ANOMALIES IN INDIAN STOCK MARKET – AN EMPIRICAL EVIDENCE FROM SEASONALITY EFFECT ON BSEIT INDEX

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ABSTRACT

Evolution of Efficient Market theory had ushered a significant change in pricing capital asset. Before the development of Efficient market theory by Fama in 1970s, there was no comprehensive theory on pricing of capital assets. Earlier to Fama(1970), various economists like Louis Bacheliar, Alfred Cowles, Holbrook Working etc have discusses about Random walk behaviour of stock price movement, but they could not succeed in providing a comprehensive theory on asset pricing. Fama(1970) had come out with three different forms of Efficient market hypothesis i.e., Weak form, Semi-strong form and Strong form of efficient markets. Weak form of efficient markets asserts that all the published information must be reflected in stock prices, semi-strong form holds that all the available information must be reflected into the stock prices, whereas strong form of efficient markets contends that all the published and unpublished information must be reflected into the stock prices. Though, the weak form and strong form of efficient markets do not have much practical relevance, semi-strong form of efficient markets has its implications on the real life world of financial markets. Semi-strong form of efficient markets postulates that all the investors in the market will discount the published information at the similar level. But real life conditions are quite different, different investors have different levels of understanding of the available information and it leads to estimation of different levels of stock prices by different investors. Anomalies in stock market are the imperfections in discounting the available information by the market participants. In the present study, a modest attempt has been made to examine the anomalies present in the Indian stock market in the form of seasonality effect. The study has considered BSEIT Index as a proxy of Indian Information Technology sector stocks and BSE-Sensex is surrogated for Indian stock market. Period of study is from april, 1999 to march, 2013. The results of the study highlight the fact that the Indian IT Sector was experiencing seasonality effect. The study also concludes that the BSE-Sensex has significant impact on the volatility of Indian IT sector.

Keywords: Seasonality effect, Month effect, Indian IT sector, GARCH analysis.
JEL Classification: G10, G12 and G14

INTRODUCTION:

School of thoughts on capital asset pricing can broadly be divided into four categories. First school of thought is random walk theory which states that movement in stock price is randomly distributed which means there will be no autocorrelation in stock prices. The theoretical extension of random walk model is Efficient market theory which provides a more systematic way of understanding the asset pricing in the context of informational efficiency of the markets. Efficient market theory classifies markets into three categories (i.e., weak form, semi-strong form and strong form) based on the speed of adjustment of stock prices to market information.

Second school of thought is so-called fundamental analysis which asserts that markets price the stocks fairly reflecting the true intrinsic value of the stocks. The fundamental analysts believe that it is the performance of the firm, industry and the economy which influences the stock prices in the market and hence it is very essential to an investor to understand current and future expected performance of the firm, industry and economy on the whole. Put it differently, the fundamental analysts assume that there will be no possibility of imperfections or anomalies in the market. All the investors will have access to the relevant information and their ability to analyse the information is similar.

Third school of thought is technical analysis which purports that the stock prices will follow a trend and this trend can be estimated in advance. Technical analysts by using charts and graphs, estimate the future trend of stock prices and plan their short term investment decisions. Technical analysis give importance to behavioural aspects in financial decision making.

Fourth school of thought is chaotic theory of finance which states that movement of financial markets is too complex to predict. The zigzag nature of stock price behaviour provides a challenge to the investors in predicting the market conditions and hence investors have to apply very advanced methods of stock price prediction incorporating different factors which could otherwise be not possible.

After understanding the central tenets of the four above mentioned theories, a fundamental question would arise that which theory will dominate the market. Past experience clearly provides an evidence that it is waste of time to argue on the dominance of one theory on another rather it is prudent to understand the empirical relevance of all the theories and use them as complementaries to one another in real life financial markets.

STOCK MARKET ANOMALIES:

Semi-strong form of efficient market hypothesis contends that all the publicly available information is reflected in stock prices and hence there is no scope for abnormal returns to an investor. The only way to get more returns is to bear more risk, as there is positive relationship between return and risk. Put it otherwise, an investor cannot expect more return than which can be expected for the given level of risk. However, the empirical findings provide more controversial results of the 'semi-strong' form of market hypothesis. The fundamental question which need to be answered is what cause the real life market situation quite dynamic than what is originally provided in the theory. The researches in this direction have identified many imperfections in the market which can distort the investor in discounting the right information at right time. Such imperfections prevailing in the market are named after as 'stock market anomalies'. The empirical studies discovered many anomalies in the market like size effect, january effect(or tax selling hypothesis),day of the week effect, P/E ratio effect etc.,

In the present study, the market anomalies present in the form of seasonality effect is examined. Seasonality effect can be understood as the impact of month of a year on the stock price behaviour. Seasonally effect implies that all the months in a year do not have similar effect on stock price movement. Put it otherwords, some of the months in a year have more effect on the stock price movement than other months in the same year.

LITERATURE REVIEW:

Proponents of 'semi-strong' efficient market hypothesis argue that the stock prices shall immediately reflect all the publicly available information and hence, it is impossible to beat the market and earn abnormal returns. However, in real life, there are many imperfections present in the stock which cause

distortions in asset pricing. Such plausible situations are called stock market anomalies in the finance theory.

Non-constant variance of stock returns over a time period indicates the presence of time effect on stock returns which can also be called seasonality effect. In econometric analysis, this type of situation is called heteroscedasticity. Studies like Deepak. R et.al., (2012) have examined the heteroskedasticity present in stock returns and it was proved that stock returns are heteroskedastic. Previous studies show that seasonality effect on stock price returns can be examined from different dimensions. Ashish Garg B.S et.al., (2010) have analysed the impact of seasonality effect from five different dimensions like month effect, semi-monthly effect, monthly effect, Monday effect and Friday effect and the study proved the presence of Monday effect on Indian stock market.

It is commonly assumed that developed markets would experience more informational efficiency than developing or underdeveloped markets. An attempt in this regard was made by Ashish Garg B.S et.al., (2010) and results of the study are quite interesting. Both Semi-monthly and turn of the month effect was found in both developing and developed markets whereas month effect was not present in any of the two markets and hence, it can be inferred that the degree of seasonality effect was more or less the same irrespective of level of development of the markets.

It is also worthwhile to see the impact of market crashes on the seasonality effect of stock returns. Interplay between month of the year effect and market crash effect was studied by Mihir Dash et. al., (2011) and the study concludes that seasonality effect was reduced due to market crashes. Seasonality effect can also be examined by observing holiday effect on stock returns. How the stocks prices will react immediately before and after holidays is examined by various authors.

January effect or Tax selling hypothesis contends that investor sell their loss making stock in the last week of December and repurchase them in the first week of January to show the loss and consequently reduce the taxable income. January effect in China, Brazil, Shanghai, India, Argentina and Turkey was examined by Sevinc Guler (2013) and results of the study concludes that January effect was present on the stock markets of China, Argentina and turkey. The other dimension of time effect is 'day of the week effect' on stock returns. 'Day of the week effect' on Indian stock market was examined by P. Nageswari et.al.,(2011) and results are in favour of Efficient Market Hypothesis indicating that week effect pattern was absent in the Indian Stock market.

Sectoral analysis of 'day of the week effect' can provide an insight into the differences in seasonality effect across different sectors. First attempt in this direction was made in the Indian context by P. Srilath et.al.(2012) and results of the study provides that different sectors have experienced 'day of the week effect' on different ways. Banking sector stocks were influenced by Monday and Friday; FMCG sector stocks were influenced by only Friday; IT sector stocks are influenced by Thursday and Pharma Sector stocks were influenced by Monday, Wednesday and Friday. Impact of weekend effect was analyzed by Potharla Srikanth et.al.,(2013) and results of the study discloses the fact that stocks of Banking sector, FMCG and Pharma were experiencing weekend effect but the same was not true in the case of IT sector.

Being India is a land of festivals, examination of impact of festivals on the stock price movement can help the investor in planning their investments more effectively in short term horizon. Diwali effect on Indian stock market was studied by Potharla Srikanth et.al.,(2013) by using event study methodology and results of the study highlights that Diwali effect was not significant on the returns from Indian stock market.

OBJECTIVES OF THE STUDY:

The main objective of the present study is to examine the anomalies present in the form of seasonality effect on Indian Information Technology companies stocks. The study also analyses the impact of overall Indian stock market conditions on the Information technology companies' stocks.

HYPOTHESIS OF THE STUDY:

Null Hypothesis: There is no seasonality effect on Indian Information Technology companies' stocks

Alternative Hypothesis:- There is a presence of seasonality effect on Indian Information Technology companies' stocks.

METHODOLOGY OF THE STUDY:

Data and Period of Study:

For the present study, data on weekly returns of BSEIT Index is used as a proxy for Indian IT sector companies' stock behaviour and weekly returns of BSE-Sensex is surrogated for Indian stock market behaviour. The period of study is from april,1999 to march,2013.

Analytical framework of the study:

The prices of BSEIT Index and BSE-Sensex are converted into log returns by using the following formula

$$R_i = \ln\left(\frac{P_t}{P_{t-1}}\right)*100 \quad \text{.....(1)}$$

In equation(1) P_t is price of the index at time 't' and P_{t-1} is the price of the index at time t-1.

At the outset, to understand the characteristics of the returns of select indices the descriptive statistics like mean, standard deviation, skewness, kurtosis, minimum and maximum have been computed.
Before applying GARCH model to examine the seasonality effect on return and volatility of IT sector stocks, the stationarity of indices returns has been confirmed by employing augmented version of Dickey Fuller(ADF) test. ADF test has been conducted at the level form of returns with intercept, but without trend in the series. Trend has not been introduced in the ADF equation because the returns of the indices did not follow any trend over the period of time. The equation of ADF is as follows

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \varepsilon_t \quad \text{.....(2)}$$

In Equation(2) ΔY_t is the first differenced value of weekly returns from the select indices; α_0 is the constant ; Y_{t-1} is one week lagged value of the weekly returns of the index; ε_t is the error term.

To examine the seasonally effect on Indian IT sector companies' stocks GARCH(1,1) model has been used. The GARCH equation can be divided two segment. One is mean equation and another one is variance equation. The two equations are presented as follows

MEAN EQUATION:

$$R_i = \alpha + \beta_1 D_{apr} + \beta_2 D_{may} + \beta_3 D_{jun} + \beta_4 D_{jul} + \beta_5 D_{aug} + \beta_6 D_{sept} + \beta_7 D_{oct} + \beta_8 D_{nov} + \beta_9 D_{dec} + \beta_{10} D_{jan} + \beta_{11} D_{feb} + \beta_{12} D_{mar} + \gamma M_t + \text{AR(1)} + \text{MA(1)} + \varepsilon_t \quad \text{.....(3)}$$

VARIANCE EQUATION:

$$\sigma^2_t = \omega + \alpha\varepsilon^2_{t-1} + \beta\sigma^2_{t-1} + \phi M_t \quad \text{.....(4)}$$

In equation(3), Ri is the weekly return from BSEIT Index; α is the constant; D_{apr} to D_{mar} are dummy variables for each month in the financial year i.e., from april in the current year to march in the succeeding year; M_t is the weekly return from Sensex; AR(1) is first order autoregression; MA(1) is first order moving average and ε_t is the error term.

In equation(4) σ^2_t is the squared value of standard deviation at time 't' which is the indicator of

volatility measured under GARCH model; ε^2_{t-1} is one week lagged value of squared error term; σ^2_{t-1} is one week lagged value of squared standard deviation; and M_t is the market return at time 't'.

ANALYSIS OF RESULTS:

Table 2 present the descriptive statistics on the weekly returns from BSEIT index and Sensex. Mean return of BSEIT index is nearly 0.003% whereas the mean return of Sensex is nearly 0.011% with a standard deviation of nearly 2.518% and 1.504% respectively. Lower mean return with higher standard deviation for BSEIT index compared to that of Sensex indicates that returns of Indian IT sector stocks are more volatile than the overall Indian stock market. Skewness of the distribution of both the series of returns is negative. However, higher negative value of skewness of the distribution of BSEIT Index returns implies the presence of large number of high values in the distribution of BSEIT returns compared to that of Sensex returns. Kurtosis of the distribution of both the series in leptokurtic, but the higher value of kurtosis of the distribution of BSEIT returns indicates that the values in the distribution are closer to their mean value.

Table 3 presents the results of unit roots test conducted based on augmented version of Dickey Fuller Test. Presence of unit root or non-stationarity is a common phenomenon in the case of time series data. Hence, returns from the indices are converted into log values. The advantage of using log values of returns is that they incorporate the compounding effect of returns and moreover the log returns tend to have stationarity compared to simple returns. The results of ADF test also confirms that the log returns of BSEIT Index and Sensex are free from unit root and hence the data series is viable for econometric analysis.

Table 4 presents the results of volatility estimation done based on GARCH(1,1) model. The results of the analysis are divided into two parts i.e., Mean Equation and Variance Equation. Mean equation presents the impact of months of the year effect on mean returns of BSEIT index. It also includes the first order autoregression and moving average. The results of the analysis discloses that april and march month returns have significant negative impact on the mean returns of IT sector($p<0.05$). Though, July, August and January months' returns also have negative impact on average return of BSEIT Index, but it is not significant($p>0.05$).All the remaining months' returns have positive impact on average returns of BSEIT Index returns, but the impact is not significant statistically($p>0.05$). Sensex which is introduced as surrogate index for Indian stock market, has significant positive impact on the average returns of BSEIT Index ($p<0.05$). First order autoregression[i.e., AR(1)] has significant positive impact on the average returns from BSEIT Index, whereas first order moving average[i.e.,MA(1)] has significant negative impact.($p<0.05$). It means unexplained shocks which are represented by MA(1) have negative influence on stock market. This type of phenomenon implies that negative returns in stock markets are caused by many unobservable factors which are beyond the expectation limits of individual investors.

Variance equation has four components i.e, constant, one week lagged value of squared error term(or ARCH), one week lagged value of squared standard deviation and Sensex returns. Results of the analysis show that ω is positive. Long term variance can be obtained by dividing ω with γ where γ is the excess of the sum of α, β and ϕ over '1'. So, the long term unconditional variance is 4.6662 per day and long term unconditional volatility, obtained by taking square root of long term unconditional variance, is 2.1602 per day.

One week lagged value of squared error term has significant positive impact on the volatility of BSEIT Index returns which indicates that the market is influenced by recent news impact and movement of the returns from the Index in the market is not random. One week lagged value of GARCH is also positive and significant indicating the presence of old news impact. Coefficient of one week lagged squared standard deviation is higher than that of one week lagged squared error term which clearly indicates that the old news has more impact than recent news. It implies that the movement of stock returns is highly exponential and informational efficiency of the market is not so good. Sum of the coefficients of ARCH and GARCH is almost equal to one which imply strong persistence of volatility in the returns from BSEIT Index. Sensex has negative impact on the volatility of BSEIT Index. It indicates that when

overall market is in favourable condition, investors prefer to invest in other than IT companies' stocks. It can be due to the fact that IT sector stocks are more vulnerable to international market conditions rather than to domestic market conditions.

R-squared value which is also called coefficient of determination, is nearly 0.4231 which indicates that nearly 42% variation in the returns of the BSEIT index can be explained by the so constructed mean equation. Durbin-Watson statistic value is very closer to 'two' indicating the presence of very weak positive autocorrelation.

FINAL FINDINGS:

The era of information technology with increased importance for financial sector reforms by the countries' governments has opened up new opportunities and challenges to the market participants. Accessibility to price sensitive information has increased rapidly and various research consultancies publish their analysis results which can be accessible to even a common investor. However, still it is a common phenomenon in the market that sometimes investors over or under react to the price sensitive information and it leads to the continuous existence of market imperfections.

Seasonality effect is well tested stock market anomaly with large body of literature. In the present study, a modest attempt has been made to examine seasonality effect specifically on information technology stocks. The rationale behind the selection of information technology sector is stocks in this sector always experience high volatility in the market and hence need special attention by investors. Results of the study confirms the presence of seasonality effect on information technology stocks in India.

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APPENDICES

Table 1: Month-wise Descriptive Statistics of Weekly returns of Select Indices

Month	Index	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
April	BSEIT Return	53	-22.2984	5.6768	-0.5689	4.2513	-2.8170	12.7550
	Sensex Return	53	-4.8069	4.4138	-0.1324	1.7976	-0.1720	0.9700
May	BSEIT Return	60	-8.4714	8.8170	-0.0870	2.3055	-0.1130	5.6430
	Sensex Return	60	-7.0033	4.9200	-0.0515	1.8226	-0.7690	3.4530
June	BSEIT Return	60	-3.7020	7.6218	0.4165	1.9180	0.7470	2.9020
	Sensex Return	60	-4.8397	6.6670	0.2699	1.6056	0.2680	4.6600
July	BSEIT Return	61	-5.2415	9.8355	0.0358	2.3701	1.2380	4.7140
	Sensex Return	61	-4.2648	4.1742	0.1881	1.4369	0.0390	1.1410
August	BSEIT Return	61	-4.0701	5.9037	-0.0264	1.8880	0.4180	0.9420
	Sensex Return	61	-4.3789	3.2639	-0.1215	1.3200	-0.4830	1.4550
September	BSEIT Return	60	-8.3314	6.8978	-0.3517	2.2764	-0.3020	2.7510
	Sensex Return	60	-4.2129	1.7894	-0.2229	1.2412	-0.8700	0.7620
October	BSEIT Return	54	-5.7532	9.6454	0.1514	2.7975	0.7830	2.3690
	Sensex Return	54	-3.9942	5.4958	-0.1254	1.7076	0.1850	1.4370
November	BSEIT Return	57	-4.3559	8.6263	0.2569	1.9428	1.2340	5.3920
	Sensex Return	57	-3.8867	2.2771	0.0510	1.2589	-0.7920	1.6730
December	BSEIT Return	60	-5.7699	4.3191	0.3425	1.9370	-0.6210	1.3060
	Sensex Return	60	-2.3326	5.3672	0.3862	1.2083	1.1320	4.8790
January	BSEIT Return	59	-6.1503	8.5926	-0.1051	2.7485	0.4350	0.9340
	Sensex Return	59	-3.5161	2.6205	-0.1318	1.3214	-0.1300	0.0050
February	BSEIT Return	54	-7.1840	5.8646	0.0814	2.4677	-0.2730	1.5070
	Sensex Return	54	-3.9452	4.7105	0.0580	1.5738	-0.0190	1.1920
March	BSEIT Return	60	-7.4018	5.2199	-0.1415	2.7312	-0.8070	0.8490
	Sensex Return	60	-4.8962	3.6650	-0.0625	1.6444	-0.2560	0.6000

Source: Authors' Calculations

Table 2: Descriptive Statistics of Weekly returns of select indices of the whole period

	BSEIT Return	SENSEX Return
Mean	0.003090	0.010991
Median	0.097880	0.117320
Maximum	9.835547	6.667006
Minimum	-22.29842	-7.003340
Std. Dev.	2.517963	1.504420
Skewness	-0.957081	-0.192868
Kurtosis	13.23435	5.110534
Observations	699	699

Source: Authors' Calculations

Table 3: Unit Roots Test based on Augmented Dickey Fuller Test

Index	t-statistic	P-Value
BSEIT Return	-27.35098	0.0001
SENSEX Return	-26.31631	0.0001

Source: Authors' Calculations

Table 4: Estimation of Volatility of BSEIT Index using GARCH(1,1) Model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
April	-0.744488	0.179361	-4.150771	0.0001
May	0.345004	0.203425	1.695977	0.0899
June	0.270765	0.195024	1.388370	0.1650
July	-0.073756	0.142875	-0.516227	0.6057
August	-0.112429	0.179057	-0.627897	0.5301
September	0.082964	0.158716	0.522719	0.6012
October	0.273288	0.143267	1.907540	0.0565
November	0.035388	0.192725	0.183620	0.8543
December	0.150823	0.165903	0.909105	0.3633
January	-0.129111	0.177562	-0.727132	0.4671
February	0.106922	0.143727	0.743929	0.4569
March	-0.382410	0.136383	-2.803947	0.0050
Sensex Return	0.939512	0.032467	28.93700	0.0001
AR(1)	0.866379	0.027346	31.68214	0.0001
MA(1)	-0.955918	0.013170	-72.58348	0.0001
Variance Equation				
C	0.185279	0.048665	3.807253	0.0001
ARCH(-1)	0.372725	0.054789	6.802934	0.0001
GARCH(-1)	0.675863	0.032165	21.01227	0.0001
Sensex Return	-0.088294	0.044615	-1.979017	0.0478
R-squared	0.423086	Durbin-Watson stat		1.927834
Adjusted R-squared	0.407792			

Source: Authors' Calculations
