2/df = 1., p < .000, CFI = 0.918; RMR= 0.055 reflect good model fit.

Table 5: Hypotheses results

Hypothesis No	Hypothesis	R^2	â	T value	Results
H1	Power Distance negatively effects . Tangibility	0.431	-0.528	-8.385	Supported
H2	Power Distance negatively effects . Reliability	0.281	-0.283	-4.231	Supported
H3	Power Distance negatively effects . Responsiveness	0.048	-0.076	-.982	Not supported
H4	PowerDistancenegatively effects . Assurance	0.288	-0.330	-4.789	Supported
H5	Power Distance negatively effects . Empathy	0.013	0.122	1.661	Not supported
H6	PowerDistance negatively effects Food Quality	0.572	-0.557	-9.162	Supported
H7	Collectivism positively effects Tangibility.	0.431	0.241	3.943	Supported
H8	Collectivism negatively effects Reliability.	0.281	-0.354	-5.022	Not supported
H9	Collectivism positively effects Responsiveness.	0.048	0.179	2.325	Not Supported
H10	Collectivism positively effects Assurance.	0.288	0.318	4.478	Supported
H11	Collectivism positively effects Empathy.	0.013	0.020	0.265	Not supported
H12	Collectivism positively effects Food Quality.	0.572	0.344	5.854	Supported

Overall Impact: ÷2 = 1291.930, df = 727, ÷2/df = 1., p < .000, CFI = 0.918; RMR= 0.055 reflect good model fit.

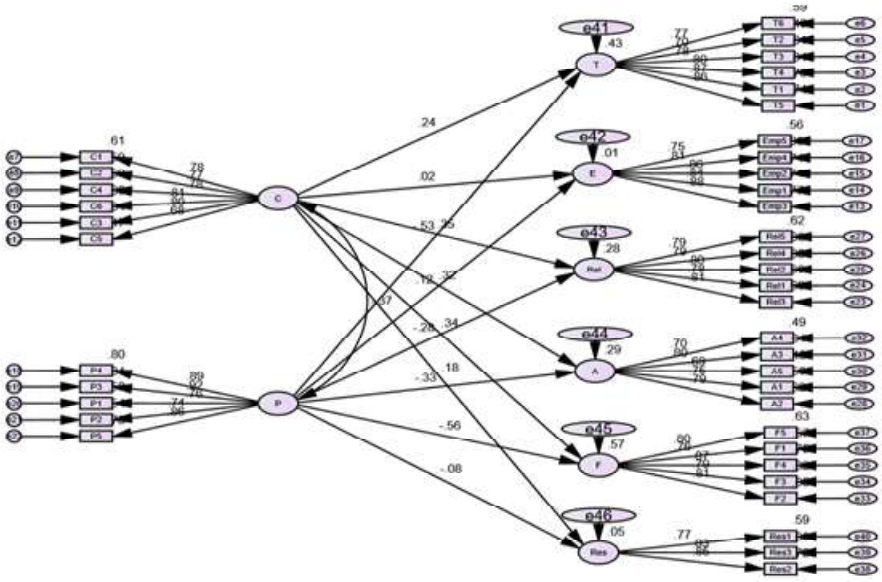

Figure 2: Path Diagram

Overall Impact: ÷2 = 1291.930, df = 727, ÷2/df = 1., p < .000, CFI = 0.918; RMR= 0.055 reflect good model fit.

Note: P= Power Distance, L = Long Term, C = Collectivism, T= Tangibility, U = Uncertainty Avoidance, M = Masculinity, Rel = Reliability, F = Food Quality, Emp = Empathy, A = Assurance, Res = Responsiveness.

Conclusion

The impact of culture on service quality has attracted lot of interest from the researchers across the globe and this shows the importance of culture in understanding service quality expectations from customers. This study has been conducted to find out whether cultural dimensions (Power Distance and Collectivism) affect service quality in the fast-food restaurant industry. The research problem was tested on samples of the undergraduate students of Delhi-NCR as students of this age groups are frequentvisitors to fast-food joints.

Out of total 12 hypotheses tested on the dimensions of culture and service quality, 8 were fully supported. The result affirms the effect of culture on service quality. The results of this study are important to both - the industry and the academia.

With respect to industry, the study provides suggestions to managers on the use of cultural dimensions to service the customers of fast-food industry in a more efficient manner. This research has various practical implications as proved by the results. Sincemain consumers of fast food are youngsters which are mostly students, managers cannot afford to ignore this group.

The outcomes of this study will contribute towards more efficient management of the service environment and, more specifically, of thefast-food service industry. Managers should keep that aspect of culture in mind and then design their service offerings accordingly. For example, to provide the best service to the customers in fast-food restaurants, managers can skip empathy and focus on all the remaining dimensions of service quality.

Finally, culture is never static and keeps on evolving. Keeping this fact in mind, managers should not take things for granted. They have to keep changing the patterns of their services according to the changing cultural paradigms. Also, the requirements of different industries are unique and this methodological framework is applicable to all cultural settings and service providing arrangements.

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Appendix:Questionnaire

Hofstede Cultural Dimensions

Power Distance

1 People in higher positions should make most decisions without consulting people in lower positions.

2 People in higher positions should not ask the opinions of people in lower positions too frequently

3 People in higher positions should avoid social interaction with people in lower positions.

4 People in lower positions should not disagree with decisions by people in higher positions

5 People in higher positions should not delegate important tasks to people in lower positions.

Collectivism

1 Individuals should sacrifice self-interest for the group.

2 Individuals should stick with the group even through difficulties.

3 Group welfare is more important than individual rewards.

4 Group success is more important than individual success

5 Individuals should only pursue their goals after considering the welfare of the group

6 Group loyalty should be encouraged even if individual goals suffer.

Service Quality Scale

Tangibility

1 The restaurant has visually attractive parking areas and building exteriors.

2 The restaurant has visually dining area.

3 The restaurant has appropriate, decent and neatly dressed employees.

4 The restaurant has a menu that is easily readable.

5 Dining space is spacious and comfortable.

6 The restaurant looks clean and neat.

Reliability

1 The restaurant provides the service on time.

2 The restaurant quickly corrects everything that is wrong.

3 The restaurant is reliable and consistent in the service

4 The restaurant offers an accurate calculation of the guests.

5 The restaurant serves the food exactly as you have ordered it.

Food Quality

1 The food has a nice taste.

2 Food is served at an appropriate temperature.

3 Food is fresh.

4 The choice of food is different.

5 Food is served in good portions.

Responsiveness

1 During the busy hours the restaurant provides the service at the promised time.

2 The restaurant provides quick service.

3 The restaurant gives extra effort to handle your special requests.

Assurance

1 Employees should always be ready to help.

2 Staff should be loyal and honest.

3 Staff should be polite.

4 The restaurant has staff who are both able and willing to give you information about menu items, their ingredients, and methods of preparation.

5 The restaurant has staff that look educated, competent and experienced

Empathy

1 The restaurant has employees who have time for your individual wishes.

2 The restaurant makes you feel special.

3 The restaurant provides your individual needs and requirements.

4 The restaurant has employees who are sympathetic and calm when something is wrong.

5 The restaurant seems to have the customers' best interests at heart.

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Construction of Scale for the Measurement of Emotional Branding: A Study of Indian Hair Oil

NIHARIKA

Abstract: In today's era, where there is so much of competition among brands, there has to be some distinctive strategy to build and develop consumer-brand linkages. One such strategy is connecting consumers with brands at emotional level. In order to develop deeper, stronger and long -lasting brand attachment, a deeper emotional connection with consumers is required. Such strategy is emotional branding. Emotional Branding plays a vital role in influencing purchase decisions of customers. These days advertisers are using more of emotional dimensions in advertisements in order to connect to customers and trigger the purchase. There has been studies which have talked about emotional branding but a holistic validated scale to measure it has not been developed. Therefore, the focus of this study is to conceptualize, develop and validate a multidimensional scale for Emotional Branding. Firstly, questionnaire was developed for pre-testing in the first stage. Followed by three level data collection to fulfil the objective. Initial scale was tested for its reliability. In the second stage, exploratory factor analysis was conducted to explore the underlying factors of EBS. The results show that the four constructs having 31 items form EBS Scale. The finalised scale was tested for the validity in the last phase of data collection which confirmed that the emotional branding scale has four components (i.e.sensory appeal, brand attachment appeal, communication appeal and patriotism appeal).

Keywords: Emotional branding, scale development, sensor appeal, brand attachment appeal, communication appeal, patriotism appeal, emotional branding scale.

Introduction

The concept of emotional branding has gained importance in the neoteric times. Establishing a strong brand is closely linked to creating an emotional connection with your consumers – this is called emotional branding (Khanna, 2019). Emotional branding refers to the practice of building brands that appeal directly to a consumer's ego, emotional state, needs and aspirations (Prabha, 2011). Involving

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in emotional branding strategy can help entail customers, make them feel how much do you care about how do they feel, how much can you connect with them, how much are they attached with your brand, how can they relate themselves with your brand, how much your brand deeply connects with their believes, values and emotions. These-days the competition among brands have been increasing, therefore there has to be some distinctive strategy to build and develop consumer-brand linkages. One such strategy is connecting consumers with brands at emotional level. The brand demands a strong emotional connection and relatable dimensions to survive and be different or unique from the competitors. Every advertisement may have some emotional connect. But the advertisements which have sky-scraping amount of connecting emotions- which have the potential to touch human hearts- trigger emotional impulse-are the ones successful. These brands which connect emotionally with customers are retained and remembered by them. As soon as they see the brand, they hear the song of that brand -the memories pass by and they connect themselves with the brand. In India, there are certain old but recognized jingles which we still remember and once we hear them anywhere, we start to sing. These are: "we are heroes- Hero Motor Corp", "The Taste Of India: Amul", "Googly Woogly Woosh: Ponds", "You and I: Vodafone", "Washing Powder: Nirma", "every friend is important: Airtel", "our Bajaj". No matter how old these background songs get, we always start to sing as it starts. These have created an emotional attachment with the consumer resulting in recalling of the brand and long-term connection, involving emotional experiences such as happiness, trust, essence of childhood, involvement and loyalty. "A brand's uniqueness should not be limited to factors such as innovative designing, durability and quality but also their impact on the consumer's ideologies, thoughts and perception" (Seth, 2016). The deep emotional connection between consumers and brand will enhance their relationship, trigger purchase decisions, build long term relations, retain consumers, increase satisfaction, commitment, brand loyalty and increase repurchase intention.

The stages of paper are as followed. First the paper develops the conceptual framework of emotional branding with the help of the review of literature followed by motivation of the study. Then the reliability of the scale is tested after the initial exploratory factor analysis and finally in the last stage confirmatory factor analysis has been performed to validate the scale. The detail of these has been given in the subsequent sections.

Motivation for the Study and Research Gap

The literature on the phenomenon, Emotional Branding is scant. There is meagreness in the same area. Moreover, there is dearth of studies on emotional branding in the Indian context (Nair, et al. 2017). There is no holistic measurement

approach for the phenomenon. (Singla et al. 2019) as well as no empirical investigation for the same (Akgun et al. 2013). This study aims at fulfilling the above research gaps by providing quantitative investigation and a holistic measurement approach for the same. The study focuses on fast moving consumer goods industry with product hair oil. The paper focuses on Indian consumers, their perception, their elucidation and their responses towards the brand.

Theoretical Background and Identification of Constructs

Rieunier and Jallais (2013) "defined sensory marketing as the fact to use the ambient factors which surround the selling point (such as the music, the scent, the colour, the touching and tasting sensations) in order to stimulate, in the consumer's mind, a favourable reaction toward the purchasing act". "The sensory marketing is then a marketing tool, using the senses of the consumer, which mean the tactile, visual, auditory, olfactory and gustatory senses" (Rieunier 2006). Hui, et al. (1997) "showed that the atmospheric factors, and especially the music, can have a positive impact on the mood of behaviour. The music and sounds, in general, can stimulate the pleasure and the memory of individuals, which probably can result in a desire to buy more, or at least to spend more time at the point of sales. The smell has a huge impact on the memory by touching the emotions that the customers have had an experience (pleasant or unpleasant)". Sensory marketing engages and triggers consumers' senses i.e., sight, sound, feel, taste, and smell (Krishna 2012). Similarly, Hulten (2011) examined the importance of multi-sensory brand experience. The study shows that "multi-sensory brand experience helps in differentiating, distinguishing and positioning a brand in the human mind as an image". Therefore, our first construct is sensory appeal.

"Brand attachment is an effective brand management objective which results in positive financial performances beyond established consequences such as brand loyalty and price premium" (Thomson et al., 2005). Whan (2010) "suggests that when consumers are strongly attached to a brand, they can also have a positive and strong attitude toward it". According to Grisaffe and Nguyen (2011) "the companies harvest financial benefits when enduring emotional connections are developed between brands and consumers, and rewards from emotionally bonded repurchases are less exposed to situations that induce switching". Therefore, our second construct is brand attachment appeal.

Advertising is known for the continuing impact on the consumer's mind. "One of the effective tools of integrated marketing communication that emotionally motivate consumers to buy products is advertising" (Moore, 2004). "The most effective tool in advertising is emotional advertising because it enables consumers give emotional response to product" (Brassington & Petitt, 2001). Srivastava (2016) proved emotional advertisement lead to a higher degree of purchase

intentions for low involved products. People remembered emotional advertisements more than the funny advertisement. Abayia and Khoshtinat (2004) "explained that the impact of advertising for attracting the consumer, when the individual's mind is engaged with the considered product, positively affects his/her tendency to search for information, therefore, the first thing the individual does is web browsing". Therefore, the third construct is communication appeal.

The feeling of patriotism is now playing an important role in marketing and branding of a brand. This sentiment has the power to influence purchase decision of consumers. Yoo et al. (2014) "demonstrated that fused persons in both countries increased their willingness to be patriotic consumers by showing a high consumer ethnocentric tendency and favourable responses to patriotic advertising". Wel et al. (2015) found that patriotism, attitude and subjective norms were positively related to consumer buying intention. Alekam et al. found patriotism, trust and family directly influenced the purchase intention in the case of local brands. Spillan et al.(2013) "found that ethnocentric attributes such as patriotism, protectionism, and social conservatism influenced the way Indian and Vietnam consumers perceived products". Salman et al. (2015) "found that there was a relationship between ethnocentrism and purchase intentions with reference to local brands". Therefore, the fourth construct is patriotism appeal.

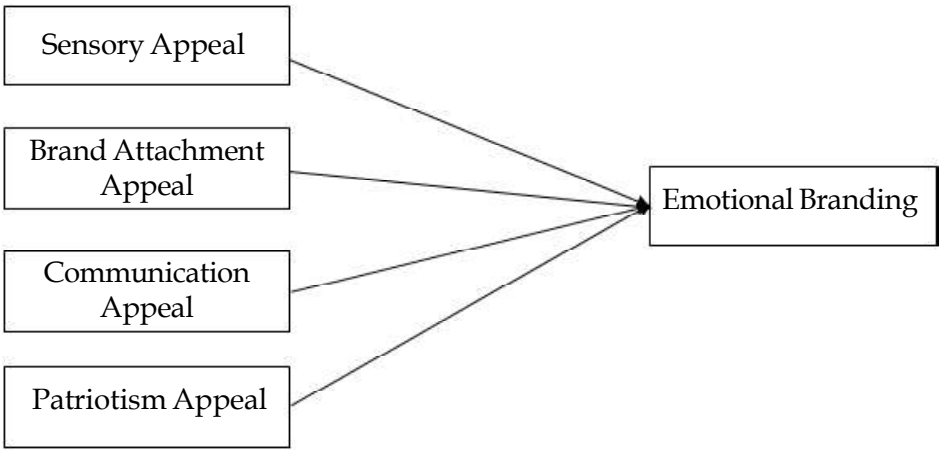

Figure 1: Theoretical Framework

Research Methodology

Research Design

A multiple stages study has been conducted to develop and validate the scale. Initial questionnaire was developed for pre-testing in the first stage. Initially there were 38 statements. After several rounds of discussion 31 statements were

selected. A five-point Likert's scale was applied to measure different constructs ranging from *'Strongly Disagree'* to *'Strongly Agree'*. Subsequently, the study followed three level data collection to fulfil the objective. In the first stage, the initial scale was tested for its reliability by conducting a pilot survey and suggestions about the language items were incorporated before the second stage of data collection. The second stage incorporates exploratory factor analysis to explore the factors of EBS.The finalised scale was tested for the validity in the last phase of data collection. A total sample size was 525 (for pilot study 30 respondents for EFA 170 respondents and for CFA 325 respondents). The sampling technique used was convenience sampling, for exploratory study. For the validity of the scale, the data was collected through simple random sampling. The duly filled up questionnaire of 30 respondents were utilized for the Pilot study. After that the responses from 495 respondents were used for the analysis purposes. 170 responses for EFA and 325 for CFA.

Results

Item Generation

The items were finalized from the review of literature for the development of the emotional branding scale the items generated are listed in Table 1. The instrument had 31 items which were culturally modified considering the past studies and expert's insights to ensure the content validity.

Table 1: Measurement items

Construct		Final Measurement Items
Sensory appeal (SA)	1.	I like the fragrance of this product.
	2.	The texture of this product is sensational.
	3.	The product is visually appealing.
	4.	The colour of this product is attractive.
Brand attachment appeal (BA)	1.	I am fond of this brand.
	2.	I love this brand.
	3.	I think that this brand and I are quite similar to each other.
	4.	I feel emotionally attached with this brand.
	5.	There is something almost magical about my relationship with this brand.
	6.	There is a bond between me and this brand.
	7.	I feel connected to this brand.
	8.	I am passionate towards this brand.
	9.	I am delighted to this brand.
	10.	I am captivated to this brand.

Contd...

Communication appeal (CA)	1.	I feel happy about the brand.
	2.	The brand is popular.
	3.	I feel excited about the brand.
	4.	I feel contented with the brand.
	5.	I am favourable to this brand.
	6.	The product is effective.
	7.	The product possesses distinct feature.
	8.	The product is good for overall health of the human being.
	9.	The product is not harmful.
	10.	The product is right value for money.
Patriotism appeal (PA)	1.	I love Indian brand.
	2.	I feel happy when I buy Indian brand.
	3.	I prefer to buy products manufactured in India.
	4.	The country of origin is very important for me.
	5.	I feel proud in buying Indian brand.
	6.	When I buy products made in India, Indian economy will prosper.
	7.	I am committed to the Indian brand.

Phase 1: Pilot Testing

In the pilot testing phase, the instrument had 31 items which were culturally modified considering the past studies and expert's insights to ensure the content validity. For the new construct i.e. Patriotism appeal, seven statements were selected. The items for Brand attachment appeal were adopted from (Thompson et al. 2005). Pilot test was conducted on 30 respondents. The Cronbach's alpha for each construct was 0.804, 0.866 and 0.921. Since, the values are more than 0.7, which is considered to be satisfactory (Christmann & Van Aelst, 2006; Cronbach & Meehl, 1955) (Table 2).

The reliability and validity has been checked for each item and construct. In this process the ineffective items are eliminated. The Cronbach alpha value for each construct has been verified, here. Table 2 shows that the Cronbach's alpha of all the constructs is above 0.70, which indicates ideal internal consistency and is considered satisfactory for research (Hair et al.2019). The internal consistency of the scales used in the present study is represented in Table 3 and it has an acceptable internal consistency measured through Cronbach's alpha. For Composite Reliability Statistics, scores of > 0.70 are recommended for satisfactory results (Carmines and Zeller, 1982). Therefore, the research retained 31 items for further analyses.

Further inter item correlation was also checked and any item with less than 0.5 value as correlation was deleted. In this study all the items had a correlation higher that 0.5 so none of the item was deleted from the instrument

Table 2: Cronbach's alpha for pilot study

Construct	Cronbach's Alpha
Sensory Appeal (SA)	.763
Communication Appeal (CA)	.923
Patriotism (PA)	.943

Phase 2: Exploratory Factor Analysis

Exploratory factor analysis was applied on 21 items of Emotional Branding on the response of 170 respondents. The results show that construction of EBS comprising 21 statements were grouped into three factors, namely, sensory appeal, communication appeal and patriotism appeal. Since, the items for one factor namely, brand attachment was adopted from (Thompson et al. 2005), these items were not included while conducting EFA but it has been included directly in CFA. The factors which have the Eigen value greater than 1 were considered. For reliability, the split half method as well as Cronbach's Alpha were analyzed. The results of split half wise reliability show a correlation value of .560, .784, .866, Spearman-Brown split half and Guttman split half coefficient show good reliability to the extent of .718, .879, .928 and .717, .870, .900 respective for each factor. Therefore, these values prove good reliability. The Cronbach's Alpha result was 0.906 for 21 items (Table 3).

Phase 3: Confirmatory Factor Analysis

In the final stage, the questionnaire was distributed to another set of respondents for its validity. As per Hair et al. (2019), "An initial sample can be examined with EFA and the results used for further purification. CFA requires the use of multiple samples particularly when the measurement model includes new scales". Therefore, additional responses of 325 were collected and CFA was performed to test the validity. Moreover, at the final stage, brand attachment appeal which had 10 items (Thompson et al. 2005) were added. Since, brand attachment factor was adopted as it is, thus EFA was not performed. It was directly added for CFA analysis.

Validity Assessment (Content, Construct: Convergent and Discriminant)

The content validity has been defined as the extent to which the items of constructs or instrument covers the meanings of the concept that is being studied for a

Table 3: Reliability analysis

Constructs	Items	Factor loadings	Mean	Std. Deviation	Eigen. value	Variance explained	Cronbach's Alpha
Sensory Appeal	I like the fragrance of this product.	.680	3.70	.811	10.868	45.284	.763
	The texture of this product is sensational.	.710	3.70	.811			
	The product is visually appealing.	.681	3.79	.689			
	The colour of this product is attractive.	.766	3.71	.798			
Communication	I feel happy about the brand.	.708	3.95	.647	2.545	10.603	.923
Appeal	The brand is popular.	.746	4.08	.660			
	I feel excited about the brand.	.561	3.78	.776			
	I feel contented with the brand.	.520	3.83	.754			
	I do not enjoy in recalling the brand.	.723	3.96	.729			
	The product is effective.	.807	4.03	.682			
	The product possesses distinct feature.	.655	3.92	.684			
	The product is good for overall health of the human being.	.775	4.02	.708			
	The product is not harmful.	.811	4.03	.672			
	The product is right value for money.	.686	3.96	.704			
Patriotism Appeal	I love Indian brand.	.855	3.94	.740	1.898	7.909	.943
	I feel happy when I buy Indian brand.	.793	3.94	.787			
	I prefer to buy products manufactured in India.	.844	3.96	.805			
	The country of origin is very important for me.	.674	3.72	.894			
	I feel proud in buying Indian brand.	.852	3.93	.784			
	When I buy products made in India, Indian economy will prosper.	.653	4.04	.698			
	I am committed to the Indian brand.	.754	3.82	.811			

particular research (Creswell and Creswell, 2017)." "Content validity aims to clarify the scope of a concept (i.e. EBS) and determine whether the measure sufficiently reflects the domain of the concept (Bollen, 1989)." The content validity was confirmed by the in-depth discussion with professors, industry experts and customers.

"Convergent validity is the degree that ensures various methods of measuring variables which are providing same results" (O' Leary and Vokurka,1998). Factor loadings are to be looked at for examining the Convergent validity. The items have significant loadings. (Table 3). We also need to look into two additional measures, i.e. Average Variance Extracted (AVE) and Composite Reliability (CR). The criteria for ensuring Convergent Validity is "CR > 0.70, CR > AVE and AVE > 0.5 (Hair et al., 2006)". Composite Reliability Statistics scores > 0.70 are recommended (Carmines and Zeller, 1982) to indicate adequate convergence or internal consistency. Table 4, depicts that the values of CR and AVE for all the constructs are significant, which confirms the Convergent validity. The results show that all constructs have satisfied convergent validity. All individual constructs satisfied all pre-requisites for convergent validity (Hair et al., 2006).

Table 4: AVE and CR values

Constructs	AVE	CR
SA	0.85	0.74
BA	0.89	0.73
CA	0.86	0.67
PA	0.92	0.96

* SA= Sensory Appeal, BA= Brand Attachment Appeal, CA = Communication Appeal, PA= Patriotism Appeal

Discriminant validity refers to the extent to which measures of the constructs (i.e. SA,BA,CA and PA) are relatively distinct. Discriminant validity can be measured by comparing the AVE values with the Squared Inter variable Correlation estimates (SIC). To get adequate Discriminant validity, AVE values should be greater than the Squared Inter Construct Correlation estimates (SIC). AVE values are greater than the squared correlation estimates (Table 5). This finding implies that the estimates are significant indicating adequate discriminant validity.

Table 5: AVE, CR AND SIC

Constructs	AVE	SIC	CR
SA	0.85	0.87,0.30,0.61	0.74
BA	0.89	0.41,0.59,0.87	0.73
CA	0.86	0.40,0.30,0.41	0.67
PA	0.92	0.61,0.59,0.40	0.96

* SA= Sensory Appeal, BA= Brand Attachment Appeal, CA = Communication Appeal, PA= Patriotism Appeal

In conclusion, the statistical results indicated that the test of the measurement model, such as content and convergent and discriminant validity measures was satisfactory.

Model Fit

In this model, five dimensions (SA, BA, CA and PA) have been conceptualised as determinants of emotional branding. The results from CFA analysis show that each path is positive and significant. This indicates that each construct contributes positively to the emotional branding scale. It shows that CFA

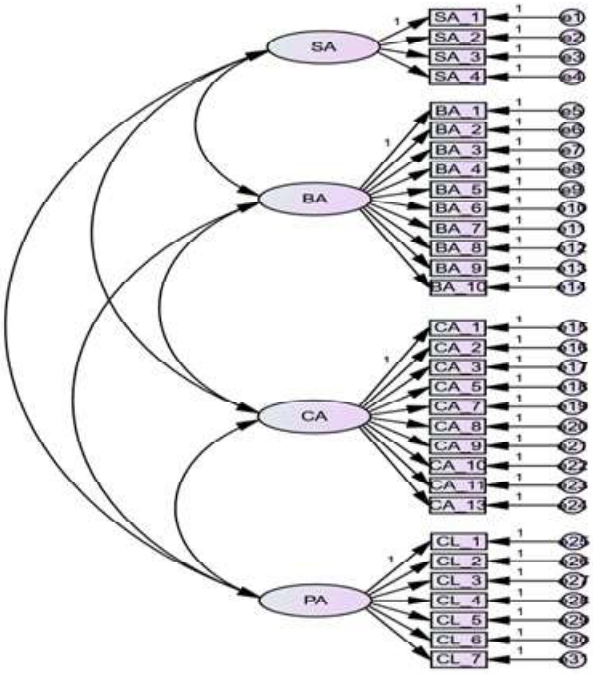

Figure 2: Model Fit, where SA= Sensory Appeal, BA= Brand Attachment Appeal, CA= Communication Appeal, PA= Patriotism Appeal

(31 items) was confirmed with j" / df= 3.012, CFI = .898, RMSEA = .079. As per (Hair et al. 2019) "a value of 2.0 or less is considered to be good" (Table 6). Thus, we confirm that dimensions namely, sensory appeal, brand attachment appeal, communication appeal and patriotism appeal comprises emotional branding.

Table 6: CFA results for model

Model	CFI	RMSEA	TLI	NFI	Df	p value
Model 1	.898	.079	.889	.856	3.012	0.00

Summary and Discussion

The aim of the study was to develop and validate emotional branding scale on Indian hair oil products. The results of split half wise reliability show a correlation value of .560, .784, .866, Spearman-Brown split half and Guttman split half coefficient show good reliability to the extent of .718, .879, .928 and .717, .870, .900 respective for each factor. The Cronbach's Alpha result was 0.906. The factor analysis result discovered that emotional branding comprises of four factors namely, sensory appeal, communicational appeal, brand attachment appeal and patriotism appeal. The study shows that emotional branding if adopted can be an armament of the brands to touch hearts and influence consumers purchase decisions. Exploratory and empirical analyses suggest that the Emotional branding Scale (EBS) has a four-factor model which indicated a good fit.

Proposed Implications and Limitations

The present study contributed in the present literature and provides a valid and reliable scale for measuring Emotional Branding. It provides important parameters required by researchers as well as for the management of organizations. It will help researchers and practitioners to understand and develop strategies to connect with the consumers at emotional level. Developing such strategy can bring in new marketing trends which can have enduring effects. These days customers are well aware of what do they want and from where to get it. Moreover, there are so many alternatives available for a particular product leading to more switching rate. The consumers are even flooded with plethora of advertisements on a regular basis. Thus, for a brand to stand out and survive such competition - emotional branding strategy can be adopted which will not just trigger emotional aspect but will also influence the buying and repurchasing decision as well as help in slackening switching rate of consumers. The study is based on hair oil product and thus the scale can be applied on hair oil product of FMCG industry only. The data set used in this study is also 525 which can be increased.

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Dynamic Effect of Manufacturing and Service Sector on Economic Growth in India: A Cross Section Analysis from Selected Indian States

ABHIJEET BAG AND SARBAPRIYA RAY

Abstract: In India, economic reforms adopted in 1991 in form of LPG (Liberalization-Privatization-Globalization) removed numerous barriers to grow and offered opportunities to improve productivity, particularly, for the manufacturing sector. The rationale that manufacturing sector acted as main contributor to country's economic growth via GDP growth (called 'engine of growth') for a long time in India has been challenged now. The growing significance of the services sector across the world exhibits that at the present time, the services sector could become the new engine of economic growth in developing economies like India. The present study seeks to bring to light whether manufacturing is acting as an "engine of growth" at inter-state level in India or not and the cross section result indicates that potency of manufacturing growth and agricultural growth is gradually slowing down as a conforming part of economic growth and service sector is taking leading position in accelerating engine of growth in India.

Keywords: Manufacturing, growth, engine, GDP, service, agriculture, India.

Introduction

The reforms in India particularly besieged manufacturing sector because of the stipulation that that the sector put forwarded much better prospects for technical change, capital accumulation and linkages. The expectation behind this initiative was that the restructuring also would create greater job opportunities, predominantly for the semi skilled and inadequately educated section of the labour force that encompasses most of India's working underprivileged section. Nevertheless, the impact of reforms has been rather diverse. Some of the industrialized states in India have grown faster than the states that are likely to

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be not at par with so called industrially developed states. The projection for the Indian economy has changed extremely during the last couple of decades because of the country's enormous advancement in information and communication technology. The Indian economy has been extended at a rate of 5.5% in 1980-2000 to 7% per annum during 2000-2018. This is a substantial achievement in itself in that the economic growth rate in the previous 30 years was only 3.5%-4% per annum. India will do even better over the next two decades and achieve growth rates of 7% to 8% per annum, and most likely out perform China (Rodrik and Subramaniam, (2004)). This is because of the anticipation that India is considered to have a high level of institutional development, much higher than that of China. Moreover, Indian labour force is anticipated to grow up over the next several decades at a faster rate than that of China and other contestant countries. Economic record designates the fact that for developing countries at India's level of per capita income, economic growth has usually been guided by the manufacturing sector.

In the early development thinking, transformation follows transfer of resources from agriculture to manufacturing, manufacturing to service which stood as conduit of economic development (Clark 1941; Kuznets 1957; Chenery 1979; Fuchs 1980). The rationale that manufacturing sector acted as an engine of growth for a long time in India owing to capability of spreading spill over effect, accepting rapid technological changes, economies of scale, and easy integration into global production networks has been challenged. The growing significance of the services sector across the global economies, with the expansion of the information and communications technology sector, exhibits that at the present time, the services sector could become the new avenues for acting as engine of economic growth in developing economies (Fagerberg, Guerrieri, and Verspagen, 1999; Dasgupta and Singh, 2005; Maroto-Sanchez and Cuadrado-Roura 2009; Lee and McKibbin 2014). Five significant characteristics were identified such as high level of productivity, unconditional convergence (faster productivity growth in lower productivity areas) in terms of domestic convergence and international convergence, expansion of the sector in terms of its use of inputs, comparative advantage for the host country, and tradability in terms of export growth that allow a sector to serve as an engine of structural transformation and produce sustainable economic growth (Amirapu and Subramanian, (2015)). By spotlighting on Indian perspective, they argue that some services branches, including finance, insurance, and real estate, could replace the role of manufacturing sector.

Therefore, the role of manufacturing sector in economic progress can be examined in the light of certain novel empirical predisposition which have been experimented in our state-wise analysis of manufacturing sector in India during the last four decades that a faster growth of services than that of manufacturing industry in India, really, challenging the idea that manufacturing is the main engine of growth

in economic development. The production and growth of Gross Domestic Product GDP is stepped up as the industry boosts its participation in it, in loss of the participation of other sectors. The manufacturing sector has been called the engine of growth not only because of excess labour and low productivity in non-manufacturing like agricultural sector but also because it creates supplementary demand for the goods and services afforded by the non-manufacturing sectors. Development of the manufacturing sector encourages the incentives of savings, increases demand for capital and investment which accelerates the pace of technological accumulation. Moreover, a speedy rising manufacturing sector may create enormous exports which tempt economic growth.

The main intention of this article is to examine the role of manufacturing industry in economic development in India in the light of certain new experimental predispositions which have been observed in many developing countries during the last decade. More specifically, the present study aspires to bring to light whether manufacturing sector remained the main contributor of economic growth via GDP growth or service sector contributed substantially towards growth path of India's economy which is considered to be one of the fastest growing economies of the world.

Methodology

The cross section analysis is based on regression estimates at several point of time over last four decades-1980-81 to 2016-17. Data of gross state domestic product (GDP), agricultural gross domestic product (AGDP), manufacturing gross domestic product (MGDP), service gross domestic product (SGDP), all at constant prices, have been collected for 15 industrially developed Indian states for 1980-81,1993-94,1999-2000,2004-05,2011-12 and 2016-17. Data on these several point of time during the above mentioned last 4 decades have been collected because price index bases have changed on these particular years. Therefore, data collected on these points of time does not require deflation by suitable deflator because all these parameters have been constructed at constant prices which seem to be inflation adjusted price in India.

Data on statewise GDP, agricultural GDP, manufacturing GDP and service GDP have been collected at constant prices from Handbook of Statistics on Indian Economy (several issues) published by the Reserve Bank of India (RBI) for the same sampled years undertaken into our study. All data have been converted into their natural logarithmic form to avoid heteroscadasticity as far as practicable.

In 2000, Bihar, Madhya Pradesh (MP) and Uttar Pradesh (UP) were bifurcated and three new states Jharkhand, Chattisgarh and Uttrakhand, were formed respectively and in 2014, Andhra Pradesh was bifurcated and another new state

was formed named Telengana. In the present analysis, these four states were merged with their parent states so as to have consistent data for all the time periods.

Econometric Model

This study suggests an empirical model which approximates economic growth of Indian states as a function of agricultural growth, manufacturing growth and growth of service sectors.

Economic Growth = f (Agricultural sector's growth, manufacturing sector's growth, service sector's growth) i.e.

GDP = f (AGDP, MGDP, SGDP)

The linear regression model, taking this function into consideration, is :

$LnGDP= \beta_1 + \beta_2 LnAGDP + \beta_3 LnMGDP + \beta_4 LnSGDP + u_i$

Separately, we have built-up three equations, one for each of the three sectors and for each time period.

$LnGDP= \alpha + \beta_1 LnAGDP + ui$ ……..(1)

$LnGDP= \alpha + \beta_1 LnMGDP + u_i$……(2)

$LnGDP= \alpha + \beta_1 LnSGDP + u_i$……(3)

Econometric Techniques

Without applying intricate method, OLS regression is the most suitable method to study a relationship between a dependent (endogenous) variable and several independent (exogenous) variables. Assuming that the model is linear in parameters, the regressed (dependent variable) is considered in a linear function by a specific set of regressors (independent variables) with residual Other assumptions such as absence of multicollinearity (byVIF test), absence of serial correlation (by Durbin Watson test and Breusch-Godfrey LM test), homoscedasticity or absence of heteroscadasticity (by Breusch-Pagan-Godfrey Test and White Test**)**, normality of error terms (by Jarque-Bera test and more specifically,Kolmogorov-Smirnov test/Shapiro–Wilk test**)** and model specification (by Ramsey RESET Test**)** must be observed before applying OLS regression to achieve Best Linear Unbiased Estimator (BLUE) properties.

Analysis of Result

This is also crucial to remember that the relation between manufacturing growth and GDP growth can be best done at the cross-sectional level. A time series, or a panel data exercise, will not be accommodating from an economic perspective.

Table-1: Share of agriculture, manufacturing and services to SDP in selected industrially developed states of India

States	Agriculture as% of SDP					Manufacturing as% of SDP					Services as % ofSDP				
	% measured for the year			Change between		% measured for the year			Change between		% measured for the year			Change between	
	80-81	99-00	16-17	80-81 and 99-00	99-00 and 16-17	80-81	99-00	16-17	80-81 and 99-00	99-00 and 16-17	80-81	99-00	16-17	80-81 and 99-00	99-00 and 16-17
AP	40.5	25.3	11.7	-15.2	-13.6	12.3	12.5	11.1	0.2	-1.4	43.0	47.4	40.6	4.4	-6.8
Bihar	43.0	30.3	10.5	-12.7	-19.8	15.2	7.2	10.5	-8	3.3	31.2	53.9	52.0	22.7	-1.9
Delhi	4.0	1.3	0.4	-2.7	-0.9	18.4	11.4	4.4	-7	-7	79.6	80.4	72.8	0.8	-7.6
Gujarat	34.7	14.5	8.8	-20.2	-5.7	22.0	30.8	31.5	8.8	0.7	37.4	42.2	31.5	4.8	-10.7
Haryana	53.0	30.9	9.2	-22.1	-21.7	14.5	20.3	18.8	5.8	-1.5	30.1	39.5	46.6	9.4	7.1
Karnataka	40.7	28.6	5.6	-12.1	-23	15.1	13.9	16.1	-1.2	2.2	38.0	45.3	57.2	7.3	11.9
Kerala	31.6	18.5	4.8	-13.1	-13.7	14.5	9.6	10.1	-4.9	0.5	43.4	56.4	55.5	13	-0.9
MP	41.2	28.0	20.9	-13.2	-7.1	13.8	12.3	13.5	-1.5	1.2	30.9	46.0	34.1	15.1	-11.9
MH	23.9	14.6	6.6	-9.3	-8	27.6	20.6	19.7	-7	-0.9	43.0	54.7	48.5	11.7	-6.2
Odisha	44.2	26.4	9.6	-17.8	-16.8	11.5	10.3	16.5	-1.2	6.2	33.3	44.4	39.2	11.1	-5.2
Punjab	48.2	37.0	14.5	-11.2	-22.5	11.7	14.9	13.7	3.2	-1.2	30.9	39.7	45.0	8.8	5.3
Rajasthan	47.8	28.1	12.3	-19.7	-15.8	11.8	13.0	11.1	1.2	-1.9	33.6	42.2	40.5	8.6	-1.7
Tamil Nadu	23.4	15.0	3.6	-8.4	-11.4	27.2	19.8	21.6	-7.4	1.8	47.9	53.1	47.7	5.2	-5.4
UP	48.5	33.2	14.2	-15.3	-19	10.1	13.1	16.5	3	3.4	36.0	42.8	41.1	6.8	-1.7
WB	26.0	25.9	11.4	-0.1	-14.5	21.7	10.0	12.7	-11.7	2.7	43.6	52.1	46.4	8.5	-5.7
Average	36.7	23.8	9.6	-12.9	-14.2	16.5	14.6	15.2	-1.8	0.5	40.1	49.3	46.6	9.2	-2.8

Source: Hand Book of Statistics on Indian Economy(Several isuues);*change is taken between manufacturing and service;[AP-Andhra Pradesh;MP-MadhyaPradesh;MH-Maharastha;UP-UttarPradesh;WB-West Bengal]

Table-2: Multicollinearity test (TOL and VIF)

Variables	1980-81		1993-94		1999-2000		2004-05		2011-12		2016-17	
	VIF	Tolerance = 1/VIF	VIF	Tolerance = 1/VIF	VIF	Tolerance = 1/VIF	VIF	Tolerance = 1/VIF	VIF	Tolerance = 1/VIF	VIF	Tolerance = 1/VIF
LNAGDP	1.351	0.740	1.259	0.794	1.311	0.763	1.789	0.559	2.942	0.339	2.508	0.398
LNMGDP	6.506	0.154	4.049	0.247	3.044	0.329	3.616	0.277	4.985	0.201	4.219	0.237
LNSGDP	5.797	0.173	3.797	0.263	2.604	0.384	2.506	0.399	2.671	0.374	2.590	0.386

Source :Authors' own estimate from tabulated data

The Table -1 presents that the manufacturing sector which acted as an engine of growth for Indian industrially developed states for a long time is depicting very thrilling trend because the contribution of manufacturing is not very high which, on an average, is 15.3% in the State Domestic Product during our point study of three periods-1980-81, 1999-2000 and 2016-17. Not only the share is low, even it is declining as is evident from Table 1. Excepting Bihar, Gujarat, Karnataka, Kerala, MP, Orissa, Tamil Nadu, UP, WB, share of manufacturing has fallen for all other states. On the other hand, all the States have become more service oriented. Except for Gujarat, MP and Orissa, the services contribution is over 40% of SDP for all other states under our study. Though share of services is escalating in most states of India, many of the knowledge intensive service sectors like software, banking etc. have manufacturing as their locus. More prominently, it has been found that service sector growth rate has been sluggish during the period 1999-2000 to 2016-17 at the rate of -2.8% on an average in all states under our study except Gujarat and Orissa.

Before conducting regression analysis by OLS technique to establish statistically that whether manufacturing or service sector is playing dominant role in country's GDP growth, we have conducted several statistical tests for judging the suitability of OLS technique. In order to verify that there is no multicollinearity among the regressors included in the regression model, tolerance (TOL) and variance inflation factor (VIF) of the independent variable is calculated and the result has been depicted in Table-2.

From the result given in Table 2,we can see that there is no evidence of correlation among the regressors because the value of VIF for both the variables is less than 10 (general rule of thumb:) and the TOL is closer to or less than 1 (Gujarati & Sangeetha, 2007). Therefore, the regression model is fulfilling the assumption of no multicollinearity.

To confirm that the regression model used in the analysis is correctly specified, Ramsey's Reset test has been applied in the above model. Result of the Ramsey's RESET has been given in Table 3.The computed value of F-statistic is insignificant and therefore, the null-hypothesis of misspecification of the model is rejected and the relationship between dependent and independent variables is correctly specified in the above used model.

$H_{0:}$There isno functional misspecification in the series and model is specified

$H_{1:}$There isfunctional misspecification in the series and model is non-specified

Moreover, we reject null hypothesis when the p-value for the model is less than the significance level of 0.05, otherwise do not reject the null hypothesis. According to the generated result, p-value is always greater than 0.05. Thus, there is enough

evidence to conclude that the regression model is specified correctly at significance level of 0.05. In our study, Ramsey's test statistic indicates no functional misspecification in the series and therefore, model is well specified as shown by F-statistics provided by Ramsey Reset test.

Table 3: Ramsey's RESET test

Year	Parameters	Value	df	Probability
1980-81	t-statistic	1.224020	10	0.2490
	F-statistic	1.498225	(1, 10)	0.2490
	Likelihood ratio	2.094114	1	0.1479
1993-94	t-statistic	1.055888	10	0.3159
	F-statistic	1.114899	(1, 10)	0.3159
	Likelihood ratio	1.585520	1	0.2080
1999-2000	t-statistic	0.647814	10	0.5317
	F-statistic	0.419663	(1, 10)	0.5317
	Likelihood ratio	0.616644	1	0.4323
2004-05	t-statistic	0.372828	10	0.7171
	F-statistic	0.139001	(1, 10)	0.7171
	Likelihood ratio	0.207065	1	0.6491
2011-12	t-statistic	0.444557	10	0.6661
	F-statistic	0.197631	(1, 10)	0.6661
	Likelihood ratio	0.293555	1	0.5880
	t-statistic	0.584412	10	0.5719
2016-17	F-statistic	0.341537	(1, 10)	0.5719
	Likelihood ratio	0.503751	1	0.4779

An important assumption of the classical linear regression model is that the disturbance (residual) term u_i is homoscedastic; that is, they all have the same variance. For the validity of this assumption, White's Heteroscedasticityand Breusch-Pagan-Godfrey test are applied in the regression equation and the result is given in Table 4.We can define **heteroscedasticity** as the condition in which the variance of error term or the residual term in a regression model varies.

According to the Table 4, we do not reject the null hypothesis because the p-value is larger than 0.05. Since p-value is always larger than the significance level of 0.05, there is no sufficient evidence to conclude that there is a heteroscedasticity problem in the model.

Table-4: Heteroscedasticity Test

Breusch-Pagan-Godfrey Test				White Heteroscedasticity Test:			
	1980-81				1980-81		
F-statistic	0.10446	Prob. F(3,11)	0.9557	F-statistic	0.28526	Prob. F(9,5)	0.9509
Obs*R-squared	0.41551	Prob.Chi-Square(3)	0.9370	Obs*R-squared	5.08909	Prob. Chi-Square(9)	0.8265
Scaled explained SS	0.11843	Prob. Chi-Square(3)	0.9895	Scaled explained SS	1.45051	Prob. Chi-Square(9)	0.9975
	1993-94				1993-94		
F-statistic	0.2775	Prob. F(3,11)	0.8405	F-statistic	2.172	Prob. F(9,5)	0.2033
Obs*R-squared	1.0553	Prob. Chi-Square(3)	0.7879	Obs*R-squared	11.945	Prob. Chi-Square(9)	0.2164
Scaled explained SS	0.7907	Prob. Chi-Square(3)	0.8517	Scaled explained SS	8.950	Prob. Chi-Square(9)	0.4418
	1999-2000				1999-2000		
F-statistic	0.439564	Prob. F(3,11)	0.7293	F-statistic	0.312	Prob. F(9,5)	0.9383
Obs*R-squared	1.605722	Prob. Chi-Square(3)	0.6581	Obs*R-squared	5.394	Prob. Chi-Square(9)	0.7987
Scaled explained SS	0.478467	Prob. Chi-Square(3)	0.9236	Scaled explained SS	1.607	Prob. Chi-Square(9)	0.9963
	2004-05				2004-05		
F-statistic	0.225933	Prob. F(3,11)	0.8764	F-statistic	0.217788	Prob. F(9,5)	0.9767
Obs*R-squared	0.870627	Prob. Chi-Square(3)	0.8325	Obs*R-squared	4.224283	Prob. Chi-Square(9)	0.8960
Scaled explained SS	0.195566	Prob. Chi-Square(3)	0.9783	Scaled explained SS	0.948888	Prob. Chi-Square(9)	0.9995
	2011-12				2011-12		
F-statistic	0.134284	Prob. F(3,11)	0.9376	F-statistic	0.645983	Prob. F(9,5)	0.7322
Obs*R-squared	0.529937	Prob. Chi-Square(3)	0.9123	Obs*R-squared	8.064445	Prob. Chi-Square(9)	0.5277

Contd...

Scaled explained SS	0.139983	Prob. Chi-Square(3)	0.9866	Scaled explained SS	2.130221	Prob. Chi-Square(9)	0.9892
	2016-17		2016-17				
F-statistic	0.103343	Prob. F(3,11)	0.9564	F-statistic	2.217785	Prob. F(9,5)	0.1970
Obs*R-squared	0.411179	Prob. Chi-Square(3)	0.9379	Obs*R-squared	11.99520	Prob. Chi-Square(9)	0.2136
Scaled explained SS	0.089516	Prob. Chi-Square(3)	0.9931	Scaled explained SS	2.611412	Prob. Chi-Square(9)	0.9777

Source: Authors' own estimate from collected data

$H_{0:}$ There is no heteroscedasticityi.evariance for the errors are equal. In math terms, that's: H_0 =

$H_{1:}$ There is heteroscedasticityi.evariance for the errors are not equal. In math terms, that's:$H_{1=}$

Both the white test and Breusch-Pagan-Godfrey test do not reject the null hypothesis of no heteroscedasticity [p>0.05]. The *Q*-statistic and the LM test both indicate that the residuals are not heteroscedastic and therefore variances for the errors are equal.Therefore, OLS (Ordinary Least Square) estimators are the *Best Linear Unbiased Estimator (BLUE)* and therefore produce estimates that are better than estimates from all other linear model estimation methods.

Table: 5: Autocorrelation test (Durbin Watson test)

Year	Durbin Watson statistic
1980-81	2.15
1993-94	2.14
1999-2000	2.02
2004-05	2.08
2011-12	2.06
2016-17	2.16

Source: Authors' own estimate from tabulated data

$H_{0:}$ There is no autocorrelation problem in the regression model.

$H_{1:}$ There is autocorrelation problem in the regression model.

A rule of thumb is that test statistic values of Durbin-Watson test in the range of 1.5 to 2.5 are relatively normal. Durbin Watson test result in Table 5 suggests that there is as such no autocorrelation in regression model as the D-W values in

all sampled years are centered on nearly 2.This result has been replicated in Breusch-Godfrey Serial Correlation LM Test.

Table: 6: Breusch-Godfrey serial correlation LM test

1980-81			
F-statistic	0.944222	Prob. F(2,9)	0.4244
Obs*R-squared	2.601535	Prob. Chi-Square(2)	0.2723
1993-94			
F-statistic	0.148582	Prob. F(2,9)	0.8640
Obs*R-squared	0.479444	Prob. Chi-Square(2)	0.7868
1999-2000			
F-statistic	0.148582	Prob. F(2,9)	0.8640
Obs*R-squared	0.479444	Prob. Chi-Square(2)	0.7868
2004-05			
F-statistic	0.816538	Prob. F(2,9)	0.4722
Obs*R-squared	2.303768	Prob. Chi-Square(2)	0.3160
2011-12			
F-statistic	0.463823	Prob. F(2,9)	0.6431
Obs*R-squared	1.401611	Prob. Chi-Square(2)	0.4962
2016-17			
F-statistic	0.430715	Prob. F(2,9)	0.6628
Obs*R-squared	1.310302	Prob. Chi-Square(2)	0.5194

Source: Authors' own estimate from collected data

H_0: There is no serial correlation in the residuals up to the specified order,

H_1: There is serial correlation in the residuals up to the specified order

The test does not reject the hypothesis of no serial correlation up to order 2[p>0.05]. The *Q*-statistic and the LM test both indicate that the residuals are not serially correlated and the equation should not be re-specified.

In Jarque-Bera test of normality, if the p-value is smaller than significance level which is 0.05, the null hypothesis will be rejected. It means that the error terms in the model are not normally distributed. Here, in table-7, in all the sample years, p-values of Jarque-Bera Test statistic of GDP, MGDP and SGDP are greater than 0.05 except for AGDP. Therefore, all the variables- GDP, MGDP and SGDP satisfy normality condition except AGDP.

Table: 7: Jarque-Bera Test-Normality of error terms

	LNGDP	LNAGDP	LNMGDP	LNSGDP
Observations	15	15	15	15
1980-81				
Jarque-Bera	0.371617	33.32924	0.995570	0.491014
Probability	0.830432	0.000000	0.607876	0.782308
1993-94				
Jarque-Bera	0.726521	25.25491	0.127379	0.346866
Probability	0.695405	0.000003	0.938296	0.840773
1999-2000				
Jarque-Bera	0.645222	32.98866	0.319026	0.301337
Probability	0.724255	0.000000	0.852559	0.860133
2004-05				
Jarque-Bera	0.847784	40.49636	0.369844	0.551140
Probability	0.654495	0.000000	0.831169	0.759139
2011-12				
Jarque-Bera	0.720338	50.22992	0.318027	0.240003
Probability	0.697558	0.000000	0.852985	0.886919
2016-17				
Jarque-Bera	0.654994	49.58352	0.536739	0.334994
Probability	0.720726	0.000000	0.764625	0.845779

H_0: Error terms are normally distributed

H_1: Error terms are not normally distributed

The Kolmogorov-Smirnov test assesses whether there is significant departure from normality in the population distribution for the variables-GDP, AGDP, MGDP and SGDP-undertaken into our study. The null hypothesis states that the normality assumption is not violated.

The result of the normality shows that the significant values of GDP, MGDP and SGDP during entire point sample periods-1980-81,1993-94,1999-2000,2004-05,2011-12 and 2016-17 are more than 0.05(i.e $p>0.05$) except for AGDP ($p<0.05$), meaning that normality assumption has not been violated in all variables like GDP, MGDP and SGDP except AGDP. Since the significant values of each of the variables- GDP,MGDP and SGDP- (in table-8) is greater than 0.05, we do not reject the null hypothesis and conclude that these data do not violate the normality assumption by using the two test as per Table 8.

Table 8: Kolmogorov-Smirnov test and Shapiro-Wilk test of normality

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	Df	Sig.
1980-81	LnGDP	.131	15	.200*	.966	15	.801
	LnMGDP	.163	15	.200*	.934	15	.315
	LnSGDP	.134	15	.200*	.979	15	.963
	LnAGDP	.258	15	.008	.716	15	.000
1993-94	LnGDP	.107	15	.200*	.959	15	.679
	LnMGDP	.127	15	.200*	.988	15	.998
	LnSGDP	.102	15	.200*	.973	15	.904
	LnAGDP	.245	15	.016	.765	15	.001
1999-00	LnGDP	.101	15	.200*	.966	15	.793
	LnMGDP	.112	15	.200*	.980	15	.969
	LnSGDP	.124	15	.200*	.970	15	.857
	LnAGDP	.252	15	.011	.725	15	.000
2004-05	LnGDP	.127	15	.200*	.964	15	.754
	LnMGDP	.111	15	.200*	.983	15	.985
	LnSGDP	.117	15	.200*	.972	15	.890
	LnAGDP	.268	15	.005	.674	15	.000
2011-12	LnGDP	.103	15	.200*	.975	15	.921
	LnMGDP	.148	15	.200*	.973	15	.898
	LnSGDP	.109	15	.200*	.987	15	.996
	LnAGDP	.277	15	.003	.627	15	.000
2016-17	LnGDP	.122	15	.200*	.969	15	.846
	LnMGDP	.167	15	.200*	.947	15	.484
	LnSGDP	.120	15	.200*	.978	15	.957
	LnAGDP	.285	15	.002	.636	15	.000

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Source: Author's own estimate

The significant value of agricultural domestic product (AGDP) being less than 0.05, we reject the null hypothesis and conclude that these data violate the normality assumption. The same result derived from Kolmogorov-Smirnov (KS) test has also been substantiated by the Shapiro-Wilk test.

In statistics, the generalized linear model (GLM) is a flexible generalization of ordinary linear regression that allows for response variables that have error distribution modelsother than a normal distribution. GLM does not assume a linear relationship between the dependent variable and the independent variables, but it does assume linear relationship between the transformed response in terms of the link function and the explanatory variables. The homogeneity of variance does not need to be satisfied. Because of its flexibility in addressing a variety of statistical problems and the availability of software to fit the models, it is considered a valuable statistical tool and is widely used. The violation of normality does not generally diverge result of regression if the sample size is large but if the sample is small, it may cause faulty regression result. That is why, we have used generalized linear model to get authentic picture of regression. But, astoundingly, we have got similar result by GLM regression.

The regression result by Generalized Linear Model technique is presented below in Table-9. The coefficients of all the three regressors- agricultural GDP, manufacturing GDP and service sector GDP' are positively and significantly associated with the dependent variable-GDP except manufacturing GDP in 1980-81 and agricultural GDP in 2011-12 and 2016-17.

Table 9: Generalized Linear Model [GLM](Quadratic Hill Climbing) estimates

Year		Intercept only	Agriculture (LnAGDP) ?1	Manufacture (LnMGDP)?2	Service (LnSGDP)?3
1980-81	[Intercept]	1.901(4.54)	-	-	-
	[Slope]	-	0.2567(12.48)	0.0922(1.524)	0.585(8.24)
LR statistic: 1033.84; Pearson SSR: 0.0411; Dispersion: 0.0037; Dispersion computed using Pearson Chi-Square					
1993-94	[Intercept]	2.255(8.68)	-	-	-
	[Slope]		0.202(16.63)	0.150(6.93)	0.569(18.71)
LR statistic: 3515.56; Pearson SSR: 0.0122; Dispersion: 0.0011; Dispersion computed using Pearson Chi-Square					
1999-	[Intercept]	2.103(6.30)	-	-	-
2000	[Slope]	-	0.129(10.21)	0.173(6.66)	0.629(19.01)
LR statistic: 2124.03; Pearson SSR: 0.0185; Dispersion: 0.0017; Dispersion computed using Pearson Chi-Square					
2004-05	[Intercept]	2.586(5.69)	-	-	-
	[Slope]	-	0.107(5.54)	0.139(3.71)	0.653(15.84)
LR statistic: 1119.23; Pearson SSR: 0.0281; Dispersion: 0.0026; Dispersion computed using Pearson Chi-Square					

Contd...

2011-12	[Intercept]	2.876(4.28)	-	-	-
	[Slope]	-	0.039(1.51)	0.249(4.06)	0.609(9.97)
LR statistic: 587.09; Pearson SSR: 0.0549; Dispersion: 0.0049; Dispersion computed using Pearson Chi-Square					
2016-17	[Intercept]	2.974(2.80)	-	-	-
	[Slope]	-	0.029(0.324)	0.228(3.07)	0.635(7.01)
LR statistic: 274.75; Pearson SSR: 0.1226; Dispersion: 0.0111; Dispersion computed using Pearson Chi-Square					

Dependent variable: Log State GDP in constant prices,1980-81 1993-94,1999-2000,2004-05,2011-12

Independent variable: Log of State Agriculture GDP, 1980-81 1993-94, 1999-2000, 2004-05, 2011-12Independent variable: Log of State Manufacturing GDP. 1980-81 1993-94, 1999-2000, 2004-05, 2011-12

Independent variable: Log of State Service GDP, 1980-81 1993-94, 1999-2000, 2004-05, 2011-12

*Z-statistics in parenthesis.

Effect of agricultural, manufacturinging and service sector growth on economic growth for 16 industrially sophisticated Indian States, 1980-81, 1993-94 and 1999-2000, 2004-05,2011-12,2016-17(Dependent variable: Ln GDP)

It has been observed that manufacturing is unambiguously acting as an engine of growth during our point study in 1999-2000 and 2016-17, as is indicated by significant coefficient of manufacturing growth(0.173**)**in 1999-2000 and (0.228**)** in2016-17, in Table 9. In all these two cases happened in 1999-2000 and 2016-17, its coefficients (0.173**)** and (0.228)are more than its average share in SDP (14.6% and 15.2% respectively in last row of table 1). This may generally be due to the reform initiatives undertaken in 1990-91 which particularly targeted manufacturing sector due to the stipulation that the sector presented much greater hopes for capital accumulation, technical change and linkages and consequently job creation, mainly for the semiskilled and poorly educated section of the labour force, which encompasses most of India's working poor.

Generally, the growth conduit followed by rapidly developing country like India is from agriculture to manufacturing and from manufacturing to services. With the expansion of economy, reallocation of labourforce follows from agriculture to industry. It leads to increased productivity in both sectors-agriculture and industry. The way in which it is possible is that the productivity being superior in the manufacturing sector and the sector being more vibrant, the transfer of labour / resources from agriculture to manufacturing would instantly lead to improved productivity (termed as a structural change bonus), which contributes to growth. Alternatively according to Baumol, the transfer of resources from manufacturing to services affords a structural change burden(termed as Baumol's

disease). This is mainly due to the fact that productivity is less in services than to manufacturing. Therefore, although the share of the service sector in India's GDP increases, aggregate per capita growth will tend to slow down. Without considering efficient utilization of all resources, it is assumed that there is substantial disguised un-employment in agriculture, so that a transfer of labour force from agriculture to industry not only directs to no reduction in output, but by dropping employment, it boosts up productivity in agriculture. It also ,at the same time, leads to increased production and productivity in industry. Of late, the extensive use of information technology in wide range of sectors like education, healthcare, and supply-chain has made services very vibrant; As a result of this, the argument may not be exclusively legitimate.

There is no doubt that manufacturing accelerates services sector because manufacturing sector has numerous relevant qualities which do not have in other sectors. In addition, most technological change occurs first in manufacturing, and then diffused out to other sectors (Tregenna, 2007). Therefore, it can be inferred that spillover effects are stronger in the manufacturing sector than in any other sector.

Our result, on the other hand, suggests that despite continuous increase in the share of services in the last 2-3 decades (1980-81 to 1999-2000), share of services is gradually falling since new millennium [during 1999-2000 to 2016-17] at an average speed of -2.8%p.a; Nevertheless, it is also acting as a new engine of growth in industrially developed states of India, as is indicated by coefficient of service growth in Table 9. In table-9, all statistically significant regression coefficients (0.585 in 1980-81, 0.629 in 1999-2000, 0.635 in 2016-17) are more than its share in SDP (table 1), which were 40.1 % in 1980-81, 49.3% in 1999-2000, 46.6% in 2016-17. This is because most of the arguments put forth in favour of manufacturing acting as engine of growth are debatable at the moment, and simultaneously applicable to IT and other services similarly due to contemporary technical progress creating a new-fangled technological paradigm. It has even well-built spillover effects than those of manufacturing. It not only directs to new demand for its service products, (internet connectivity in its diverse magnitudes), but it can be applied to pick up productivity not slightest in existing manufacturing, or generate new products and processes incorporating IT. In the same way, IT, by means of its applications, is as tradable as manufactured goods and makes a substantial contribution to the balance of payments of India.

For every 1% increase in agricultural growth via agricultural GDP growth, on average, economic growth via GDP growth in India will increase significantly by 0.2567% in 1980-81, 0.202% in 1993-94, 0.129% in 1999-2000, 0.107% in 2004-05, but noticeably a meager 0.039% in 2011-12 and 0.029% in 2016-17 trends are noticed which are also statistically insignificantwhen holding other variables constant.

Besides, GDP in India is estimated to grow or increase by 0.0922%in 1980-81(statistically insignificant), 0.150% in 1993-94, 0.173% in 1999-2000, 0.139% in 2004-05 and 0.249% in 2011-12for every 1% increase in manufacturing growth via manufacturing GDP growth when other variables remain constant. In addition, for every 1% increase in service growth via service GDP growth, on average, GDP in India will increase significantly by 0.5847% in 1980-81, 0.569% in 1993-94, 0.629% in 1999-2000, 0.653in 2004-05, 0.609% in 2011-12while other variables remain constant. Our findingssuggest that manufacturing as engine of growth has become sluggish and service sector is gradually taking theplace of manufacturing sector. The results indicate that although agricultural growth, manufacturing growth and service sector growth is positively related with economic growth in India, strength of manufacturing growth and agricultural growth is gradually slowing down as a conforming part of economic growth and service sector is taking dominant role in accelerating engine of growth in India.

Additionally, tables 10 explores relations between state wise GDP , agricultural GDP, manufacturing GDP and service GDP for a cross section of Indian states for the period 1980-81, 93-94, 99-2000, 04-05, 11-12, 16-17. Three equations are built-up, one for each of the three sectors and for each time period. All the equations designate high correlation between sectoral and overall growth except for agricultural sector.

Table 10,the model-1indicating relation between state GDP and agricultural GDP fits the data poorly;alternatively, the model-1will fail to well explain the variation of the response through the (linear) model and regressor (independent variables -AGDP) chosen. Therefore, it is not a superiorinitiative to make use of the model with so low adjusted R-squared. Specifically, adjusted R-squared reflects the goodness of fit of the model to the population taking into account the sample size and the number of predictors used. Examining the adjusted R squared (R^2), it is possible to see the percentage of total variance of the dependent variables explained by the regression model. Low R-square value may have implication that linearity assumption may not correct, essential normality assumption of regression might appropriate or might not appropriate,and here normality assumption is violated.

The equation 2 and 3 in table-10 for different years suggest that GDP growth for Indian states is positively associated with manufacturing GDP and service GDP for different years undertaken. Although influence of service GDP is little bit more than manufacturing GDP on state GDP as our result depicts so, manufacturing sector is subject to static and dynamic return to scale and is having spillover effect over entire economy, productivity growth goes hand by hand with manufacturing growth and growth of manufacturing will associate and augment growth of productivity and vice versa(as growth of production in

manufacturing sector is positively and causally interrelated to the growth ofmanufacturing productivity) as compared to other sectors. This is because of the fact that productivity growth is poorer in other sectors except manufacturing due to diminishingreturns, camouflaged joblessness, and other factors.

Table 10: OLS estimates showing relation between State GDP and agricultural GDP, manufacturing GDP, service GDP [one equation for each of the three sectors]

Year		Eq:1:Agriculture (LnAGDP)	Eq:2:Manufacture (LnMGDP)	Eq:3:Service (LnSGDP)
1980-81	α [Intercept]	8.18(6.25)	5.47(5.02)	2.79(1.89)
	β [Slope]	0.424(3.99)	0.687(7.28)	0.852(7.20)
Adjusted R-squared:		0.5158	0.7880	0.7841
1993-94	α [Intercept]	9.28(5.00)	7.49(7.45)	2.75(2.18)
	β [Slope]	0.425(3.18)	0.577(7.65)	0.869(9.82)
Adjusted R-squared:		0.3944	0.8044	0.8721
1999-2000	α [Intercept]	11.74(7.02)	7.44(6.15)	2.39(1.74)
	β [Slope]	0.297(2.56)	0.611(7.09)	0.890(9.89)
Adjusted R-squared:		0.2851	0.7788	0.8737
2004-05	α [Intercept]	13.14(7.62)	8.01(6.15)	3.51(2.65)
	β [Slope]	0.233(1.98)	0.584(6.55)	0.822(9.83)
Adjusted R-squared:		0.1721	0.7495	0.8724
2011-12	α [Intercept]	15.19(10.66)	8.42(5.89)	3.53(2.08)
	β [Slope]	0.1614(1.74)	0.588(6.48)	0.839(8.33)
Adjusted R-squared:		0.1261	0.7454	0.8301
2016-17	α [Intercept]	16.35(13.53)	9.59(6.88)	3.12(1.65)
	β [Slope]	0.108(1.37)	0.524(6.03)	0.864(7.88)
Adjusted R-squared:		0.0589	0.7168	0.8134

Dependent variable for Eqn. 1, 2 and 3: Log State GDP at constant prices, 1980-81, 93-94, 99-2000, 04-05, 11-12, 16-17

Equation 1: Independent variable Log of State Agriculture GDP, 1980-81, 93-94, 99-2000,04-05, 11-12,16-17.

Equation 2: Independent variable Log of State Manufacturing GDP. 1980-81, 93-94, 99-2000,04-05, 11-12,16-17.

Equation 3: Independent variable Log of State Service GDP, 1980-81, 93-94, 99-2000,04-05,11-12, 16-17.

Notes: a) t-statistics in parenthesis.

b) All equations corrected for heteroscedasticity where necessary.

c) Eq :1 for all the sample years does not satisfy normality criterion

d) Eq :1 for all the sample years does not satisfy the Ramsey test for functional form.

But, there is not yet harmony among economists on why manufacturing has not been playing leading role now in the growth trajectory in India. A new recent trend is noticed that with the application of modern information technology, many of the service sectors especially software segment of service sector yields enhanced productivity growth as suggested by many researchers probably leading to substantially highly significant beta values of the regression model under our study which initiate us to infer that strength of manufacturing and service growth play a crucial role in augmenting economic growth via GDP growth in most of the selected states of India.

Conclusion

The generalized linear model regression and OLS analysis suggests that both manufacturing and service sectors are closely related to economic growth via GDP growth in India. It has been observed that manufacturing as engine of growth is slowing down and service sector is progressively taking place of manufacturing sector. The results indicate that although agricultural growth, manufacturing growth and service sector growth is positively related with economic growth in India, potency of manufacturing growth and agricultural growth is gradually slowing down as a conforming part of economic growth and service sector is taking leadingposition in accelerating engine of growth in India. While manufacturing may not be the main engine of growth, its implication can be felt in the light of the high income-elasticity of demand for manufacturers at India's level of per capita income.But, there is no denying the fact that the growth of services depends basically on the growth of manufacturing. As service sector grows, there is shift of resource like labour force, technology from manufacturing to service; nevertheless, the transfer of resources from manufacturing to services imposes a structural change burdenowing to lower productivity in services than manufacturing. Consequently, the enhanced share of the service sector in the economy results in reduced per capita aggregate growth. Inspite of having rising share of service sector in almost all states of India under our study, many of the knowledge intensive service sectors like software, banking etc. have manufacturing as their locus. India would reap and utilize the progress of its potency in service sector, especially information technology and exploit it comprehensively in all areas of the economy in order to promote dominant sectors of the economy.

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Knowledge Based Service Firms: The Role of Networks, Culture and Resources for Innovation

AMIT SAREEN AND SHARADINDU PANDEY

Abstract : Within the service industries, knowledge intensive business services (KIBS) are highly innovative. An important aspect of innovation in services is development of new service concepts (NSC) resulting in development of new or improved service offerings in the market. Firms may develop network relationships with customers, suppliers, select competitors and investors. These networks provide crucial access to information, knowledge and technology particularly when one considers the scenario that knowledge markets are rare. This study evaluates the role of culture and resources for innovation within a firm and network relationships with external partners in fostering new service concepts related innovation in KIBS firm in the Indian context. The study involved a cross sectional survey of middle to senior executives. The findings show that a culture supporting innovation within a firm and network relationships with investors have a significant and positive effect on NSC. The findings also show that resources available for innovation and network relationships with customers, suppliers and select competitors do not have a significant impact of NSC.

Keywords: New Service Development, Network Relationships, Culture for Innovation, Resources for Innovation

Introduction

Knowledge based service firms may innovate by introducing new service concepts. Such firms may introduce new services (Bell, 2005) or introduce products or services that are either new to the industry or new to the firm (Laforet, 2012). Such new services may be provided to new or existing users (Damanpour et al., 2009).There is a need to focus on the firm's relations with its external partners which form the firm's innovation network (Tether, 2005). This study provides insights into how are knowledge intensive business services (KIBS) able to innovate by introducing new service concepts (NSC) and the role of culture for innovation (CI), resources for innovation (RI) and network relationships with

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customers (NC), suppliers (NS), select competitors (NCOM) and investors (NI). Figure 1 explains the variables being studied.

Innovation literature has historically focused on manufacturing industries instead of services although currently there is acceptance of innovation in service industries (Trigo and Vence, 2012). While in manufacturing R&D is synonymous with innovation, this may not be the case in services (Sundbo, 1997). Key innovation lessons learnt in services can also be applied to manufacturing (Miles, 2000) and the synthesis approach towards innovation considers services both similar to and different from manufacturing (Gallouj and Savona, 2009). There is a need to focus beyond technological innovation in services (Bryson and Monnoyer, 2004).Highly innovative industries are more likely to cooperate with each other (Trigo and Vence, 2012). The role of different sources of knowledge needs to be explored further (Amara et al., 2009).

India is now a global hub for Information Technology (IT) and Business Process Outsourcing (BPO) services. KIBS firms rely heavily on professional knowledge (Muller and Doloreux, 2009) and are more likely to find external sources of information and engage in cooperation with other partner firms.

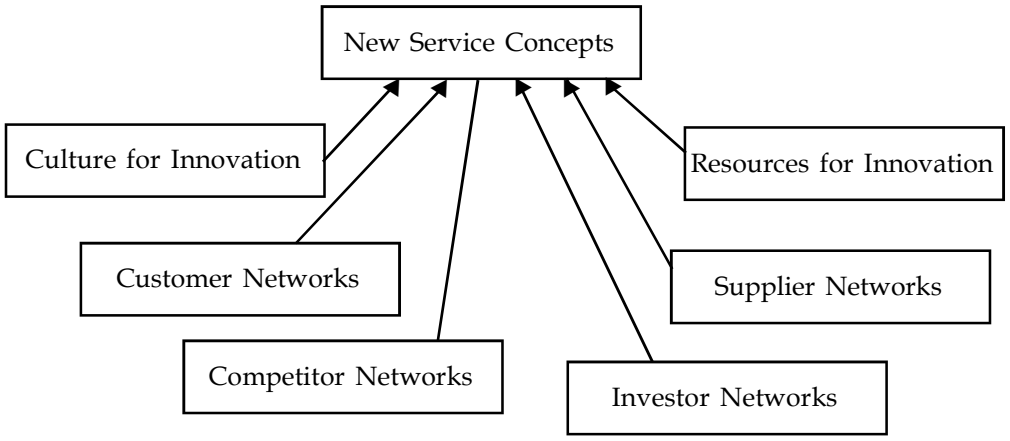

Figure 1: New service concepts in KIBS: Role of networks, culture &resources for innovation

New Service Concepts

In service firms innovation is more of a search and learn process instead of being the domain of R&D departments as in the case of manufacturing firms (Sundbo, 1997). Thus in services innovation is not a discretionary process but happens continuously as old elements are combined with new elements to add and enhance new features. Firms may develop new service products or add new features in existing services. A firm may increase service attributes of existing service

offerings and the products or services that are launched may be new to the industry or new to the firm (Yen et al., 2012). A firm may also improve product characteristics (Chang et al., 2012) or improve its existing service offerings (Amara et al., 2009). A firm may also combine or bundle existing service offerings (Hertog, 2010). Innovation may be considered as development and implementation of new ideas (Bell, 2005). The primary role of a firm is to integrate the knowledge of specialists into goods and services (Grant, 1996).

Network Relationships

Business organizations have linkages with other organization through networks. Networks provide access to knowledge and resources (Inkpen and Tsang, 2005). Firms interact and collaborate with each other in order to innovate (Huggins, 2010). Networks provide knowledge which is important for innovation in knowledge based services (Amara et al., 2009). Such collaboration may extend upstream with suppliers and downstream with customers (Walters and Rainbird, 2007). Network relationships may be considered in terms of inter-firm collaboration (Trigo and Vence, 2012). Mutual trust forms the basis of inter-firm collaboration (Ren et al., 2013). Firms may innovate in terms of needs that have been expressed by customers or proposal made by suppliers or even ideas from competitors (Chang et al, 2012). Knowledge exchanges with stakeholders may be in the form of tacit or explicit knowledge (Amara et al., 2009). Detailed specifications for new products may be provided by customers (Laforet, 2012).

There is a positive relationship between knowledge acquisition, knowledge application, knowledge protection and firm innovativeness (Abang et al., 2020).Service providers may collaborate in order to form a large value network or a common business model (Hertog, 2010). KIBS firms exchange knowledge through a combination of codified and tacit knowledge and largely rely on codified knowledge(Tai-Shan et al., 2018).

Although firms may be viewed as independent entities, the networks of relationships they are embedded in has an impact on their performance (Gulati et al., 2000). Firms gain access to a versatile range of resources through network relationships and while weak ties and low intensity collaboration may provide access to easily transferable resources but in order to access confidential and tacit knowledge requires stronger ties and high intensity collaboration (Rusanen et al., 2014). Cooperation and collaboration for knowledge sharing is all the more important as knowledge markets are rare (Huggins, 2010). Instead of internal R&D departments, service firms are more likely to gain knowledge and technology from collaboration with other stakeholders such as customers and suppliers (Tether, 2005). Firms may even need to build networks for discontinuous innovation (Birkinshaw et al., 2007). Networks allow firms to downsize to their

core competence and outsource all other activities to their alliance partners (Arias, 1995). Tacit knowledge may be context related and lie with key employees of a firm and thus difficult to share (Bell and Zaheer, 2007). Networks may play a particularly important role in sharing of tacit knowledge (Xu et al., 2008). Frequency of communication between network partners may define the intensity of networks (Xu et al., 2008).

Impact of Culture and Resources for Innovation

Within a firm, culture for innovation and resources available for innovation are also important factors that have an effect on innovation. In firms with innovative culture,the employees see the organizational climate as supportive of innovation (Scott and Bruce, 1994).When people see that innovation is welcome and rewarded then creativity is unleashed in the organization as such a culture encourages learning and experimentation (Euchner, 2017).Transformational leadership has a positive effect on an organization's innovative culture as such leaders effectively communicate and attain organizational goals and are able to inspire followers to overcome status quo (Hui et al., 2019).Innovative culture is established when a leader supports innovation frequently communicating the visions towards innovation, encouraging employees to pursue innovative projects and rewarding such efforts (Villaluz and Ma. Regina,2019). Thus organizations may build an innovative climate by sending positive signals to everyone by rewarding and recognizing employees who exhibit innovative behavior and by supporting innovative projects and collaborations. Available technology infrastructure mediates the relationship between cross functional integration and new service development projects(Rahman et al., 2020).

Innovative organizations may encourage knowledge sharing and allow the same problem to be solved in different ways. In such organizations, employees and manager have a high degree of freedom in making operational decisions (Abbey and Dickson, 1983). Innovative organizations may encourage key employees to become innovation champions (Berry et al., 2006). In the case of service firms, cross functional integration and project team efficiency have a positive impact on new service development projects (Rahman et al., 2020).A company such as Google has built a university like work culture with small work groups, peer review-feedback and a culture of experimentation (Hamel and Breen, 2007).

In order to encourage innovation, firms may provide necessary resources both in terms of financial resources and time and slack for key employees (Scott and Bruce, 1994). There is a positive correlation between organizational resources and both innovation strategy and innovation value (Pai-Chin et al., 2019). Slack resources play an important role in the ability of small firms to perform innovative activities although such resources do not have a direct effect on firm performance

and it is their co-alignment with innovative activities that drives firm performance (Soetanto and Jack,2018).Instead of traditional R& D departments some service firms may have innovation departments whose role is to stimulate innovative ideas and projects across the organization (Sundbo, 1997). A company such as Thomson Reuters has built a special fund for encouraging and funding innovative projects within the organization (Ashkenas and Burch, 2014). It may be noted that many traditional companies do not innovate as the time and resources of senior management are devoted towards mainline operations and revenue targets, while on the other hand, innovative companies have a long run vision and thus make extra effort to dedicate time and resources to pursue innovative projects. Large firms may be able to spend more resources towards innovation (Amara et al., 2009).

Thus the following hypotheses are proposed:

H_{01}:The culture for innovation in firm (CI) has a positive effect on New Service Concepts (NSC) related innovation.

H_{02}: The resources available for innovation in a firm (RI)has a positive effect on New Service Concepts (NSC) related innovation.

Impact of Network Relationships

Network relationships with different stakeholders such as customers, suppliers and investors may play an important role in firm level innovation (Varis and Litunen, 2010). Innovative strategic decisions are made based on access to knowledge within the context of social and business networks operating in a larger business ecosystem (Wulf and Butel, 2017).A critical factor for knowledge exchange is trust among members and open and frequent communication. Strong network relationships contribute towards product development (Amara et al., 2009). Highly innovative industries have a higher level of cooperation (Trigo and Vence, 2012). Service firms are more likely gain access to knowledge and technology from their network partners as compared to in-house R&D departments (Tether, 2005). In order to successfully leverage stakeholder knowledge in new service development projects, firms should deploy a dynamic model that is based on the relationship between the firm and its different stakeholders Pellizzoni et al., 2020). Network resources provide competitive advantage to firms and have a direct effect on innovation performance(Zheng et al., 2013). From a resource based view, international and local firms may work together as partners particularly in emerging markets and integrate their respective competitive advantages to introduce innovations in marketing (Gupta and Malhotra, 2013).

Innovative performance of firms is positively influenced by access to heterogeneous knowledge available in the networks and by recognizing the need

to cooperate with others to gain critical knowledge (Fang et al., 2017).Customers may participate in new service development as a supplier of ideas, co-developer, tester and as feedback provider (Dorner et al., 2011). A firm may develop a global service development strategy by working with key customers as service development partners and harnessing expertise and resources across the globe (Alam, 2018).Customers may participate in the entire innovation process cycle (Chesbrough, 2011).In case of KIBS, frontline employees have regular service encounters with customers and thus may act as a key interface for transfer of external knowledge into the firm (Santos-Vijande et al., 2016).Customers and suppliers are important partners in innovation (Pittaway et al., 2004). The role of KIBS firms has increased from being knowledge providers to business partners (Tai-Shan, 2017).

Suppliers may also play an important role as they provide new technologies and intellectual property (Rusanen et al., 2014; Hertog, 2000).Ideas for innovation may come from external networks (Sundbo, 1997; Jong and Vermeulen, 2003). Collaboration with suppliers is particularly required when bespoke or turnkey solutions need to be provided. Similarly competitors may collaborate with each other, in order to implement common standards in the market (Brettel and Cleven, 2011). Firms may need to work together as a part of a global alliance or in order to bid for large turnkey projects. Collaboration with select competitors has the potential to provide benefits to participating firms and a critical parameter in partner selection is whether a potential partner is a direct or indirect player in the market as firms perceive indirect players as more trustworthy and complementary (Kraus et al., 2018). Also, investor relationships may provide new ideas that may influence development of new services. Strategic investors who have key stakes in the firm may play a particularly important role in firm level innovation. Equity investments by investors promote knowledge driven business model innovation (Zheng et al., 2020).

There is a positive link between service innovation and network relationships (Yung-Chang, 2019).Thus networks with customers, select competitors, suppliers and investors are important in fostering new service concepts related innovation and the following hypotheses are proposed:

H_{03}: Network relationship with customers (NC) has positive effect on New Service Concepts (NSC) related innovation.

H_{04}: Network relationship with suppliers (NS) has positive effect on New Service Concepts (NSC) related innovation.

H_{05}: Network relationship with select competitors (NCOM) has positive effect on New Service Concepts (NSC) related innovation.

H_{06}: Network relationship with investors (NI) has positive effect on New Service Concepts (NSC) related innovation.

Research Methodology and Data Collection

The study has been conducted using measurement instrument developed by Sareen and Pandey (2015). The instrument has gone through an extensive review process and has been tested for validity and reliability. The survey instrument was divided into separate sections and was based on a single cross sectional research design. The survey was administered across the broad spectrum of knowledge based firm in India belonging to different KIBS subsectors and sent to middle to senior level executives.A personalized email was sent to 687 potential respondents describing the purpose of the study. Positive response was received from 280 respondents who were then sent the web based survey. Finally 151 valid responses were received. Respondents included executives with important designations such as CEO, President, MD, VP, COO, CFO, CTO, GM, Partner, Business Head etc.

Data Analysis and Discussion

Innovative firms may develop new service concepts. Table 1 presents the mean scores and standard deviation for the items (NSC1 to NSC4) constituting the construct *New Service Concepts*(NSC). The mean score of 4.22 for NSC indicates that knowledge intensive firms are creating new service concepts and offerings in the market. KIBS firms are under competitive pressure to constantly renew and improve their service offerings and introduce new service concepts.

Table 1: Mean scores and SD of new service concepts

Item	Description	Mean	Std. Deviation
NSC1	Our firm has developed services that are new to the market	4.1523	.83065
NSC2	Our firm has developed services that were not previously offered by us	4.2980	.79829
NSC3	Our firm has improved existing service offerings	4.3179	.76916
NSC4	Our firm has provided new service offerings by combining various individual services	4.1192	.90868
NSC		4.2219	.68041

Table 2: Bivariate correlation between NSC and predictor variables

	NSC
CI	.359**
RI	.210**
NC	.193*
NS	.062
NCOM	.056
NI	.261**

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

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

It may be noted that in terms of the strength of association between two variables correlations between .1 and .3 are considered weak, .3 to .5 are considered moderate and .5 to 1 are considered strong. In Table 2, it may be observed that NSC has significant and moderate correlation with CI. Thus firms with a strong culture for innovation are more likely to introduce new service concepts. Similarly it is observed that correlation between NSC and NI is .261 and is significant ($p<.01$).

Regression analysis was done with NSC as the dependent variable and CI, RI, NC, NS, NCOM and NI as predictors. Table 3 presents the model summary. The R Square value of the model is 0.20 and Durbin-Watson value of close to 2 shows the independence of error terms.

Table 3: Model summary of variables predicting NSC

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.448[a]	.200	.167	.62094	2.120

a. Predictors: (Constant), NI, CI, NCOM, NC, NS, RI

b. Dependent Variable: NSC

Table 4 presents the ANOVA summary and Table 5presents the details of regression coefficients of variables predicting NSC.

Table 4: Anova summary for NSC

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.921	6	2.320	6.017	.000[b]
	Residual	55.522	144	.386		
	Total	69.443	150			

a. Dependent Variable: NSC

b. Predictors: (Constant), NI, CI, NCOM, NC, NS, RI

In Table 5, value of VIF is less than 5 and tolerance of more than 0.2 indicates that there is no multicollinearity. As presented in Table 5, Beta coefficient of: CI is significant (β =.341, t=4.076, $p<.01$) and NI is significant (β =.272, t=3.279, $p<.01$). Thus CI and NI are significant predictors of NSC. It is also observed in Table 5, that RI, NC, NS and NCOM are not significant predictors of NSC.

Thus as observed in Table 5, a strong culture for innovation facilitates development of new service concepts. The hypothesis, H_{01}:*The culture for innovation in firm (CI) has a positive effect on New Service Concepts (NSC) related innovation,* is supported. In firms such as Google, the university like collegial and innovative

culture with peer feedback and focus on merit encourages the firm to continuously come out with new service concepts by enhancing or combining existing service offerings or coming out with completely new service offerings. Different dimensions of organizational culture have an overall impact on different aspects of innovation such as product development, service innovation, administrative innovation & process innovation (Mu et al., 2018).

Table 5: Regression coefficient of variables predicting NSC

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Const)	2.131	.445		4.794	.000		
CI	.364	.089	.341	4.076	.000	.792	1.263
RI	.012	.083	.014	.146	.884	.579	1.727
NC	.075	.101	.069	.744	.458	.644	1.553
NS	-.146	.094	-.148	-1.547	.124	.604	1.655
NCOM	-.005	.067	-.006	-.068	.946	.820	1.219
NI	.201	.061	.272	3.279	.001	.806	1.241

At the same time, in Table 5, it is surprisingly observed that resources available for innovation within a firm (RI) is not a significant predictor of NSC. Thus the hypothesis, H_{02}*: The resources available for innovation in a firm (RI)has a positive effect on New Service Concepts (NSC) related innovation,* is rejected. This could be explained by the reasoning that in knowledge based service firms, developing new service concepts may not be resource intensive. Also, it may be possible that lack of resources may result in innovative ideas to find solutions within the resource constraints. There is some support for this in literature. There is a negative and significant relationship between innovation and firm level resources such as cash slack and human slack and this suggests that constraints such as lack of resources may actually facilitate innovation (Demirkan, 2018).The effect of resource utilization on innovation performance is moderated by attitudinal factors that include intention, inspiration, integration and indefatigability and these factors allow firm to utilize limited resources in creative ways, thus challenging the conventional thinking of the need of abundant resources in order to innovate (Bicen and Johnson, 2014).

In Table 5, it is also observed that network relationship with: customers, suppliers and select competitors is not a significant predictor of NSC. Thus the following hypotheses are rejected:

H_{03}: Network relationship with customers (NC) has positive effect on New Service Concepts (NSC) related innovation;

H_{04}: Network relationship with suppliers (NS) has positive effect on New Service Concepts (NSC) related innovation;

H_{05}: Network relationship with select competitors (NCOM) has positive effect on New Service Concepts (NSC) related innovation.

This shows that in knowledge based services, customers are more of end users and may not contribute towards development of new service products or enhancements in existing service offerings. Similarly suppliers may play only a supporting role in the case of KIBS firms, unlike in the case of manufacturing industries where suppliers are a critical part of supply chains and need to be involved particularly in case of new product development. The findings also show that in KIBS firms, network relationship with competitors does not play a significant role in new service development. Firms may be wary of sharing new service concepts or potential plans with their competitors. There is some support in the literature for these findings. Knowledge sources from customers in the private sector and knowledge sources from competitors show a negative relationship with innovative activities in a firm (Shoaib and Medase, 2019).

In Table 5, it is observed that network relationship with investors is a significant predictor of NSC. Thus the hypothesis, *H_{06}: Network relationship with investors (NI) has positive effect on New Service Concepts (NSC) related innovation,* is supported. In knowledge based firms, strategic investors may bring in important market insights as many investors are well aware of the competitive scenario. Such investors may influence firm level strategy and provide guidance on developing new service offerings.

Conclusion

Knowledge based service firms may innovate by developing new service offerings or enhancing existing services or even by combining or bundling individual service offerings. This study has contributed towards understanding the drivers of new service concepts related innovation in knowledge based services firms in the Indian context. Firms have network relationships with customers, suppliers, select competitors and investors. Networks are an important source of information, technology and knowledge. The study has evaluated the role of the above network relationships in innovations related to new service concepts in the case of knowledge based service firms. At the same time culture for innovation within a firm and resources available for innovation within a firm are expected to play an important role in innovation in terms of developing new service concepts.

Implications of the Study

The study finds that network relationship with investors and culture for innovation play a significant role in terms of new service concepts related innovation. Strategic investors may bring crucial insights about markets and competitive scenario and thus contribute towards new service development. Such investors may also influence firm level strategy. At the same time, a strong culture for innovation encourages employees and managers to come out with and implement new service offerings. Surprisingly resources available for innovation do not have a significant role in terms of developing new service concepts. This could be due to the reasoning that new service development may not be resource intensive in the case of knowledge based services as compared to manufacturing. Edison et al. (2013) discuss that in the case of software industry in order to innovate, the creative climate is more important than technology. Also customers are more focused on delivery and end use of services and thus may not contribute towards development of new service offerings. Similarly suppliers who play an important role in new product development in manufacturing industries, do not play a significant role in terms of developing new service concepts in KIBS firms. In such firms, most suppliers are tactical in nature and may only play a supporting role.

The study provides crucial insights to knowledge based service firms for identifying the important drivers of innovation related to developing new service concepts. Managers may need to focus more on developing a culture for innovation within the firm and network relationships with investors with the purpose of developing new service offerings. Managers should consider the national culture in which the firm operates while formulating new service development strategies as different national cultures may vary from structured, which require more guidelines and control, to unstructured which value freedom and empowerment (Valtakoski et al., 2019). Thus Future researchers may conduct similar studies in knowledge based service firms in the context of other countries. Also researchers may conduct similar studies for other sectors in service industries beyond the knowledge intensive business services.

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Esops And Employee Retention

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Abstract: Organizations work towards retention of employees. Compensation is the most important factor that influences employee retention. One of the important complements of a compensation system is employees stock options (ESOPs). No study has been conducted on establishing the relationship between ESOP and employee retention which has been the primary objective of the study. A conceptual framework wherein features of ESOPs namely ownership feeling, vesting period, exercise period and repricing underwater options which impacts employee retention has been built. Multiple regression has been used for numerically supporting the framework along with theoretical support. It has been found that longer the vesting period, better will be the employee retention. Similarly, longer exercise period provides the employees an opportunity to wait till market price is more than grant price, in times of slump season which will favour employee retention. Moreover, ownership feeling binds employees to organization. In the case of repricing, it is one of the alternatives before organizations to deal with underwater options. Due to lows in stock market particularly in the year 2008-09, mostly ESOPs have been below the exercise price at which ESOPs are granted to staff. These are called 'underwater' ESOPs, and if exercised, will lead to loss to employees. Thus, vesting period, exercise period and ownership feeling are useful predictor of employee retention while insignificant relationship between repricing options and employee retention.

Keywords: ESOPs; Employee Retention; Ownership feeling; Vesting period; Exercise period; Repricing underwater options.

Introduction

Optimum utilization of human resource requires that employees should not leave the organization early. Thus, retaining employees is a major concern among business organizations (Samuel & Chipunza, 2009). Organizations work towards employee's retention, otherwise, they will be accepting the expenditure of engaging and the expenditure on losing their workforce in terms of productivity (Lockwood and Ansari, 1999). Employee retention means employees do not leave the organization and stay for maximum time period with it. The term

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retention means "to prevent the loss of competent employees from leaving the organization as this could have an adverse effect on productivity and profitability"(Chiboiwa, et al., 2010).

An indicator of employee retention is labour turnover. Therefore, studies examining turnover provide an insight into dynamics of employee retention. Employee retention is the converse of turnover (Starosta, 2006). The improved retention means lower employee turnover (Fitz-enz, 1997).The management deals with high level of employee turnover by creating an environment to retain them for long term. Employee turnover in general means the rate of change in labour force (Abe, 2013). Employee turnover is defined as the number of workforce which exits the corporate and gets substituted by other personnel.

Some degree of turnover is essential for every organization (Grobler et al., 2006). This will bring in new ideas with new blood and provides opportunities for growth of internal staff. If taken to extreme, high turnover entails cost to the company. The reward experts have approximated the expenditure on turnover, which consists of laying off expenditure, vacancy expenditure till a seat is occupied, expenditure on recruiting and replacement and lower efficiency with a new staff, at 50% to 200% of a staff's yearly compensation (Compensation & Benefits Review, 1997). Further, loosing key personnel has a negative impact on organizational performance and productivity (Goswami, and Jha, 2012).

The other expenditure of turnover are huge too. Guy and Brachet (2011) stated that turnover results for double corporate forgetting as the more conventionally understood skill depreciation. In addition to this higher turnover influences workforce team harmony and brings a bad name to the organization (Goswami, and Jha, 2012). Therefore, organizations work towards the retention of key personnel at all levels (Cole, 2002). The organizations take measures to retain workforce and minimize the turnover due to job dissatisfaction, poor working conditions, insufficient benefits (Mobley, 1977; Kuria and Ondigi, 2012).

It has been found that labour turnover is a gradual process (Kuria and Ondigi, 2012). Mobley (1977) stated that an employee scrutinizes the work and the work environment to decide whether to continue in a job or not. An employee scrutinizes the work and the work environment on the basis of number of factors. These factors include the compensation structure, organization policies, rules and regulations, the Hertzberg hygiene factors, work monotony and burnouts (Kuria and Ondigi, 2012). One of the most commonly cited reason by employees for quitting their existing job is the availability of better compensation in another job (Wood and Macaulay, 1991). Workforce (1998) identified dissatisfaction with pay package as one of the major causes why does staff leave jobs in high turnover fields. Compensation is the most important factor that influences employee retention (Career Builder Survey, 2013).

One of the important complements of a compensation system is employees stock options. The ESOPs have emerged as an important non-cash tool to compensate employees *(Rizvi, 2010).* It means a scheme through which an organization grants shares to staff usually at a lower price for a specified period of time. The term ESOP is defined as " the right (the option) given by a company to a person (optionee) to purchase (exercise) a stated number of shares of company common stock at a prescribed price (grant or strike price) over a specified time period (exercise period)" (Ellig, 1998). Thus, ESOP is a stock option scheme, which grants employees the right to purchase shares of the organization in future at a pre-decided price, though the market price of the shares has raised from the ESOP's grant price. *According to* Oyer and Schaefer, 2002, any type of deferred compensation will make it expensive for people to leave. *Thus, ESOPs provide retention incentive to employees* (Oyer and Schaefer, 2002).

Literature Review and Conceptual Framework

The significance of holding employees is highest in organizations needing quality staff and in organizations wherein human resource is significant production factor. Kole (1997) states that ESOPs are given to hold staff when their experience or knowledge is expensive for the organization to lose. In the following section, features of ESOP impacting employee retention have been discussed.

Vesting Period and Retention

The prevalence of concept of the vesting periods for ESOPs means that organizations give ESOPs to hold employees. As per the SEBI (ESOS and ESPS) Guidelines, 1999, the vesting period means "the period during which the vesting of the option granted to the employee in pursuance of ESOS takes place". There must be a minimum time gap of one year between grant of ESOPs and vesting of ESOPs. According to KPMG Survey 2010-11, a vesting schedule of three to four years has been common in Indian scenario. Longer vesting period binds an employee to the organization. This is because employees generally stays in the organizations till the ESOPs are exercised (Damodaran, 2005).

ESOPs gives an inducement to stay with the organization (Oyer, 2004). ESOPs vest for a long time duration, therefore the staff loses value by leaving organisation. Moreover, as the outside options progresses when stock prices are greater, the attraction against leaving grows when leaving seems to be more attractive. These results have been in parlance with the findings exhibited by Aldatmaz et al (2014). They stated that ESOPS have been useful in lowering turnover. They dwelled that ESOPs give an explicit reward for staff to stay with the organisation till ESOPs vest.

On the basis of above arguments the following hypothesis has been dwelled.

$H0_1$: Longer vesting period do not bind employees to organization.

Exercise Period and Retention

The condition that staff immediately exercises ESOPs when they quit the organization highlights that organization give ESOPs to hold staff. Exercise period is another feature of ESOP which retains employees in an organisation. As per the SEBI (ESOS and ESPS) Guidelines, 1999, the exercise period means "the time period after vesting within which the employee should exercise his right to apply for shares against the option vested in him in pursuance of the ESOS". Longer exercise period gives employees ample time to decide whether it would be beneficial for them to exercise ESOPs or not (Pendleton et al., 1998). Longer exercise period provides the employees an opportunity to wait till market price is more than grant price, in times of slump season. The organization generally has a condition that workforce immediately exercise ESOPS when they leave it (https://www.themuse.com/advice/getting-startup-equity-everything-you-need-to-know). This forces employees to stick to the organization. KPMG Survey 2010-11 on ESOPs found that majority of the organization in India have an exercise period between 2 to 5 years.

On the basis of above discussion the following hypothesis has been developed.

$H0_2$: Longer exercise period does not help in employee retention.

Repricing Underwater Stock Options and Retention

The retention favouring discussion is that workforce is in demand from similar organisations, and therefore, more possible to leave the organisation, when industry stock prices are more . Though, more stock prices gives ESOPs with greater values in such cases and therefore results in holding workforce to the organisation (Oyer, 2002). Repricing underwater stock options affects overall employee retention. In case of underwater stock options, exercise price is greater than market price. Thus it will have a negative impact on option holders. In this scenario, there will be no monetary gain to option holders, thus they will not exercise options. Thus, repricing existing options to bring the exercise price nearer to market price helps to retain employee.

Carter and Lynch (2003) studied whether repricing ESOPs decreases both executive and overall workforce turnover by means of a sample of 136 organizations; 89 firms are divided as high technology organsiations and 47 are non-high technology organizations, that reprice underwater ESOPs in 1998 and a control sample of organisations with underwater ESOPs that are not to reprice. The regression had been used in the study. The results state lesser substantiation that repricing underwater ESOPs influences executive turnover. Repricing is

negatively associated with overall workforce turnover but repricing nonexecutive ESOPs helps to hold those staff.

Chidambaran (2003) stated that executive turnover has been greater in repricing organisations than nonrepricing organisations, but that within repricing organsations, executive turnover has been lesser for corporates that reprice executive's ESOPs than in organsiations which reprice non-CEO ESOPs alone. Daily et al. (2002) highlighted that post-repricing CEO turnover has been more for corporate that reprice CEO's ESOPs vs in corporate that do not reprice.

On the basis of above discussion the following hypothesis has been developed.

$H0_3$: Repricing options in a given year does not help in employee retention.

Ownership Feeling and Retention

Pendleton et al (1998) states employees get psychological 'feelings of ownership' from ESOPs. This is particularly applicable in case of lower level employees. For example, ESOPs gives employees ample time to decide whether it would be beneficial for them to exercise ESOPs or not. On grant of ESOPs, no cash outlay is required. Thus, it provides employees an opportunity to save scarce cash for exercising options, if any (Pendleton et al, 2002). However, the very fact that ESOPs results in ownership is questionable by critics. Zacharias and Martin (2005) showed that employees exercise their options very early and in a few large transactions. Carpenter (1998) also captured that executives sell ESOPs more or less at the same time at which they exercise ESOPs. This means that an executive gives more importance to cash than ownership. The proponents of ESOPs favoured that ESOPs creates 'quasi-ownership' sentiments among employees even though they sell ESOPs more or less at the same time at which they exercise ESOPs.

On the basis of above discussion the following hypothesis has been developed.

$H0_4$: The psychological feeling of ownership given by ESOPs does not keep employees with organisation.

Research Methodology

On the basis of above discussion, there are certain features of ESOPs which impacts employee retention namely, ownership feeling, vesting period, exercise period and repricing underwater options. To test the above framed hypothesis, multiple regression has been used. The dependent variable has been gauged using a 5 point Likert scale from strongly agree to strongly disagree with the statement "ESOPs helps in employee retention". The four independent variables have been measured as follows. The ownership feeling has been gauged using a 5 point Likert scale from strongly agree to strongly disagree with the statement

"ESOPs gives me a psychological feelings of ownership". The remaining three independent variables namely, vesting period, exercise period and repricing options have been taken as dummy variables. In case of organizations, having vesting period of more than or equal to three years, it has been taken as 1, otherwise 0. In case of organizations, having exercise period of more than or equal to four years, it has been taken as 1, otherwise 0. If organizations had repriced ESOPs in 2014, it has been taken as 1, otherwise 0. For the purpose of the study, data has been taken from a sample of 88 employees who have being granted ESOPs. Simple random sampling method had been used in the study. Multiple regression technique has been applied with the help of Statistical Package for the Social Sciences (SPSS) version 19.0.

The regression equation used in the study is as follows:

ER = a + b1 * VP + b2 * EP + b3 * RP + b4 * OF + ì

Wherein,

ER	=	Employee retention
a	=	Intercept
b1, b2, b3, b4	=	Slope Coefficient
VP	=	Vesting Period
EP	=	Exercise Period
RP	=	Repriced ESOPs in a given year
OF	=	Ownership Feeling
µ	=	Error Term

Findings

Determining How Well the Model Fits

Model Summary table gives the *R, R^2* and the standard error of the estimate. These have been deployed to identify how good a regression model fits the data. The "R" column shows the value of *R*. The *multiple correlation coefficient*, *R* is the quality of the prediction of the dependent variable, employee retention. A value of 0.701 indicates a good level of prediction. The "R Square" column gives the R^2 value. R^2 is the coefficient of determination. R^2 is the proportion of variance in the dependent variable (employee retention) that can be accounted by the independent variables (ownership feeling, vesting period, exercise period and repricing underwater options). The value of 0.505 indicates that the independent variables accounts for 50.5% of the variability of the dependent variable. In addition to *R and* R^2, the error of estimate is considerably low, about 1.030 (Table 1).

Table 1: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.710[a]	.505	.481	1.030

a. Predictors: (Constant), OF, EP, RP, VP

Statistical Significance

The *F*-ratio as depicted in the ANOVA table dwells whether the overall regression model is a good fit for the data. The Table 2 brings out that the independent variables statistically significantly forecast the dependent variable, F (4, 83) = 21.128, $p < .001$. Thus, the regression model is a good fit of the data. The significance value of the F statistic is less than 0.001, which connotes that the variation accounted by the model is not due to chance.

Table 2: ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	89.661	4	22.415	21.128	.000[a]
	Residual	88.055	83	1.061		
	Total	177.716	87			

a. Predictors: (Constant), OF, EP, RP, VP

b. Dependent Variable: ER

Estimated Model Coefficients

The equation to forecast ER from VP, EP, RP and OF is

Predicted ER= .616 + .461 * VP + .430 * EP -.582 * RP + .706*OF

Table 3: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.616	.355		1.735	.086
	VP	.461	.233	.162	1.980	.051
	EP	.430	.253	.135	1.699	.093
	RP	-.582	.402	-.118	-1.449	.151
	OF	.706	.086	.649	8.196	.000

a. Dependent Variable: ER

Statistical Significance of the Independent Variables

To test for the statistical significance of each of the independent variables, *t*-value and corresponding *p*-value are located in the "t" and "Sig." columns, respectively, have been analysed. Thus, VP, EP and OF are statistically significant at 10% level of significance, while RP is not statistically significant at 10% level of significance.

Discussion

Multiple regression technique is applied to study how certain features of ESOPs namely, ownership feeling, vesting period, exercise period and repricing underwater options impacts employee retention. Analysis of Table 3 reveals that the *F* value has been found significant in the model, which indicates the utility of the model in explaining the employee retention in India. Thus, ESOPs are an important predictor of employee retention. Vesting period, exercise period and ownership feeling have been found to be statistically significant at 10% level of significance except for repricing options. Thus, vesting period, exercise period and ownership feeling are useful predictor of employee retention. All these three independent variables are positively related with employee retention.

The analysis of results of regression technique in case of vesting period reveals a statically positive and significant relationship between vesting period and employee retention. This means that longer the vesting period, better will be the employee retention. The null hypothesis $H0_1$ that "longer vesting period do not bind employees to organization" cannot be supported. Thus, longer vesting period binds employees to organization. This is consistent with the findings of Serdar et al (2014) who stated that ESOPs are good for lowering turnover. They highlighted that ESOPs give an explicit incentive for staff to stay with the organization till the options vest.

The analysis of results of regression technique in case of exercise period reveals a statically positive and significant relationship between exercise period and employee retention. This means that longer the exercise period, better will be the employee retention. The null hypothesis $H0_2$ that "longer exercise period do not bind employees to organization" cannot be supported. Thus, longer exercise period binds employees to organization. Longer exercise period gives employees ample time to decide whether it would be beneficial for them to exercise ESOPs or not, thereby retaining them in organisation (Pendleton et al., 1998). Longer exercise period provides the employees an opportunity to wait till market price is more than grant price, in times of slump season.

The analysis of results of regression technique in case of ownership feeling reveals a statically positive and significant relationship between ownership feeling and

employee retention. This means that higher the ownership feeling more will be the employee retention. The null hypothesis $H0_4$ that "the psychological feeling of ownership given by ESOPs does not keep employees with organisation" cannot be supported. Thus, ownership feeling binds employees to organization. Pendleton et al (1998) highlighted employees get psychological 'feelings of ownership' from ESOPs. This is particularly applicable in case of lower level employees. On grant of ESOPs, no cash outlay is required. Thus, it provides employees an opportunity to save scarce cash for exercising options, if any (Pendleton et al, 2002). Even though employees sell ESOPs more or less at the same time at which they exercise ESOPs, still ESOPs creates 'quasi-ownership' sentiments among employees.

The analysis of results of regression technique in case of repricing options reveals a statistically negative and insignificant relationship between repricing options and employee retention. The null hypothesis $H0^3$ that "Repricing options in a given year does not help in employee retention" cannot be rejected. This means that there is no statistically significant relationship between repricing options in a given year and employee retention. Repricing is one of the alternatives before organizations to deal with underwater options. Due to lows in stock market particularly in year 2008-09, mostly ESOPs have been below the exercise price at which ESOPs are granted to staff. These are called 'underwater' ESOPs, and if exercised, will lead to loss to employees. The workforce will be gaining if they buy the ESOPs directly from the market instead of purchasing from the corporate. An underwater ESOPs results mostly due to situations outside the control of the employer, thus they look for alternatives to add value to their underwater options. Repricing is one of the alternatives before organizations to deal with underwater options. The present paper considers repricing done in year 2014. More companies in India have opted for this alternative around the period of global meltdown 2008-09. Thus, in addition to repricing, cancellation (making cash payment in exchange for termination of the underwater ESOPs), replacement (exchanging the underwater ESOPs for a new plan with favorable terms and conditions) are other alternatives which management opts for in order to deal with underwater options.

On the basis of above discussion, it can be concluded that ESOPs impacts employee retention through its features such as vesting period, exercise period and ownership feeling.

Conclusion

It has been found that longer the vesting period, better will be the employee retention. Similarly, longer exercise period provides the employees an opportunity to wait till market price is more than grant price, in times of slump season which

will favour employee retention. Moreover, ownership feeling binds employees to organization. In the case of repricing, it is one of the alternatives before organizations to deal with underwater options. Due to lows in stock market particularly in year 2008-09, mostly ESOPs have been below the exercise price at which ESOPs are granted to staff. These are called 'underwater' ESOPs, and if exercised, will lead to loss to employees. Thus, vesting period, exercise period and ownership feeling are useful predictor of employee retention while insignificant relationship between repricing options and employee retention.

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