

IS THERE ANY MIRACLE ON MONDAY!
DAY OF THE WEEK EFFECT IN NSE (CNX NIFTY)
INDEX; EVIDENCE FROM GARCH (1, 1) MODEL

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ABSTRACT

This study examines the existence of the day of the week effect in NSE (CNX NIFTY) index of Indian stock market by using ARCH/GARCH analysis. The study covering the period from 1st April 2005 to 31st March 2015, which is consist of ten years. The data has been tested by different statistical tools namely; Graphical analysis, Correlogram, unit root test, ordinary least square regression, GARCH (1,1) and so on. The study evidence that Monday, and Wednesday are provided high return than other days of the week. The empirical findings of the ARCH/GARCH(1,1) model showed that NSE (CNX NIFTY) index have Monday effect for the study period. However, other trading days of the week coefficient is negative except Monday and Wednesday. The Monday provides the highest return than other trading days of the week at 1 per cent significant of the p-value.

Keywords: NSE (CNX NIFTY), Monday effect, OLS Regression, ARCH/GARCH(1,1)

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INTRODUCTION

An investor can invest their money in stock market and earns a profit on investment. The stock market plays a crucial role for the investors as well as for the researcher and academicians. Hence, this study focused on calendar anomalies in NSE (CNX NIFTY) index, especially for day of the week effect. Stock markets exclusively depend upon on sentiment i.e., calendar anomalies. We may define calendar anomaly is a particular period that affect the stock market positively. It may produce the abnormal return for specific time. There are a number of anomalies exist in the stock market namely, Day of the week effect or week end effect, Turn of month effect, January effect, Holiday effect and so on. According to Al-loughani *et al.*, “an anomaly is an incident that cannot be explained by a prevailing theory”. When anomalies exist in the stock market, it's ignoring the weak form of an efficient market hypothesis. In the words of Fama, an efficient market is defined as “a market where there are a large number of rational profit maximisers, actively competing with each trying to predict the future market and where the current information is almost freely and equally available to all participants”. The weak form of the efficient market hypothesis is popularly known as the Random Walk Theory. The weak form holds the view that the current prices of stocks fully reflect all the information which is contained in the historical sequences of prices Natarajan L (2013). EMH elicits that, the daily returns of the stock market are identical for all the days of the week, a month of the year and so on. But many of the studies contradict the EMH namely; The Monday – Friday set for all the indices has the highest positive deviation thereby indicating the presence of an opportunity to make a consistent abnormal return through a trading strategies of buying on Monday and selling on Fridays S N Sarma (2004). The positive Monday and Wednesday effects in the NSE-Nifty and BSE-SENSEX market returns. The average return on Monday is significantly higher than the average return of Wednesday in the NSE-Nifty and BSE-SENSEX markets. As a result of the existence of day-of-the-week effects, their study suggested that the Indian stock markets are weak-form inefficient. This signifies that there exists an opportunity to the traders for predicting the future prices and earning abnormal profits in the Indian stock markets through day-of-the-week anomalies Srinivasan P. and Kalaivani M. (2013).

A study of stock market price behaviour is very quiet and interest to the all the investors and market participants. In India, there are two top most stock market exchanges exists namely, BSE and NSE. For studying the day of the week effect, NSE CNX Nifty index has been chosen.

The National Stock Exchange (NSE) is India's leading stock exchange covering various cities and towns across the country. NSE was set up by leading institutions to provide a modern, fully automated screen-based trading system with national reach. Its offering index known as the CNX Nifty is the flagship index on the National Stock Exchange of India Ltd. (NSE). The Index tracks the behavior of a portfolio of blue chip companies, the largest and most liquid Indian securities. It includes 50 of the approximately 1600 companies listed on the NSE, captures approximately 65 per cent of its float-adjusted market capitalization and is a true reflection of the Indian stock market. The CNX Nifty covers major sectors of the Indian economy and offers investment managers exposure to the Indian market in one efficient portfolio. The Index has been trading since April 1996 and is well suited for benchmarking, index funds and index-based derivatives. The CNX Nifty is owned and managed by India Index Services and Products Ltd. (IISL). IISL is India's first specialized company focused on an index as a core product. (www.nseindia.com).

STATEMENT OF THE PROBLEM

In the modern world, there are wide areas availed for investment, namely Bank Deposits, Mutual Fund, Real Estates, Share Market and so on. Investment may be short term or Long term. Short-term investments like Bank Deposits, Postal savings are having low risk. On the other hand, long-term investment involves high risk and high return. Especially share market involves high risk as well as high return.

Basically, stock market price reflects the relevant information about the market. Therefore, the investors are unable to follow the market prices hence, investors can't earn any abnormal returns but investors can earn a normal return, sometimes may get the loss. In order to earn an abnormal return, the investors have to understand the certain anomalies to exist in the stock market.

OBJECTIVES OF THE STUDY

The overall objective of the study is to examine the existence of Day of the week effect in NSE (CNX NIFTY) index in India. The following are specific objectives they are

1. to identify the descriptive statistics for NSE (CNX NIFTY) index for the day of the week; and
2. to identify whether markets follow a normal distribution and examine whether return series is stationary or not.

HYPOTHESES

1. Return series is normally distributed.
2. There is no stationarity in the returns of the NSE (CNX NIFTY) index.
3. The average daily returns are statistically equal across the trading days.

REVIEW OF LITERATURE

Nageswari P and Selvam M (2011), their study found that the BSE Sensex index earned a maximum daily mean return of 0.1179 on Wednesday, and negative mean return recorded on Monday during the study period. Therefore, it is suggested that the investors would yield good returns on Wednesday. The Kruskal-Wallis Test Statistic value was lower than the Table Value, which clearly indicate that day of the week pattern did not appear to exist for BSE Sensex Index.

Nikunj R Patelet *al.*, (2012), states that In BSE, the maximum average return is on Wednesday with highest standard deviation on Monday. The BSE is the only market which has given average positive returns on all days among Asian Markets. The return distributions in all market were not normally distributed.

Asif Sanaullahet *al.*, (2012), the empirical findings showed that that coefficient of t-value is 0.528238829 and coefficient of p-value are 0.115498574 which are less than 2.0 so we may conclude that weekend effect does not exist and the market is said to be efficient. Anomaly in the form of weekend effect is no more existing phenomena for equity market of Karachi. Investors in this equity market cannot get abnormal returns on trading in week days which means that information reflects prices of the stock.

Allan Muchemi Kuria and George KamauRiro (2013), they found that the mean returns for Monday are negative and for all other days mean returns are positive. It is also evident that only positive returns on Thursdays are statistically significant at 1 per cent significance levels for the NSE-20 indices thus our analyses. So we can say that significant day of the week effect observed in NSE stock returns. We thus accept the alternative hypothesis, which stated that the average return of NSE of every working day of the week is statistically different.

Neeraj Amarnani and Parth Vaidya (2014), Monday gives average return (-0.060 per cent). Monday is lowest as compared to coefficients of dummy variables. All dummy variable coefficients are positive and almost none of them are statistically significant. Day of the week

effect is found in Nifty. But Monday returns are not significantly less as compared to other weekday returns.

Archana Set *al.*, (2014), the weekend effect describes the tendency of stock prices to decrease on Mondays, meaning that closing prices on Monday are lower than closing prices on the previous Friday. For some unknown reason, returns on Mondays have been consistently lower than every other day of the week. In fact, Monday is the only weekday with a negative average rate of return.

Shilpa Lodha and Soral G (2015), the study investigated day of the week effects in Indian stock markets. The empirical analysis of GARCH (p, q) model showed that similar to SENSEX, Monday has been emerged to be significant for all indices of BSE except for BSE Power and Realty. Returns for Monday are significant at 1 per cent level of significance with the exception of being significant for FMCG and Oilgas at 5 per cent level and for IT and Metal at 10 per cent level. The most of the indices are having the day-of-the-week effect on Monday, only BSE-CD (Consumer Durables) and CG (Capital Goods) are showed significant returnson days other than Monday.

A number of studies have been carried out for calendar anomalies especially for the day of the week effect and also used only closing price as data for the study. Only a few studies used average share price for the study. None of the studies carried out for NSE (CNX NIFTY) index for the current year by using GARCH (1,1) model in order fill up this gap this study carried out.

METHODOLOGY

DATA

The data collectedfor this empirical study are daily open, high, low and closing prices of NSE (CNX NIFTY) index of National Stock Exchange. It is a benchmark index of NSE; it consists of fifty companies stock. Instead of using closing price itself the researcher used the average of these four prices. According to Shilpa Lodha *et al.*, Majority of prior researchers have used only closing prices as if trading is done only at closing price, rather the average of these four prices can yield better results as it can control volatility up to some extent. All the data has been collected from the official website of National Stock Exchange i.e., www.nseindia.com. The sample included from 1stApril 2005 to 31stMarch 2015, which is consist of 10 years.

Tools and Techniques Used This Study

(a) Return Calculation

The daily returns are calculated as follow;

$$R_t = \text{LN} (P_t/P_{t-1}) * 100$$

Where: R_t = Return of the day 't'

LN = Natural Logarithm

P_t = closing price of the day and

P_{t-1} = closing price of the day ($t-1$)

(b) Unit Root Test

The Augmented Dickey-Fuller (ADF) was used to test the stationarity of time-series data of NSE NIFTY index.

(c) Descriptive Statistics

It consists of Mean, Maximum, Minimum, Standard Deviation, Skewness, Kurtosis, Jarque-Bera Test and so on.

(d) Regression Equation

For investigating the day of the week effect the researcher used the following regression equation including a constant term is Monday. For remaining days dummy variables were included, suggested by Shilpa Lodha *et al.*,

$$Y_t = \alpha_1 + \alpha_2 D_{Tue} + \alpha_3 D_{Wed} + \alpha_4 D_{Thu} + \alpha_5 D_{Fri} + \epsilon_1$$

Where

Y_t represents log return on the market index

α_1 to α_5 represent the mean returns for Monday through Friday

D_{Tue} to D_{Fri} represent the dummy variables taken for Tuesday to Friday (so

that

$D_{Tue} = 1$ if day is Tuesday, zero otherwise and so on)

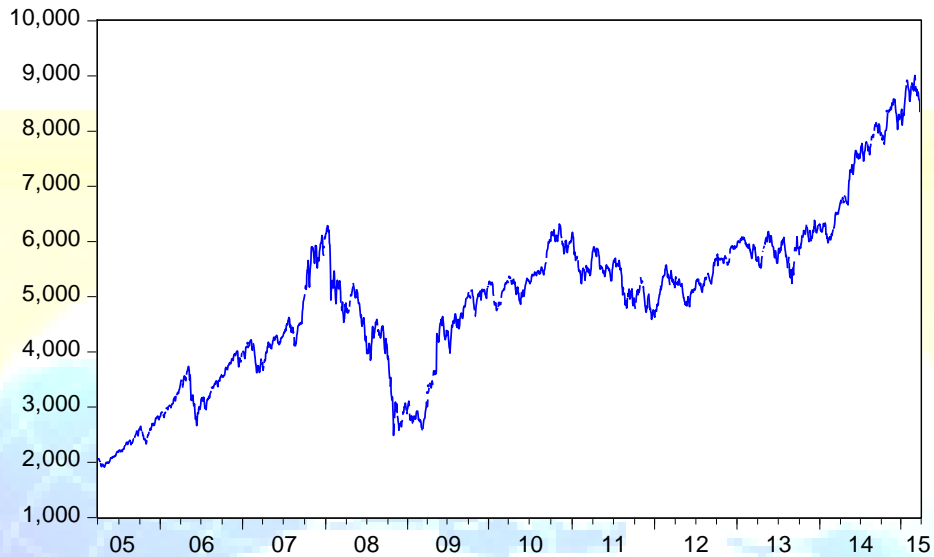
ϵ_1 is an error or residual term

DATA ANALYSIS AND INTERPRETATION

STATIONARY ANALYSIS

Figure 1: NSE (CNX NIFTY) average analysis

AVERAGE



Computed from Eviews -7

Table 1: Correlogram of NSE (CNX NIFTY) Original Series

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
*****	*****	1	0.997	0.997	2459.5	0.000
*****	*	2	0.994	-0.094	4905.1	0.000
*****		3	0.991	0.016	7337.3	0.000
*****		4	0.989	-0.005	9755.8	0.000
*****		5	0.986	-0.009	12161.	0.000
*****		6	0.983	0.007	14552.	0.000
*****		7	0.980	-0.001	16930.	0.000
*****		8	0.977	-0.010	19294.	0.000
*****		9	0.973	-0.024	21645.	0.000
*****		10	0.970	-0.012	23980.	0.000
*****		11	0.967	-0.001	26302.	0.000
*****		12	0.964	0.014	28609.	0.000
*****		13	0.961	-0.018	30902.	0.000
*****		14	0.958	-0.010	33181.	0.000
*****		15	0.954	-0.010	35445.	0.000
*****		16	0.951	-0.011	37694.	0.000

*****			17	0.947	-0.017	39927.	0.000
*****			18	0.944	-0.027	42145.	0.000
*****			19	0.940	-0.010	44346.	0.000
*****			20	0.937	0.010	46532.	0.000
*****			21	0.933	0.011	48702.	0.000
*****			22	0.930	0.030	50858.	0.000
*****			23	0.927	0.006	52999.	0.000
*****			24	0.923	-0.006	55126.	0.000
*****			25	0.920	0.005	57238.	0.000
*****			26	0.917	-0.007	59336.	0.000
*****			27	0.913	-0.003	61420.	0.000
*****			28	0.910	0.006	63490.	0.000
*****			29	0.907	0.003	65546.	0.000
*****			30	0.904	-0.001	67588.	0.000
*****			31	0.900	0.012	69616.	0.000
*****			32	0.897	0.012	71631.	0.000
*****			33	0.894	0.002	73634.	0.000
*****			34	0.891	0.005	75624.	0.000
*****			35	0.888	-0.010	77600.	0.000
*****			36	0.885	-0.006	79564.	0.000

Source: Computed from Eviews -7

Table 2: Results of ADF Test for NSE (CNX NIFTY)Original Series

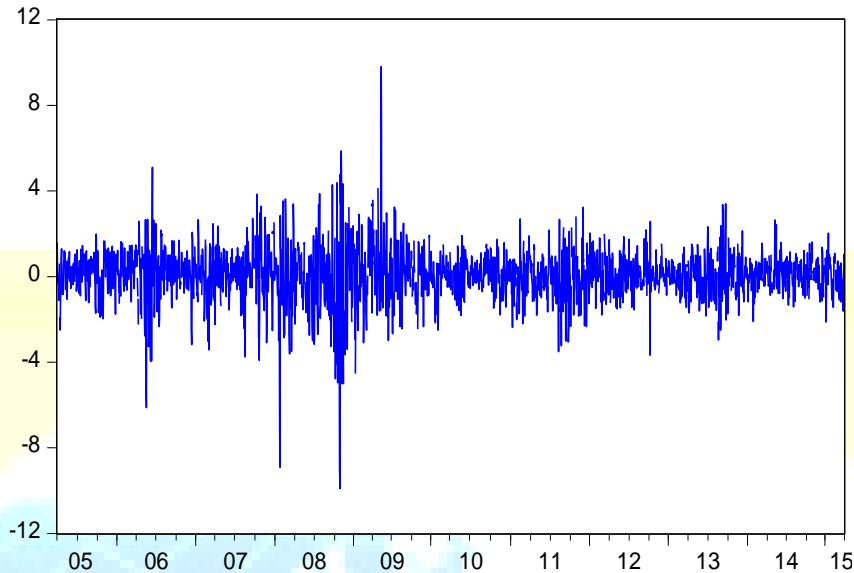
Index	Type	t-value	Critical Values		
			1%	5%	10%
SENSEX	Intercept	-0.772890	-3.432808	--2.862512	-2.567332
	Intercept and Trend	-2.069027	-3.961766	-3.411630	-3.127687
	None	1.539202	-2.565900	-1.940952	-1.616613

Source: Computed from Eviews -7

The stationary analysis is necessary for times series data. In order to test stationarity, there are three methods used namely graphical analysis, Correlogram and Unit root test. The figure 1 graphical analysis is shown for NSE (CNX NIFTY) average share price. It indicates that the average share price is non-stationarity because it's continuously changing in the line graph. The table 2 exhibits that Correlogram of NSE (CNX NIFTY) average share price, the Auto Correlation function is not dropped suddenly from first lag to last lag of Correlogram. It is evident that the data is non-stationarity in nature. Afterward, Unit root test was applied to detect the non-stationarity of NSE (CNX NIFTY) average share price. Many of the researchers used the unit root test for confirming the stationarity. The Augmented Dickey-Fuller test was used and it's presented in Table 2. It revealed that the entire test statistics are more than their critical values. It is also evident that the data is non-stationarity in nature.

Figure 2: NSE (CNX NIFTY) return analysis

RETURN



Source: Computed from Eviews -7

Table 3: Correlogram of NSE (CNX NIFTY) return Series

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
***	***	1	0.396	0.396	386.87	0.000
	*	2	-0.010	-0.198	387.14	0.000
		3	-0.030	0.065	389.41	0.000
		4	-0.036	-0.062	392.64	0.000
		5	-0.043	-0.009	397.18	0.000
		6	-0.034	-0.020	400.02	0.000
		7	0.037	0.066	403.48	0.000
		8	0.054	0.004	410.78	0.000
		9	0.033	0.017	413.42	0.000
		10	0.010	-0.006	413.68	0.000
		11	-0.012	-0.011	414.05	0.000
		12	0.003	0.022	414.08	0.000
		13	0.054	0.057	421.29	0.000
		14	0.073	0.034	434.65	0.000
		15	0.026	-0.016	436.29	0.000
		16	0.025	0.039	437.88	0.000
		17	0.057	0.040	445.88	0.000
		18	0.002	-0.038	445.89	0.000
		19	-0.051	-0.024	452.31	0.000
*		20	-0.068	-0.045	463.72	0.000
		21	-0.056	-0.026	471.41	0.000

				22	-0.025	-0.004	472.93	0.000
				23	-0.008	-0.009	473.11	0.000
				24	0.014	0.010	473.59	0.000
				25	0.044	0.030	478.37	0.000
				26	0.039	0.004	482.07	0.000
				27	0.014	0.001	482.58	0.000
				28	-0.006	-0.003	482.68	0.000
				29	-0.018	-0.010	483.49	0.000
				30	-0.027	-0.023	485.37	0.000
				31	-0.027	-0.013	487.24	0.000
				32	-0.021	-0.008	488.38	0.000
				33	0.011	0.027	488.69	0.000
				34	0.022	0.004	489.87	0.000
				35	-0.036	-0.051	493.18	0.000
				36	-0.024	0.029	494.58	0.000

Source: Computed from Eviews -7

Table 4: Results of ADF Test for NSE (CNX NIFTY)Return Series

Index	Type	t-value	Critical Values		
			1%	5%	10%
CNX NIFTY	Intercept	-24.42307	-3.432809	-2.862512	-2.567333
	Intercept and Trend	-24.42428	--3.961767	-3.411631	-3.127688
	None	-24.34934	-2.565900	1.940952	-1.616613

Source: Computed from Eviews -7

If any data has non-stationary, the researcher has to make them in stationarity. For this purpose daily returns are calculated for the entire original share price by using this formula $R_t = \text{LN}(P_t/P_{t-1}) * 100$. Subsequently stationarity were applied by using three test of stationary analysis. The figure 2 graphical analysis shown for NSE (CNX NIFTY) return series. It indicates that constant mean. The table 3 exhibits that Correlogram of NSE (CNX NIFTY) returns series, the Auto Correlation function suddenly fall from 0.396 to -0.010 when the lag length increased. Finally, unit root test of Augmented Dickey-Fuller test was used and it's presented in Table 4. It revealed that the entire test statistics are less than their critical values. The entire three tests are confirming the stationarity of the return series of NSE (CNX NIFTY). Therefore, the null hypothesis of no stationarity is rejected.

ANALYSIS OF DESCRIPTIVE STATISTICS

Table 5

Day-wise Descriptive Statistics for CNX NIFTY Return Series (%)

Descriptive statistics	Monday	Tuesday	Wednesday	Thursday	Friday	All Days
Mean	0.0746	0.0334	0.0797	0.0633	0.0246	0.0552
Median	0.2147	0.1361	0.0892	0.1282	0.0269	0.1164
Maximum	9.8104	7.5945	3.8696	3.6216	5.0975	9.8104
Minimum	-9.9046	-8.9122	-5.0287	-5.0016	-8.9540	-9.9046
Std. Dev.	1.4529	1.2096	1.0706	1.1026	1.2548	1.2253
Skewness	-0.4448	-0.3574	-0.1242	-0.5592	-0.9530	-0.5184
Kurtosis	12.9317	12.4139	5.2866	6.0724	9.5804	11.0040
Jarque-Bera	2059.05	1849.51	108.90	217.82	960.21	6701.07
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	497	498	494	489	491	2469

Source: Computed from Eviews -7

From the table -5, it is evident that descriptive statistics of the day of the week returns for the NSE CNX NIFTY index. The maximum average or mean return is on Wednesday (0.0797) and followed by Monday (0.0746), Thursday (0.0633) and so on. This indicates that among the days of the week, mean returns for all the trading days were different returns distributions. Therefore, the null hypothesis of daily returns are statistically equal across the trading days rejected. The utmost volatility was found on Monday through the Maximum daily returns (9.8104) and the value of standard deviation of (1.4529). The value of Skewness returns distribution was found to be negative for all days of the week. Its credentials that the trading daily returns distributions are asymmetric on the basis of the value of Kurtosis is greater than 3, it represent Leptokurtic distribution for all the trading days of the week. Moreover, Jarque-Bera test suggests that rejects the null hypothesis of return series is normally distributed at 1 per cent level of significance.

Regression Equation analysis

Table 6
Estimation Results of Equation 1 for CNX NIFTY Return Series
Method: Least Squares
Sample (adjusted): 4/01/2005 3/31/2015

Included observations: 2469 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MON (C)	0.074596	0.054996	1.356385	0.1751
TUESDAY	-0.041147	0.077737	-0.529306	0.5966
WEDNESDAY	0.005104	0.077894	0.065525	0.9478
THURSDAY	-0.011276	0.078094	-0.144389	0.8852
FRIDAY	-0.049955	0.078014	-0.640339	0.5220
R-squared	0.000327	Mean dependent var		0.055150
Adjusted R-squared	-0.001296	S.D. dependent var		1.225262
S.E. of regression	1.226056	Akaike info criterion		3.247505
Sum squared resid	3703.917	Schwarz criterion		3.259274
Log likelihood	-4004.045	Hannan-Quinn criter.		3.251780
F-statistic	0.201212	Durbin-Watson stat		1.208266
Prob(F-statistic)	0.937771			

Source: Computed from Eviews -7

The table – 6 clearly exhibits that, regression equation output for the OLS using dummy variables for CNX NIFTY day of the week effect. Monday and Wednesday regression coefficients are positive and other day's regression coefficient are negative. None of the regression coefficients are statistically significant at the five percent level. The Adjusted R² is negative and also the F-Statistic with a low p-value is also showing the poor fit of the model. Moreover, The D-W statistics is (1.208266), telling of the presence of positive serial correlation because it is less than 2, which showed that existence of serial correlation in the return series. So in order to confirm the serial correlation, Breusch-Godfrey LM Test statistics was applied, the Observed*R-squared is 467.9001 with a 0 p-value and confirmed the serial correlation. Therefore, it is necessary to remove the serial correlation with the help of ARIMA (Auto Regressive integrated Moving Average) model. The AR (1) and MA (1) terms are added in the equation according to Box-Jenkins methodology, then equation run again now the results are changed from the previous value. The D-W statistics is (2.000493), which indicate that no serial correlation either positive or negative. Akaike info criterion and Schwarz criterion statistic are

better after inclusion of AR (1) and MA (1) terms. However, the effects of heteroscedasticity have to be explored, for this purpose ARCH/GARCH analysis used.

Table 7
NSE (CNX NIFTY)Index GARCH (1,1) Regression Results
Method: ML - ARCH
Sample (adjusted): 4/04/2005 3/31/2015
Included observations: 2468 after adjustments

Variable	Coefficient	Std. Error	z-Statistic	Prob.
MON (C)	0.128365	0.036074	3.558417	0.0004
TUESDAY	-0.027569	0.044858	-0.614576	0.5388
WEDNESDAY	0.000574	0.053598	0.010711	0.9915
THURSDAY	-0.037274	0.052900	-0.704607	0.4811
FRIDAY	-0.038415	0.038693	-0.992813	0.3208
AR(1)	-0.004822	0.044737	-0.107795	0.9142
MA(1)	0.471705	0.040816	11.55690	0.0000
Variance Equation				
C	0.023439	0.004948	4.737139	0.0000
RESID(-1)^2	0.132360	0.011293	11.72040	0.0000
GARCH(-1)	0.852272	0.013074	65.18800	0.0000
R-squared	0.194003	Mean dependent var		0.054521
Adjusted R-squared	0.192038	S.D. dependent var		1.225111
S.E. of regression	1.101212	Akaike info criterion		2.704580
Sum squared resid	2984.376	Schwarz criterion		2.728126
Log likelihood	-3327.452	Hannan-Quinn criter.		2.713134
Durbin-Watson stat	1.946869			
Inverted AR Roots	-.00			
Inverted MA Roots	-.47			

Source: Computed from Eviews -7

The table – 7 clearly exhibits that, regression equation output for the GARCH (1,1) using dummy variables for CNX NIFTY day of the week effect. It consists of two parts, the upper part exclusive for mean equation whereas the lower part for variance equation. The sum of the ARCH and GARCH regression coefficients is 0.984632, which indicates that the volatility is persistent. The regression coefficients for the dummy variables representing Monday and Wednesday are positive; The Monday provides the highest return than other trading days of the week at 1 per cent significant of the p-value. However other regression coefficients for the dummy variables

are negative obviously indicate a strong Monday effect. The both ARCH and GARCH term are positive and statistically significant with a Z-statistic of 11.72040, 65.18800 respectively.

CONCLUSION

This study has taken an attempt to examine the existence of Day of the week effect in NSE (CNX NIFTY) index of India. The researcher used descriptive statistics and regression equation GARCH (1,1) model for identifying the day of the week effect. From the descriptive statistics, we found that Monday and Wednesday are provided the maximum mean return. Similarly, Thursday, Tuesday and Friday mean returns are positive but giving the minimum return. The daily mean returns of every trading days are different is evident from this study. The maximum volatility was found on Monday. The empirical findings of the GARCH (1,1) model suggested the regression coefficients for the dummy variables representing Monday and Wednesday are positive; The Monday provides the highest return than other trading days of the week at 1 per cent significant of the p-value. However other regression coefficients for the dummy variables are negative obviously indicate a strong Monday effect. Hence, we conclude that the market is said to be inefficient. The investor can earn an abnormal return by using calendar anomalies.

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