Seasonal Anomalies In Stock Returns: Evidence From India

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INTRODUCTION

The efficient market hypothesis (EMH) is a controversial topic in finance. It states that stock prices follow a random walk, implying that price changes are unpredictable and random because they reflect all available information. There are three forms of EMH. These forms are distinguished by the degree of information reflected in security prices. Weak-form of EMH asserts that stock prices already reflect all information contained in the history of past prices. The semi-strong form hypothesis asserts that stock prices already reflect all publicly available information. The strong-form hypothesis asserts that stock prices reflect all relevant information including insider information. EMH came increasingly under fire with the discovery of a series of persistent anomalies such as small firm effect, low P/E effect and market over-reaction. Widely documented anomalies are seasonal effects. They violate the weak-form of market efficiency i.e. asset prices fully reflect all past information. These seasonal anomalies are trends seen in stock returns, pointing out that stock returns vary across time periods. This entails an inefficient market situation where market investors would be able to earn abnormal returns, that is, returns are not commensurate with risk. This paper investigates seasonal anomalies in the Indian stock market. The rest of the paper includes a review of studies on month-of-the-year and day-of-the-week effects, followed by formulation of hypotheses, description of data and methodology, findings and a brief conclusion.

LITERATURE REVIEW

This section consists of two parts. The First and second part presents review of studies relating to month-of-the-year effect and day-of-the-week effect respectively.

MONTH-OF-THE-YEAR EFFECT

Wachtel (1942) was the first to observe seasonality in the Dow Jones Industrial average from 1927 to 1942. He observed frequent bullish tendencies from December to January in 11 of the 15 years he studied. He pointed to certain factors considered as possible causes for the higher return in January, one of which is year-end tax-loss selling. **Tinic, Barone and West (1987)** found January effect in Canada, but did not support the proposition that the tax induced trading is the sole cause of seasonality in stock returns in Canada. **Boudreaux (1995)** investigated month-of-the-year effect over seven countries- Denmark, France, Germany, Norway, Singapore/ Malaysia, Spain and Switzerland stock markets. Using regression model, he found that there was strong evidence of January effect in foreign stock markets. **Wong and Yuanto (1999)** indicated that significant monthly seasonal effect existed on Jakarta Stock Exchange, but not the January effect. **Bildik (2004)** found significant January effect in stock returns in Istanbul Stock Exchange (ISE) by using both parametric (Regression) and non parametric tests (Kruskal-Wallis). Average daily returns in January were four times as compared to non-January returns. Trading volume across the months also supported the seasonal patterns in ISE. **Marrett and Worthington (2008)** concluded that, in the Australia market, wide returns were significantly higher in April, July and December, combined with evidence of small cap effect with systematically higher returns in January, August and December. At the industry level, month-of-the-year effect was found in the diversified financials, energy, retail, telecommunications and transport industries. On the contrary, **Bahadur and Joshi (2005)** by using regression model with dummies, did not find month-of-the-year effect in Nepalese stock market as there was no difference in returns across months. **Pandey (2002)** indicated the presence of month-of-the-year effect in the Indian stock market. The returns were found statistically significant in March, July and October. Since Indian tax year ends in March, the statistically significant coefficient for March was consistent with tax- loss selling hypothesis, thus supporting the January effect. **Patel (2008)** found Nov-Dec effect in Indian stock market i.e. mean returns for the

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months November and December were significantly greater than mean returns during the remaining ten months of the year. Further, March-to-May effect was also identified, whereby mean returns for March through May were significantly less than those during the remaining months.

DAY-OF-THE-WEEK EFFECT

Jaffe and Westerfield (1985) by employing regression with dummies concluded that both Japanese and American stocks exhibit day-of the-week effect, but their patterns differ. The lowest mean return for American index occurred on Monday and for Japanese indices, it occurred on Tuesday. **Jordon and Jordon (1991)** did not find significant day-of-the-week effect in bond returns. Whereas, the S&P 500 and equally weighted (both equity indices) displayed significant day-of-the-week in US. **Agarwal and Tandon (1994)** found mixed international evidence (in 18 countries) in support of weekend effect. Lowest and negative returns occurred on Mondays in nine countries and on Tuesdays in eight countries. Friday's returns were large and significantly positive in all the countries except Luxembourg. **Wong and Yuanto (1999)** found day-of-the-week effect on the Jakarta Stock Exchange with highest positive mean return on Friday and lowest negative mean return on Tuesday. **Bildik (2004)** found day-of-the-week effect in stock returns and trading activity of Istanbul Stock Exchange. Low and negative Monday effect disappeared when the return of last trading day of the previous week and/ or return of the previous week was positive. **Bahadur and Joshi (2005)** indicated different day-of-the-week effect in Nepalese stock market as compared to the one observed in most developed markets. Significant negative return on Thursday was found instead of negative return on Monday. Contrary to the above studies, **Chukwuogor (2008)** by utilizing non-parametric Kruskal-Wallis test contradicted the presence of day-of-the-week effect in five African stock markets- Botswana, Egypt, Ghana, Nigeria and South Africa.

Sarma (2004) examined calendar effects during the post reform era in the Indian stock market. He investigated the BSE 30, the BSE 100, and the BSE 200 stock indexes to detect the day-of-the-week effect. Utilizing Kruskal-Wallis test statistics, **Sarma** concluded that the Indian stock market exhibited some seasonality in daily returns. **Mangala (2008)** found that the mean return on Wednesday was significantly higher as compared to rest of the days of the week in the Indian stock market by utilizing non-parametric Kruskal-Wallis test.

Most of the researchers in the above studies had found significant seasonality in stock market returns. They had provided convincing evidence that there are month-of-the-year and day-of-the-week effects in international stock market returns. Although detailed empirical evidence of calendar effects in stock returns is abundant for international stock markets, it is scant for the Indian stock market. Therefore, this study is an attempt to contribute to limited literature on Indian stock market issues. This paper investigates month-of-the-year and day-of-the-week effects in the stock returns using two major indices, namely, BSE 500 and S&P CNX 500 of the Indian stock market.

HYPOTHESES

Following null hypotheses are developed in the study:

1. There are no differences in the average return on stock indices across the months of the year. Symbolically,

Hypothesis (H_{01}): $a_1 = a_2 = a_3 = a_4 = a_5 = a_6 = a_7 = a_8 = a_9 = a_{10} = a_{11} = a_{12}$

2 There are no differences in the average return on stock indices across the days of the week. Symbolically,

Hypothesis (H_{02}): $a_1 = a_2 = a_3 = a_4 = a_5$

DATA AND METHODOLOGY

The data set used in the study consists of daily closing values of the BSE 500 and S&P CNX 500 indices from January 2002 to December 2009. Daily return is calculated as the continuously compounded daily change in the share price index as shown below:

$r_t = \ln(v_t / v_{t-1})$

r_t = continuously compounded return at time t

v_t = closing value of the index on day t.

v_{t-1} = closing value of the index on day *t-1*.

The seasonal effects are tested individually, using regression equations with dummy variables and t and F tests are

used to test the significance of the results. To test for differences in mean returns across months-of-the-year and days-of-the-week, the following equations are used:

❁ Model: Month-of-the-year effect

$$r_t = a_1D_{1t} + a_2D_{2t} + a_3D_{3t} + a_4D_{4t} + a_5D_{5t} + a_6D_{6t} + a_7D_{7t} + a_8D_{8t} + a_9D_{9t} + a_{10}D_{10t} + a_{11}D_{11t} + a_{12}D_{12t} + e_t$$

Where r_t is the return in month t; D_{1t}, D_{2t}..... D_{12t} are dummy variables for the various months of the year, January, February..... December respectively (i.e. $D_{1t} = 1$, if month t is a January, zero otherwise and so on); e_t is the error term. The coefficients a_1 to a_{12} in the above equation are the mean returns for January through December respectively.

❁ Model: Day-of-the-week effect

$$r_t = a_1D_{1t} + a_2D_{2t} + a_3D_{3t} + a_4D_{4t} + a_5D_{5t} + e_t$$

Where r_t is the return on day t; D_{1t}, D_{2t}..... D_{5t} are dummy variables for the various days of the week, Monday, Tuesday..... Friday respectively (i.e. $D_{1t} = 1$, if day t is a Monday, zero otherwise and so on); e_t is the error term. The coefficients a_1 to a_5 in the above equation are the mean returns for Monday through Friday respectively.

FINDINGS

❁ Month-Of-The-Year Effect : In this section, month-of-the-year effect in the Indian stock market is analyzed. Table 1 provides descriptive statistics of BSE 500 and S&P CNX 500 returns by calendar months for 2002- 2009.

Table 1: Descriptive Statistics Of BSE 500 And S&P CNX 500 Returns (2002-09) Across Months Of The Year

Months	Statistic	BSE500	S&P CNX 500
January	Mean	-0.00133	-0.00146
	Std. Deviation	0.020088	0.02028
	Skewness	-0.77665	-0.80906
	Kurtosis	5.504899	5.86294
February	Mean	0.00006	0.00005
	Std. Deviation	0.015218	0.01493
	Skewness	-0.3785	-0.40402
	Kurtosis	2.25497	2.37578
March	Mean	-0.00026	-0.00024
	Std. Deviation	0.017429	0.01695
	Skewness	-0.49098	-0.48422
	Kurtosis	2.407903	2.24293
April	Mean	0.002602	0.00219
	Std. Deviation	0.014257	0.01415
	Skewness	-0.54338	-0.52203
	Kurtosis	1.112068	1.29982
May	Mean	0.000693	0.00068
	Std. Deviation	0.023982	0.02444
	Skewness	0.087859	0.086
	Kurtosis	13.23909	13.7656
June	Mean	-0.00018	-0.0003
	Std. Deviation	0.017721	0.01771
	Skewness	-0.23752	-0.27032
	Kurtosis	1.797554	1.41674
July	Mean	0.001564	0.00158
	Std. Deviation	0.016892	0.01653
	Skewness	-0.2962	-0.26664

	Kurtosis	1.502915	1.52737
August	Mean	0.002222	0.00217
	Std. Deviation	0.013611	0.01345
	Skewness	-0.59367	-0.62648
	Kurtosis	1.5333	1.41183
September	Mean	0.001508	0.00137
	Std. Deviation	0.013531	0.01345
	Skewness	-0.59083	-0.52356
	Kurtosis	1.882078	1.97235
October	Mean	-0.00123	-0.0013
	Std. Deviation	0.021608	0.02123
	Skewness	-0.87736	-1.00277
	Kurtosis	5.294268	6.04858
November	Mean	0.002394	0.00251
	Std. Deviation	0.015244	0.01535
	Skewness	-0.4839	-0.41989
	Kurtosis	2.68702	2.76609
December	Mean	0.003454	0.00357
	Std. Deviation	0.012945	0.01319
	Skewness	-0.2941	-0.41486
	Kurtosis	1.903973	2.10158

One can find from the above Table 1 that mean returns for March, January, June and October are negative for both the selected indices. Lowest mean returns were found for March and the highest for December. Return series are negatively skewed for all months except for May. The return distributions for January, May and October are leptokurtic with long tails and platykurtic on remaining days.

Table 2 reports the regression results associated with F-test for month-of-the-year effect for the sample period. The results reject null hypothesis H_{01} ($p < 0.05$ for F-test). This means that the mean returns for each month of the calendar

Table 2: Regression Coefficients For Month-of-the-year Effect

	BSE 500	S&P CNX 500
January (D1)	-0.00133 (0.317)	-0.00146 (0.269)
February (D2)	.000059 (0.966)	0.00005 (0.970)
March (D3)	-0.00026 (0.844)	-0.00024 (0.860)
April (D4)	0.00260 (0.059)	0.00219 (0.110)
May (D5)	0.00069 (0.601)	0.00068 (0.606)
June (D6)	-0.00018 (0.892)	-0.00030 (0.819)
July (D7)	0.00162 (0.211)	0.00158 (0.223)
August (D8)	0.00222 (0.093)	0.00217 (0.099)
September (D9)	0.00151 (0.258)	0.00137 (0.302)
October (D10)	-0.00123 (0.356)	-0.00130 (0.330)
November (D11)	0.00239 (0.078)	0.00251 (0.064)
December (D12)	0.00345 (0.009)*	0.00357 (0.007)*
P value for F- test	0.04648**	0.04965**

*denotes statistical significance at 5% level based on t- statistic (p value in parentheses) for the difference of mean returns from zero

**F- test (5% significance level) is for equality of mean returns across all months of the year

year are not equal and there exists month-of-the-year effect in Indian stock market. The coefficients for January, March, June and October of both the indices are negatively insignificant. The coefficients for February, April, May, July, August, September and November representing the mean returns of respective months are positively insignificant. The coefficient of dummy variable D_{12} representing the mean returns of December is positively significant at 5% significance level of both the indices. The magnitude of this coefficient is also the highest implying that returns in the month of December are higher as compared to other months in the year.

❁ **Day-Of-The-Week Effect :** In this section, day-of-the-week effect on stock returns is analysed. Table 3 lists the summarized descriptive statistics of daily returns of BSE 500 and S&P CNX 500 for the sample period.

Table 3: Descriptive statistics of BSE 500 and S&P CNX 500 Returns (2002-09) Across Days Of The Week

Day	Statistic	BSE500	CNX500
Monday	Mean	0.0004178	0.0003852
	Std. Deviation	0.0210073	0.0210272
	Skewness	-0.350908	-0.388232
	Kurtosis	10.040583	11.284742
Tuesday	Mean	0.000407	0.0003822
	Std. Deviation	0.0157353	0.0156469
	Skewness	-0.011796	0.0242556
	Kurtosis	3.5624312	3.8769193
Wednesday	Mean	0.0012525	0.0011309
	Std. Deviation	0.0158218	0.0157511
	Skewness	-0.283484	-0.216688
	Kurtosis	3.0314765	2.821858
Thursday	Mean	0.0005733	0.0005596
	Std. Deviation	0.0153254	0.0153452
	Skewness	-0.619677	-0.596983
	Kurtosis	3.1718401	2.9869616
Friday	Mean	0.0019571	0.0018973
	Std. Deviation	0.0179598	0.0178092
	Skewness	-1.113369	-1.211658
	Kurtosis	6.9846606	7.669964

It is clear from Table 3 that Friday is the highest return day of the week followed by Wednesday. Lowest mean returns are found on Tuesday followed by Monday. On the other hand, volatility of returns in terms of standard deviation across the week is highest on Monday and lowest on Thursday. Return series of both the indices across the weekdays are negatively skewed (except of S&P CNX 500 on Tuesday) and Leptokurtic (except of S&P CNX 500 on Wednesday and Thursday). Regression is carried out to test for differences in mean returns across days of the week. Table 4 reports the regression coefficients for day-of-the-week effect along with F- test. The coefficients for Monday, Tuesday, Wednesday and Thursday are positively insignificant for both the selected indices. The coefficient of dummy variable

Table 4: Regression Coefficients For Day-Of-The-Week Effect

Index	Monday (D1)	Tuesday (D2)	Wednesday (D3)	Thursday (D4)	Friday (D5)	p- value for F- test
BSE 500	0.0004459	0.0004070	0.0012525	0.0004459	0.0019571	0.151
	(0.607)	(0.638)	(0.146)	(0.509)	(0.024)*	
S&P CNX 500	0.000385	0.000382	0.001131	0.000560	0.001897	0.197
	(0.656)	(0.657)	(0.188)	(0.518)	(0.029)*	

*denotes statistical significance at 5% level based on t- statistic (p-value in parentheses) for the difference of mean returns from zero
Note: F- test (5% significance level) is for equality of mean returns across all day of the week

D_5 representing mean returns of Friday is positively significant at 5% significance level. However, results of F- test ($p > 0.05$) indicate that null hypothesis (H_{02}) of equality of means across all the days of the week cannot be rejected at 5% level of significance for both the indices. This denotes absence of day-of-the-week effect in the Indian stock market.

SUMMARY AND CONCLUSION

The study has been undertaken to examine whether seasonal anomalies exist in the Indian stock market. The data has been collected for the period 2002-2009 of BSE 500 and S&P CNX 500. The results show absence of day-of-the-week but presence of month-of-the-year effect in the Indian stock market. This indicates that the Indian stock market is not fully efficient yet. Its implication is that the existence of month-of-the-year effect may provide opportunities to the investors to formulate profitable trading strategies to earn abnormal returns that does not commensurate with the risk. But investors would be able to earn abnormal returns only in the short run. In the long run, countervailing arbitrage and forces of demand and supply will exploit the excess returns, leaving no scope for such anomaly.

Moreover, the above have been concluded on the basis of limited data (2002-09) of two selected indices i.e. BSE 500 and S&P CNX 500. Further, the inferences are drawn for long run as the analysis is carried out by taking the entire sample period together. The study could be extended to longer time period and to other indices. Presence of anomalies could also be checked in the short run by dividing the study period into shorter time periods. Here remains the further scope of the study.

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