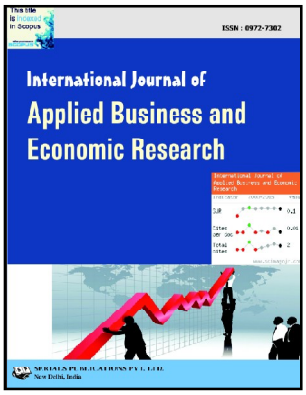

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Anomalies Effect in Returns of BSE Sectorial Indices

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Abstract: This paper has been undertaken to measure the days-of-the-week anomaly effect on the returns and volatility of six sectorial indices in Bombay Stock Exchange using PGARCH model along with descriptive statistics. To examine anomalies, the data was taken for the period of seven years (April 2010 to September 2017). The outcome of this research study expresses that the days-of-the-week anomaly consequence was found to have been prevalent in five out of six sectors and volatility effect was strongly proved to be present on Fridays.

Keywords: Day-of-the-Week, BSE Sectorial Index, Anomaly, ADF, PGARCH models.

INTRODUCTION

In financial markets, there are several cyclical effects that create higher or lesser returns depending on the period, which are called 'anomalies'. The literary meaning of anomaly is 'a strange or unusual occurrence'. Financial market anomaly means a situation in which performance of stock deviates from the assumption of the efficient market hypothesis. These financial market anomalies are cross-sectional and the time series patterns in returns that are not predicted by central paradigm or theory. Such movement which cannot be explained by using efficient market hypothesis is called market anomalies (Silver, 2013).

According to (Fama, 1970) a market in which information about values stocks are always fully available can be termed an efficient one. Efficient market hypothesis (EMH) means all information relating to securities prices are fully available in the market; stocks always trade at their fair value on the stock exchange, that is unbearable for stakeholders to either buying underestimated stock or sell stock for an overstated price. EMH related how fast and accurately the market reacts to new info from external factors like an economic report, company announcement, political statements, etc. EMH can be classified into weak form, semi-strong form and a strong form of market efficiency. In weak form, market efficiency implies all past information in the market is completely reflected in the stock prices and analysis of past information

is irrelevant in the prediction of future price movement. Semi-strong form of market efficiency states that stock prices reflect all information available publicly. The strong form of market efficiency is the oldest form comprising of both weak and semi-strong form. It implies that all information whether public or private is reflected in stock prices. Anomalies pertain to a semi-strong form of market efficiency. Calendar anomalies arise due to seasonality in stock. It can be days-of-the week effect (that is, market efficiency of Monday is lower than that of Friday), month-of-the-year effect (January effect) or seasonal effect (holidays, vacation etc.) During the winter season, woollen clothes' sales are high, and the same can be seen in gold sales during festivals in India.

Though several studies have been conducted to examine the days-of-the-week anomaly effect on the Indian Stock Market, these have been performed using indices. In a recent survey, (Kothari, Singh, & Patra, 2017) explored the days-of-the-week anomaly effect taking some significant indices of BSE and NSE. Keeping the above variations regarding the day-of-the-week anomaly effect and research gap in mind, this study tries to observe the days-of-the-week anomaly effect in the Indian stock market taking six major sectoral indices of Bombay Stock Exchange (BSE) of India.

REVIEW OF LITERATURE

(Wachtel, 1942) observed and described seasonality in stock market returns for the very initial time in the history of stock market anomalies. (Rozeff and Kinney, 1976) From 1904 to 1974, Rozeff and Kinney found the January effect (monthly effect) on New York stock exchange returns, proved that the monthly performance of January is higher than that of the other months. (French, 1980) observed that there was a negative tendency of return on Mondays and the other days of the week had a positive trend on the returns and his paper was an attempt to test the weekend effect on stock returns.

(Ariel, 1987) Found the semi-monthly impact in US stock return; in the first half of the month, there were positive rates of return whereas the end of the month showed lower returns compared to the first half. And the month December depicted lower returns in comparison to January in the US stock market. Ziemba (1989) stated that in Japan the last five days and first two days of the month had an impact on the monthly anomaly effect. (Agarwal & Tandon, 1994) found there was a positive return on Fridays in different countries, except Luxembourg and their study found the highest stock return variance on Mondays and lowest on Fridays.

(Ziemba & Hensel, 1994) stated that anomalies expressed that systematic violation of security market efficiency occurs in equity market due to time, the flow of cash, decision making, and few other macroeconomic events which resulted in significantly different risk-adjusted return than expected return which could lead to an excess earning in returns in the market. (Boudoukh, Richardson & Whitelaw, 1994**)** observed that on the days on which news was identified, it would result in 30 percent last returns, and if there were no news identified, the associated stock returns would be moderate. (Balaban, 1995) Examined the days-of-the-week anomaly effect on the Istanbul securities exchange and found there was a positive stock return on Wednesday and Friday and there was more volatility in stock returns on Monday. Wong and Yuanto (1999) study revealed the adverse effect on Tuesdays and positive outcome on Fridays in Indonesia stock market returns.

(Nath & Dalvi, 2004) found that the days-of-the-week anomaly effect in Indian equity market during the period of 1999 to 2003 using S&P CNX Nifty, there was a significant effect on Mondays and Fridays

before the rolling settlement introduction and after the rolling settlement system there was a significant effect on Fridays. (Raj& Kumari, 2006) found that the day-of-the-week effect during 1979 to 1998 on BSE and NSE depicted a negative return on Tuesdays and a higher return on Mondays related to other days of a week. (Amarnani & Vaidya, 2014) found that calendar anomalies in Indian markets had negative returns on Mondays on Nifty and positive returns on BSE Sensex. (Purohit & Tyagi, 2015**)** in their study, found that there was a December effect in India and a May effect in China, from 1995 to 2013 in India and China market returns.

However, the literature review reveals certain aspects of the existing body of research on the existence of calendar effects in Indian stock markets. This study examines the day-of-the-week anomaly effect on six major sectorials in Bombay Stock Exchange in India.

OBJECTIVE OF THE STUDY

1. Examine the occurrence of days-of-the-week anomaly effect in BSE sectorial index
2. Examine the volatility clustering effect in the sectoral index

RESEARCH METHODOLOGY

This research study is entirely based on secondary data and is purely empirical. All the data were acquired from an official database of Bombay Stock Exchange website. To study the days-of-the-week effect in returns of six major sectoral indices of BSE. The six sectors chosen for the study are Automobiles, Banking, IT, FMCG, Media and Pharma sectors. The return on BSE sectoral indices was calculated as per the following formula (1)

$$R_t = (P_t) - (Pt_{-1}) / (Pt_{-1}) \quad (1)$$

Where R_t is the daily return of sectoral indices at time t. P_t denotes the closing price of the sectoral index at time period t, and P_{t-1} denotes the closing price of the index at time period t-1. The data was collected for the period April 2010 to September 2017. The sectoral indices return of BSE were found to be very different from each other. Hence each sector is analysed independently for conditional volatility. "Eviews 9" statistical software package was used for performing the econometric analysis. In analysing the data, descriptive statistics, Augmented dickey-fuller test, ARCH LM test and PGARCH model was applied.

EMPIRICAL RESULTS

Descriptive Statistics

The descriptive statistics for the Bombay Stock Exchange index for the selected sectorial return in India is computed and presented in Table 1.

Table 1, displays the summary of statistics of the daily returns of BSE sectorial Sensex index over the period of April 2010 to September 2017. As per the table the results exhibit highest mean average returns in AUTO sector (0.072770) and lowest mean average returns in IT sectors (0.038696), the maximum return was found in Banking sectors (9.458214) and weakest return in IT sector (-11.74179). Among these six sectors, the Banking sector had a more standard deviation that expressed more volatility in the market

Table 1
Sectorial index return (from April 2010 to September 2017)

Sector	*Auto*	*Bank*	*IT*	*FMCG*	*Media*	*Pharma*
Mean	0.072772	0.060824	0.038696	0.072303	0.040317	0.049805
Median	0.097964	0.068353	0.034013	0.101839	0.054060	0.074753
Max	5.980351	9.458214	9.332137	5.383294	5.320224	5.107261
Min	-7.256881	-6.896972	-11.74179	-6.732161	-8.050082	-6.985234
Std. Dev	1.216139	1.459941	1.269434	1.080547	1.336200	1.055879
Skewness	-0.090027	0.152219	-0.515706	-0.187793	-0.139347	-0.381183
Kurtosis	4.657479	5.116871	11.34050	5.615144	4.301237	5.618463
Jarque-bera (Prob)	215.3075 (0.00000)	354.2809 (0.00000)	5470.703 (0.00000)	540.6625 (0.00000)	137.1701 (0.00000)	575.7903 (0.00000)

Source: (Authors' Calculation)

and high risk, and the Pharma sectors were less compared to other sectors in BSE. However, skewness for the returns series for all sectors was almost negative (asymmetry) except Banking sector which is nonasymmetric (positive). As far as kurtosis is concerned for sectorial indices, it was found to be nearly 5 (approximately) for all sectors except for the IT sector (11.34 almost), so the series distribution expresses a thicker tail compared to a normal distribution. The Jarque Bera test for normality portrays a significance level of 5%, indicating the rejection of the null hypothesis, that is the series data of sectoral indices are not normally distributed.

RESULTS OF AUGMENTED DICKEY-FULLER UNIT ROOT TEST

Augmented dickey-fuller (ADF) unit root test was employed to test the stationarity of the time series data. A series is called stationary when the mean value and variance of the data has not changed for a particular period of time. In case the data is nonstationary, it means that the research result and conclusion is incorrect(Dickey & Fuller, 1979). So, the ADF test is necessary to examine the time series data. The ADF null hypothesis: there is unit root in the series and alternate hypothesis: there is no unit root, and the series is stationary. The observed t-statistics and its probability values of ADF unit root test are presented in Table 2.

Table 2
ADF-Unit Root Test (At Level) Sectorial Index Return

Sectors	*T-statistic*	*Prob.*
AUTO	-19.22759	0.0000
BANK	-19.05574	0.0000
FMCG	-20.70590	0.0000
IT	-18.04529	0.0000
MEDIA	-19.04976	0.0000
PHARMA	-20.84916	0.0000

Source: (Authors' Calculation)

Table 2 presents the t-statistics and p values calculated at the first level for all the six sectoral index data series. The null hypothesis of non-stationarity was rejected for all the data series as all the computed p values were less than 0.05. The computed t-statistics were all significant at five percent level, which indicates that the data of sectoral indices returns are stationary at the first level.

ESTIMATION OF PGARCH MODEL

All the stock returns are autoregressive ness, which means that all the returns are volatility clustered. If we want to know the exact value of anomalies, we must adjust conditional means and volatility in the data. That is the reason we are using the model of PGARCH. This model was applied to BSE Sensex returns of six sectorial indices in India. It estimates the conditional variance and characteristics of PGARCH like autoregressive ness, asymmetric effect, clustering effect, and power value. The model used for in this study is represented in the equation

$$\sigma_t^d = \alpha_0 + \Sigma_{i=1}^{p} \alpha_i \left(| \varepsilon_{t-i} | + \gamma_i \varepsilon_{t-i} \right)^d + \Sigma_{j=1}^{q} \beta_j \sigma_{t-j}^d \quad (2)$$

From the above equation (2), (α_i) ARCH, estimated the presence of autoregressive characters in the estimated conditional variance. The asymmetric term (γ_i) measures the asymmetric value, that means negative or positive news which leads to more volatility, this model works on logarithm of variance and lagged absolute residual from mean equation. This is called leverage effect. Under T-Garch model, we can observe positive or negative shocks in the returns and how its different levels affect the value of returns. GARCH (1,1) (β_j) estimates the clustering effect the conditional volatility. This garch model is widely used for financial time series data. The conditional modification of returns is not only depending on the squared residual of the mean calculation of its own historical value, in power term was used for instead of taking squared residuals, estimates its own power transformation to give best value for the entire data series.

ARCH LM TEST

This test was conducted to find out whether any autocorrelation was found in the residuals of PGARCH equation, which is necessary to verify whether any arch effect has remained in the data or not. The null hypothesis of this test is that the residuals from the PGARCH equation does not have the ARCH type of heteroskedasticity.

RESULTS AND DISCUSSION

Monday Effect

Estimated PGARCH coefficient and probability value for Monday returns are presented in Table 3

From the Table 3, ARCH term (α_i) estimates Monday returns only in pharma significant at five percent level and FMCG sector was significant at ten percent level. That means there is an autoregressive character (Monday weekly effect) in Pharma and FMCG sectors and the future is influenced by the past movement of returns. Asymmetric term (γ_i) is significant in pharma sector on Monday returns, that means there is leverage effect only in Pharma on Monday. The garch term (β_j) is significant in auto and pharma sector returns at 1 percent level, so, AUTO and Pharma sectors has strong volatility clustering on Mondays.

Table 3
Monday Effect on BSE Sectors

Variable	*Statistics*	*Arch Term* (α_j)	*Asymmetric Term* (γ_j)	*Garch Term* (β_j)	*Power Term* (D)
AUTO_SECTOR	coefficient	-0.06933	0.541420	-0.600944	0.087247
	(prob.)	(0.2129)	(0.2576)	(0.0003) *	(0.7883)
BANKING_SECTOR	Coefficient	-0.01667	-0.409005	-0.231726	2.993944
	(prob.)	(0.5726)	(0.4776)	(0.7638)	(0.0045) *
FMCG_SECTOR	Coefficient	0.097018	-0.421393	0.408010	0.612407
	(prob.)	(0.06) **	(0.2801)	(0.1236)	(0.2671)
IT_SECTOR	Coefficient	0.000000	-0.042297	0.281235	18.05160
	(prob.)	(0.9857)	(0.7258)	(0.8249)	(0.7835)
MEDIA_SECOR	Coefficient	-0.02409	-0.064790	0.417686	2.217811
	(prob.)	(0.7083)	(0.8863)	(0.5272)	(0.2840)
PHARMA_SECTOR	Coefficient	0.085577	-0.083433	0.943092	14.84892
	(prob.)	(0.052) *	(0.0517) *	(0.0000) *	(0.033) **

Source: (Authors' Calculation) note: *p<0.01, **p<0.1

The power term (d) significance in Banking and Pharma sector is at five percent significant level, other sectors are not significant.

The estimated coefficients of the ARCH-LM Test and its p values are presented in Table 4.

Table 4
ARCH-LM Test
Monday Effect

VARIABLE	*R-squared*	*Prob.*
AUTO_SECTOR	0.005322	0.9184
BANKING_SECTOR	0.460994	0.4972
FMGC_SECTOR	0.180153	0.6712
IT_SECTOR	0.491813	0.4831
MEDIA_SECOR	0.092885	0.7605
PHARMA_SECTOR	0.355134	0.5512

Source: (Authors' Calculation)

From the Table 4, the observed r-squared (coefficient value) is not significant at five percent level. So, we reject the null hypothesis which means that the sectorial return on Monday doesn't have any heteroskedasticity in the residual value of PGARCH estimations. So, this model is fit for the valuation of GARCH estimation on Monday effect.

Tuesday Effect

Estimated PGARCH coefficient and probability value for Tuesday returns are presented in Table 5

Table 5
Tuesday Effect on BSE Sectors

Variable	*Statistics*	*Arch Term* (α_i)	*Asymmetric Term* (γ_i)	*Garch Term* (β_i)	*Power Term* (D)
AUTO_SECTOR	coefficient	0.245430	-0.008367	0.537517	0.495208
	(prob.)	(0.0002) *	(0.9464)	(0.0000) *	(0.1409)
BANKING_SECTOR	Coefficient	0.075554	0.802324	0.916118	0.406749
	(prob.)	(0.0004) *	(0.0000) *	(0.0000) *	(0.2256)
FMCG_SECTOR	Coefficient	0.088965	0.999993	0.696365	0.436827
	(prob.)	(0.0000) *	(0.0000) *	(0.0000) *	(0.000) *
IT_SECTOR	Coefficient	0.000360	0.071625	0.178829	13.16390
	(prob.)	(0.8893)	(0.4078)	(0.5576)	(0.2708)
MEDIA_SECOR	Coefficient	0.084497	1.000000	0.592760	1.009526
	(prob.)	(0.013) *	(0.0000) *	(0.0004) *	(0.1906)
PHARMA_SECTOR	Coefficient	-0.010979	-0.380431	0.257509	3.055867
	(prob.)	(0.8213)	(0.7113)	(0.7492)	(0.4387)

Source: (Authors' Calculation) note: *p<0.01

From the table 5, ARCH term (α_i) estimates the Tuesday returns to be significant at five percent level in four sectors, AUTO, Banking, FMCG and Media sector and remaining two sectors are not significant. That means there was an autoregressive character (Tuesday effect) in those sectors and the future is influenced by the past movements of returns. Asymmetric term (γ_i) is significant in Banking, FMCG and Media returns at one percent level, that means there is a leverage effect on Tuesday, all the days have positive returns, and therefore it leads to negative innovation in the next period of return. The GARCH term (β_i) is significant on AUTO, Banking, FMCG and Media sectorial returns at 1 percent level, so, these sectors are having strong volatility clustering on Tuesdays. The power term (d) only significance in FMCG sector and the value is less than 0.43 at five percent significance level, other sectors are not significant.

The estimated coefficients of the ARCH-LM Test and its p values are presented in Table 6

Table 6
ARCH-LM Test

	Tuesday Effect	
VARIABLE	*R-squared*	*Prob.*
AUTO_SECTOR	0.008483	0.9266
BANKING_SECTOR	0.144537	0.7038
FMGC_SECTOR	0.559424	0.4545
IT_SECTOR	0.004698	0.9454
MEDIA_SECOR	0.051024	0.5213
PHARMA_SECTOR	0.031011	0.8602

Source: (Authors' Calculation)

From the Table 6, the observed r-squared (coefficient value) is not significant at five percent level. Therefore, we reject the null hypothesis which implies that the sectorial returns on Tuesdays doesn't have

any heteroskedasticity in the residual value of PGARCH estimations. So, this model is fit for the valuation of GARCH estimation on Tuesday effect.

Wednesday effect

Estimated PGARCH coefficient and probability value for Wednesday returns are presented in Table 7

Table 7
Wednesday Effect on BSE Sectors

Variable	*Statistics*	*Arch Term* (α_i)	*Asymmetric Term* (γ_i)	*Garch Term* (β_j)	*Power Term* (D)
AUTO_SECTOR	coefficient	0.341447	0.527018	0.583958	0.002895
	(prob.)	(0.1380)	(0.1013)	(0.0040) *	(0.9929)
BANKING_SECTOR	Coefficient	0.110353	0.786816	0.592334	0.256231
	(prob.)	(0.03) **	(0.0000) *	(0.0000) *	(0.4114)
FMCG_SECTOR	Coefficient	-0.03298	-0.703293	0.337313	0.322885
	(prob.)	(0.5330)	(0.4440)	(0.6804)	(0.7574)
IT_SECTOR	Coefficient	-0.00327	0.174579	0.240395	3.802863
	(prob.)	(0.9501)	(0.8939)	(0.9566)	(0.8125)
MEDIA_SECOR	Coefficient	0.057076	0.072297	-0.032977	7.276980
	(prob.)	(0.7490)	(0.5157)	(0.8148)	(0.4552)
PHARMA_SECTOR	Coefficient	0.067494	-0.407835	0.551459	0.022145
	(prob.)	(0.1610)	(0.3419)	(0.0067) *	(0.9576)

Source: (Authors' Calculation) note: *p<0.01, **p<0.05

From the Table 7, ARCH term (α_i) estimates that Wednesday returns were significant at five percent level in Banking sector and other sectors are not significant. That means there was an autoregressive character (Wednesday effect) in Banking sector and the future is influenced by the past movement of returns. Asymmetric term (γ_i) is significant on banking at one percent level, that means there is a leverage effect on Wednesday. Also, positive returns indicate that it leads to negative innovation in the next period of return. The GARCH term (β_j) is significant in AUTO, Banking, Pharma sector returns at 1 percent level, so, these sectors are having strong volatility clustering on Wednesday. The power term (d) is not significant in any sectors, even at 10 percent significance level.

The estimated coefficients of the ARCH-LM Test and its p values are presented in Table 8.

Table 8
Arch-LM Test

	Wednesday Effect	
VARIABLE	*R-squared*	*Prob.*
AUTO_SECTOR	0.017522	0.8947
BANKING_SECTOR	0.226039	0.6345
FMGC_SECTOR	0.000004	0.9949
IT_SECTOR	0.007304	0.8888
MEDIA_SECOR	0.058341	0.8091
PHARMA_SECTOR	0.888478	0.3459

Source: (Authors' Calculation)

From the Table 8, the observed r-squared (coefficient value) is not significant at five percent level. So, we reject the null hypothesis which means that the sectorial return on Wednesday doesn't have any heteroskedasticity in the residual value of PGARCH estimations. So, this model is fit for the evaluation of GARCH estimation on Wednesday effect.

Thursday Effect

Estimated PGARCH coefficient and probability value for Thursday returns are presented in Table 9

Table 9
Thursday Effect on BSE Sectors

Variable	*Statistics*	*Arch Term* (α_i)	*Asymmetric Term* (γ_i)	*Garch Term* (β_i)	*Power Term* (D)
AUTO_SECTOR	coefficient	0.064664	-0.256519	0.722665	1.776856
	(prob.)	(0.2705)	(0.4457)	(0.0004) *	(0.4519)
BANKING_SECTOR	Coefficient	0.227950	-0.257691	0.271179	1.355896
	(prob.)	(0.007) *	(0.1929)	(0.2056)	(0.08) **
FMCG_SECTOR	Coefficient	0.002347	0.016750	0.775293	7.487394
	(prob.)	(0.8489)	(0.8609)	(0.0000) *	(0.3111)
IT_SECTOR	Coefficient	0.000206	-0.436051	0.945848	7.977263
	(prob.)	(0.8537)	(0.0189)	(0.0000) *	(0.1853)
MEDIA_SECOR	Coefficient	-0.01026	0.033926	-0.107255	2.723373
	(prob.)	(0.9096)	(0.9827)	(0.9758)	(0.8357)
PHARMA_SECTOR	Coefficient	-0.01752	0.563187	-0.644492	2.545821
	(prob.)	(0.7834)	(0.7675)	(0.0052) *	(0.0612)

Source: (Authors' Calculation) note: *p<0.01, **p<0.1

From the Table 9, arch term (α_i) estimates that Thursday returns were significant at one percent level in Banking sector and other sectors are not significant. That means there was an autoregressive character (Thursday effect) in Banking sector and the future is influenced by the past movement of returns. Asymmetric term (γ_i) is not significant in any sectors even at one percentage level, that means there is no leverage effect on Thursday. The GARCH term (β_i) is significant in AUTO, FMCG, IT and Pharma sector return at 1 percent level, so, these sectors are having strong volatility clustering on Thursday. The power term (d) is significant in Banking sectors at 10 percent significance level. That means instead of taking squared value, taking 1.35 gives exact a value for the returns.

The estimated coefficients of the ARCH-LM Test and its p values are presented in Table 10.

Table 10
ARCH-LM Test

	Thursday Effect	
VARIABLE	*R-squared*	*Prob.*
AUTO_SECTOR	0.103244	0.7473
BANKING_SECTOR	0.196856	0.6573
FMGC_SECTOR	3.102545	0.0782
IT_SECTOR	0.378129	0.5386
MEDIA_SECOR	0.007505	0.9310
PHARMA_SECTOR	0.981260	0.3232

Source: (Authors' Calculation)

From the Table 10, the observed r-squared (coefficient value) is not significant at five percent level. So, we reject the null hypothesis which means that the sectorial return on Thursday doesn't have any heteroskedasticity in the residual value of PGARCH estimations. So, this model is fit for the evaluation of GARCH estimation on Thursday effect.

Friday Effect

Estimated PGARCH coefficient and probability value for Friday returns are presented in Table 11

Table 11
Monday Effect on BSE Sectors

Variable	*Statistics*	*Arch Term* (α_i)	*Asymmetric Term* (γ_i)	*Garch Term* (β_i)	*Power Term* (D)
AUTO_SECTOR	coefficient	0.018289	0.987359	0.922762	0.881004
	(prob.)	(0.4954)	(0.4045)	(0.0000) *	(0.5502)
BANKING_SECTOR	Coefficient	0.024815	0.989501	0.992204	0.565804
	(prob.)	(0.04) **	(0.0000) *	(0.0000) *	(0.2515)
FMCG_SECTOR	Coefficient	-0.06237	-0.845776	0.853277	1.217868
	(prob.)	(0.2724)	(0.2508)	(0.0000) *	(0.1236)
IT_SECTOR	Coefficient	-0.06754	0.336887	0.835598	0.892699
	(prob.)	(0.002) *	(0.2105)	(0.0000) *	(0.010) *
MEDIA_SECOR	Coefficient	-0.03600	-0.973012	0.839504	0.735538
	(prob.)	(0.1997)	(0.0829)	(0.0000) *	(0.5416)
PHARMA_SECTOR	Coefficient	0.025437	-0.872580	-0.247175	2.758402
	(prob.)	(0.9784)	(0.9723)	(0.4010)	(0.1813)

Source: (Authors' Calculation) note: **p<0.05 *p<0.01.

From the Table 11, ARCH term (α_i) estimates that Friday returns were significant at five percent level in Banking sector and IT sector at one percent level significant, other sectors are not significant. That means there was an autoregressive character (Friday effect) in Banking sector and it sector, the future is influenced by the past movement of returns. Asymmetric term (γ_i) is significant on banking at 1 percent level, that means there is a leverage effect on Fridays. Also, positive returns lead to negative innovation in the next period of return. The GARCH term (β_i) is significant on all the sectors other than Pharma sector returns at one percent level, so, these sectors are having strong volatility clustering on Friday. The power term (d) is only significant in IT sectors at 1 percent significance level.

The estimated coefficients of the ARCH-LM Test and its p values are presented in Table 12.

Table 12
Arch-LM Test

	Friday Effect	
VARIABLE	*R-squared*	*Prob.*
AUTO_SECTOR	0.238911	0.6250
BANKING_SECTOR	0.020411	0.8864
FMGC_SECTOR	0.319233	0.5721
IT_SECTOR	0.083009	0.7733
MEDIA_SECOR	0.021509	0.8834
PHARMA_SECTOR	0.443358	0.5055

Source: (Authors' Calculation)

From the Table 12, the observed r-squared (coefficient value) is not significant at five percent level. So, we reject the null hypothesis which means that the sectorial return on Friday doesn't have any heteroskedasticity in the residual value of PGARCH estimations. So, this model is fit for the evaluation of GARCH estimation on Friday effect.

CONCLUSION

This paper examines the days-of-the-week anomaly effect and volatility on returns of Bombay Stock Exchange sectoral index. PGARCH model was applied for investigating the daily anomalies in sectorial index returns for the period from April 2010 to September 2017. This study found out that there are daily effects and volatility in BSE sectoral indices. The descriptive statistics of the data indicates that Banking sectors have a high value of standard deviation which implies that there is high volatility and the time series data is also not normally distributed. And among all the sectors, the AUTO sector has the maximum mean return value whereas the bottom-most return has been found to be in the IT sector. The data which was used for the study was found to be stationary. The ARCH term expresses the days-of-the-week anomaly consequence on the sectoral indices. Monday effect was observed in Pharma sectors, Tuesday effect was found in FMCG sectors, and it was found that there are no specific sectors with a Wednesday effect. Whereas in Banking and IT sectors, anomalies effect has been observed to be present on Thursdays and Fridays respectively. There is leverage effect on Tuesdays in both banking and FMCG sectors. There is volatility clustering effect strongly found on Fridays in all the sectors other than pharma sectors.

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