

Analysis of Quarter of Year effect in Indian Stock Market

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Abstract: This paper investigated the quarter of year effect in an Indian stock market. Third quarter was found significant in all quarter except in media, metal and reality sector. Quarter fourth is also found significant in all sectors except FMCG and IT sector. Quarter first and quarter second was significant for IT and FMCG sector respectively. There was no quarter of year effect in Energy Sector. It was observed that quarter third and fourth was significant around all sector with few exception indicating the presence of strong quarter of year effect in the stock market. This study has added more evidence for the Quarter of the year effect in Indian stock market.

Key Words: Stock Market returns, Market efficiency, Seasonality, Dummy variable, GARCH Model, Quarter of year effect.

1. INTRODUCTION:

An anomaly in general means abnormal or unfamiliar happening. Wachters (1942) conjecture that the feeling of good fellowship and cheer associated with this festive occasion may spill into the security market. They are the unexpected or anomalous regularities in security rates of return. However In other words anomalies are observed outcomes different from already existing notions of asset pricing behavior. They designate either market inefficiency or shortfalls in underlying asset pricing model. Stock market anomalies are empirical conclusions that cannot stand described through extensively recognized financial theories. It becomes extremely important to study stock “market anomalies” because that can highly expand the Knowledge of financial markets. In contemporary world several challenges to market efficiency came to existence, few of them are size effect, the weekend effect and momentum effect. All these challenges are known as stock market anomalies and the shortfalls in model for testing market efficiency. “Anomalies” are taken as unfamiliar or unusual event among non-investing groups however for shareholder it is condition where “stock market” performs against the efficient market hypothesis. Every examination of “Market efficiency” is a twofold one one-hand it examines the market efficiency on other hand it also test the expected model of revenue generation. Specific persistence, regular and apparent market inefficiencies are termed as “Anomalies”. Notion of Market efficiency proposes that every security is valued efficiently to fully reflect all the information in security prices. However, calendar effect leads to greater or lesser earnings based on the time series. Conclusively when stock yields exhibits certain empirical regulations which are challenging to describe using already established asset evaluation theories, they are called stock market anomalies. Bonin and Moses (1974) studied the seasonality in US stock market using data of 30 individual stocks and found seasonality in 7 stocks out of total 30. Rozeff and Kinney present (1976) presents evidence on the existence of seasonality in monthly rates of return on the New York Stock Exchange from 1901-1974. With the exception of the 1929-1940 period, there are statistically significant differences in mean returns among months due primarily to large January returns. Dispersion measures reveal no consistent seasonal patterns and the characteristic exponent seems invariant among months. Salmon and Stober (1994) examined cross quarter differences of stock prices in stock market. They used Regression to establish that the fourth quarter returns get less affected by earning announcement as compared to other quarters. They also documented that the results was against the prior research establishing that the fourth quarter effect was more for small firms. Girardin and zhenya (2005) examined seasonality and bank credit anomalies in Chinese stock market. They used time series modeling approach and found presence of quarter of year effect as well as month of year effect in Chinese stock market. Further they found bank credit had significant effect on stock prices. They also found that seasonality occurs as consequence of window dressing by financial and non-financial institution. Gallagher et.al (2007) examined quarter end effect. They used regression and found quarter end effect leads to inflated returns for investors. Further it was also documented that the quarter end effect was at its peak in quarter ending June. Moreover it was also found that this effect was more intense for small firms. The possible explanation given for the phenomena was end of tax year. Huang and Chan (2010) examined the quarter end effect in Taiwan stock exchange. It was found that institutional investor try to influence the stock market in the end of quarter. Further it was found that the introduction of new closing price mechanism had no effect on market efficiency as the seasonality was still there in the stock market. Ortiz et.al (2010) examined quarter of year effect in Spanish stock market. It was found that the returns were normal in first three quarter. However in fourth quarter returns were found significantly higher as compared to other quarter. It was also established that the turn of year effect was stronger in bear market as compared to bull market. Kalayaan (2012) examined the quarter-of-the-year effect in Asian stock market using returns from ten

stock indices for the period of 2001 to 2011. It was found that there was no quarter of year effect in all the indices selected for the study period. However Month of year effect was also confirmed by runs test. Therefore it was Concluded that the seasonal pattern were available and Asian stock market was not informational efficient. Sharma et.al (2017) examined the quarter of year effect in investment pattern of FIIs in India. It was found that the FPI activity is more in fourth quarter.

It is clear from the discussion that many studies in the area on various calendar Anomalies and most of them treat stock market as homogeneous and attempts to find single anomaly for whole stock market. However there was limited attempt to study the quarter of year effect in eleven different sectors. Therefore the study will contribute in the area of Stock market Efficiency by re-examining quarter of year effect in eleven sectors.

2. DATA COLLECTION AND ESTIMATION OF EMPIRICAL MODEL:

Data has been taken for the period of 2004 to 2014 from National Stock Exchange for AUTO, BANKING, ENERGY, FINANCE, FMCG, ITRETURNS, MEDIA, METAL, PHARMA, PSU BANK and REALITY sectors. Quarter of year effect was examined using dummy variables in the model. Where D₁ D₂ D₃ D₄ represents four dummies for four quarters. We have taken all four dummies in the model without Constant term. It is done to deal with problem of Dummy trap and multi-collinearity. The presence of quarter of year effect will confirmed when coefficient of quarter dummy is statistically significant.

$$R_t = \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta R_{t-1} + \epsilon_i \tag{1}$$

R_t is the daily logarithmic return of the index calculated as following:

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

Where R_t will be the return on respective index

P_t = Closing value of Index for day (t)

D₁-D₄ are dummy variable, e is the error term in regression equation it is normally distributed with mean zero. Earlier researcher has used dummy variable ordinary least square regression but that statistical tool gives erroneous results and contains shortcoming of error term being not regular over the long period of time. To overcome this shortcoming Variance is modelled to deal with problem of heteroskedasticity. In 1982 Eagle developed the model to deal with the problem heteroskedasticity which is written as following equation and known as ARCH model.

$$h_t = c + \alpha \epsilon^2_{t-1} + \epsilon_i$$

Later on Bollerslev (1986) comes out with generalized Model of ARCH known as GARCH. In this study we have used GARCH model with mean equation.

$$h^2_t = c + \alpha \epsilon^2_{t-1} + \gamma h^2_{t-1} + \epsilon_i \tag{2}$$

Empirical Results

Table 1 Results of Quarter of year effect in Auto sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.083511	0.050538	1.652446	0.0984
Q2	0.057101	0.052280	1.092203	0.2747
Q3	0.200123	0.049286	4.060439	0.0000
Q4	0.131425	0.052253	2.515164	0.0119
Variance Equation				
C	0.059347	0.008419	7.049089	0.0000
RESID(-1)^2	0.090944	0.007345	12.38223	0.0000
GARCH(-1)	0.886321	0.006099	145.3205	0.0000

Table (1) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of auto sector. Returns from Quarter third (0.20) and quarter fourth (0.13) are found positive and statistically significant at 5 percent level of Significance which means Auto sector stocks does not follow random walk. There exist Quarter of year effect. Returns of January and May are negative. However these returns are not statistically significant. ARCH (0.090) and GARCH (0.88) are positive with probability value zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 2 Results of Quarter of year effect in Banking sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
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Q1	0.022922	0.064982	0.352736	0.7243
Q2	0.087559	0.063972	1.368711	0.1711
Q3	0.200081	0.062517	3.200427	0.0014
Q4	0.169114	0.064633	2.616502	0.0089
Variance Equation				
C	0.060165	0.010728	5.608269	0.0000
RESID(-1)^2	0.081020	0.006563	12.34507	0.0000
GARCH(-1)	0.905935	0.007463	121.3893	0.0000

Table (2) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of banking sector. Returns from the month of Quarter third (0.20) and quarter fourth (0.16) are found positive and statistically significant at 5 percent level of Significance which means Banking sector stock does not follow random walk. There exist Quarter of year effect. ARCH (0.090) and GARCH (0.88) are positive with probability value zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 3 Results of Quarter of year Effect in Energy sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.019580	0.053379	0.366813	0.7138
Q2	0.077884	0.049817	1.563416	0.1180
Q3	0.048733	0.043924	1.109488	0.2672
Q4	0.058693	0.050007	1.173685	0.2405
Variance Equation				
C	0.046350	0.007453	6.219263	0.0000
RESID(-1)^2	0.102799	0.007196	14.28639	0.0000
GARCH(-1)	0.883104	0.007264	121.5725	0.0000

Table (3) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of Energy sector. Returns from the month of all the quarters are found normally distributed. Therefore Quarter of year effect was missing in Energy sector stock for the study period. ARCH (0.102) and GARCH (0.88) are positive with probability value zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 4 Results of Quarter of year Effect in Financial sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.088594	0.057951	1.528788	0.126
Q2	0.112058	0.045463	2.464811	0.014
Q3	0.220655	0.045215	4.880119	0.000
Q4	-1.59366	0.046299	-34.42	0.000
Variance Equation				
C	0.07499	0.011854	6.326278	0.000
RESID(-1)^2	0.413307	0.030443	13.57657	0.000
GARCH(-1)	0.730449	0.013694	53.33993	0.000

Table (4) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of financial sector. Returns from the month of quarter one (0.11), quarter two (0.22), are found positive and statistically significant at 5 percent level of Significance. Returns of quarter fourth (-1.59) are Negative and statistically significant. Therefore it is proved that financial sector stock does not follow random walk. There exist Quarter of year effect. ARCH (0.413) and GARCH (0.730) are positive with probability of zero is summation is more than one indicating the explosive implied variances for Energy Sector. These values also indicates the volatility clustering in financial sector.

Table 5 Results of Quarter of year Effect in FMCG sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.034115	0.044110	0.773419	0.4393
Q2	0.131128	0.041020	3.196690	0.0014
Q3	0.171315	0.044401	3.858330	0.0001
Q4	0.064279	0.045011	1.428064	0.1533
Variance Equation				
C	0.109172	0.012907	8.458206	0.0000
RESID(-1)^2	0.131882	0.008395	15.70902	0.0000
GARCH(-1)	0.809359	0.012241	66.12098	0.0000

Table (5) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of FMCG sector. Returns from the month of quarter 2nd (0.13) and quarter 3rd (0.17), are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that FMCG sector stock does not follow random walk. There exist quarter of year effect. ARCH (0.131) and GARCH (0.809) are positive with probability of zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 6 Results of Quarter of year Effect in IT Sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.183554	0.035496	5.171114	0.0000
Q2	-0.090139	0.058751	-1.534256	0.1250
Q3	0.269943	0.039193	6.887507	0.0000
Q4	0.134936	0.052427	2.573804	0.0101
Variance Equation				
C	-0.047138	0.004841	-9.737965	0.0000
RESID(-1)^2	0.401358	0.021734	18.46669	0.0000
GARCH(-1)	0.838537	0.006871	122.0434	0.0000

Table (6) exhibits the results of equation (1) equation (2) for quarter of year effect in stocks of IT sector. Returns from the month of quarter one (0.183), quarter three (0.26), quarter 4th (0.13) are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that IT sector stocks does not follow random walk. There exist Quarter of year effect. ARCH (0.401) and GARCH (0.838) are positive with probability of zero is summation is more than one indicating the explosive implied variances for IT Sector. These values also indicates the volatility clustering in IT Sector.

Table 7 Results of Quarter of year Effect in Media sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.000122	0.038299	0.003191	0.9975
Q2	0.000380	0.024921	0.015259	0.9878
Q3	-0.001602	0.008991	-0.178213	0.8586
Q4	0.103177	0.003165	32.59698	0.0000
Variance Equation				
C	6.16E-05	9.65E-06	6.389569	0.0000
RESID(-1)^2	0.286419	0.020656	13.86582	0.0000
GARCH(-1)	0.792879	0.010161	78.03199	0.0000

Table (7) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of Media returns sector. Returns from the Quarter 4th (0.103) are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that Media sector stocks does not follow random walk. There exist Quarter of year effect. ARCH (0.286) and GARCH (0.792) are positive with probability of zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 8 Results of Quarter of year Effect in Metal sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	-0.000637	0.078757	-0.008093	0.9935
Q2	-0.045696	0.069309	-0.659316	0.5097
Q3	0.077237	0.075551	1.022311	0.3066
Q4	0.442556	0.053082	8.337276	0.0000
Variance Equation				
C	0.270456	0.033328	8.115054	0.0000
RESID(-1)^2	0.161098	0.013368	12.05088	0.0000
GARCH(-1)	0.804411	0.012969	62.02407	0.0000

Table (8) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of Media returns sector. Returns from the Quarter 4th (0.103) are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that media sector stocks does not follow random walk. There exist Quarter of year effect. ARCH (0.161) and GARCH (0.804) are positive with probability of zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 9 Results of Quarter of year Effect in Pharma sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.021120	0.042128	0.501322	0.6161
Q2	0.116258	0.041067	2.830914	0.0046
Q3	0.114193	0.041643	2.742159	0.0061
Q4	0.108655	0.044250	2.455488	0.0141
Variance Equation				
C	0.064981	0.009865	6.587201	0.0000
RESID(-1)^2	0.106289	0.009058	11.73364	0.0000
GARCH(-1)	0.852800	0.012443	68.53487	0.0000

Table (9) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of Media returns sector. Returns from the Quarter 4th (0.103) are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that Pharma sector stocks does not follow random walk. There exist Quarter of year effect. ARCH (0.106) and GARCH (0.804) are positive with probability of zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 10 Results of Quarter of year Effect in PSU Bank sector using equation(1)and(2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	-0.038233	0.130251	-0.293532	0.7691
Q2	0.064425	0.117568	0.547981	0.5837
Q3	0.323113	0.107148	3.015586	0.0026

Q4	7.706302	0.060772	126.8065	0.0000
Variance Equation				
C	0.055764	0.029681	1.878771	0.0603
RESID(-1)^2	0.368156	0.017370	21.19493	0.0000
GARCH(-1)	0.786037	0.007313	107.4871	0.0000

Table (10) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of PSU bank returns sector. Returns from the Quarter 4th (0.103) are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that PSU bank stocks does not follow random walk. There exist Quarter of year effect. ARCH (0.106) and GARCH (0.804) are positive with probability of zero and summation of both is less than one indicating the absence of negative or explosive implied variances for the specification test. On the other hand, since the summation of these two coefficients is close to one, it indicates that the volatility is persistent.

Table 11 Results of Quarter of year Effect in Reality sector using equation (1) and (2)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Q1	0.000304	0.031627	0.009600	0.9923
Q2	-0.000178	0.062944	-0.002824	0.9977
Q3	0.003681	0.004532	0.812215	0.4167
Q4	0.097619	0.003532	27.63613	0.0000
Variance Equation				
C	0.000107	1.57E-05	6.791791	0.0000
RESID(-1)^2	0.385358	0.019392	19.87176	0.0000
GARCH(-1)	0.731477	0.008620	84.85739	0.0000

Table (11) exhibits the results of equation (1) equation (2) for Quarter of year effect in stocks of Reality sector. Returns from the month of quarter 4th (0.09) are found positive and statistically significant at 5 percent level of Significance. Therefore it is proved that Reality stocks does not follow random walk. There exist quarter of year effect. ARCH (0.53) and GARCH (0.65) are positive with probability of zero is summation is more than one indicating the explosive implied variances for Energy Sector. These values also indicates the volatility clustering in financial sector.

3. CONCLUSION:

Work in the area of calendar anomalies keeps on expending which begins with primary focus on individual stocks trend has changed and researcher started focusing on small and mid-cap stocks. Researcher keeps on exploring new anomalies and keep on expanding the literature of Seasonality. Researchers has been working hard to solve the problem but there are still Gaps in the area which needs to be filled. Paper investigates the quarter of year effect in an Indian stock market. Our results indicate strong quarter of year effects for most of the indices from the National Stock Exchange. Third quarter was found significant in all quarter except in Media, metal and reality sector. Quarter 4th is also found significant in all sectors except FMCG and IT. Quarter First and quarter second was significant for IT and FMCG sector respectively. There was no quarter of Year effect in Energy Sector. It was observed that quarter third and fourth was significant around all sector with few exception indicating the presence of strong quarter of year effect in the stock market. Fund managers used to dump the non performing share every quarter to make the portfolio better. However at last quarter this activity increases to show better performance of funds which leads to window dressing on part of fund managers. This could be the reason of positive and significant earnings in quarter fourth. Third quarter could be positive because of festive effect as most of Indian festival falls in this quarter earnings could be higher for the reason. This study has added more evidence for the Quarter of the year effect in Indian stock market. However there is still a need of further research to understand the further reason behind the phenomena.

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