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An empirical study on month of the year effect in gas, oil and refineries sectors- evidence from Indian stock market

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ABSTRACT
The primary objective of the study is to investigate the existence of seasonality in stock price behavior in Indian stock market and more specifically in the Gas, Oil and Refineries sector. The period of the study is from 1st January 2006 to 31st December 2010. For the purpose analysis, the study has employed daily price series that have been obtained from the official website of National Stock Exchange (NSE). The daily price series of selected eight Gas, Oil and Refineries companies were selected for this study, and used multiple regression technique to examine the significance of the regression coefficient for investigating month of the year effects. It is found that all the eight selected Gas, Oil and Refineries companies evidenced month of the year effect and mostly either on September, August or February. Only GAIL, and HPCL evidenced significant October and July effect.

Introduction

This paper investigates the month of the year effect on Gas, Oil and Refineries sector in Indian stock market for a sample of 8(eight) Indian Gas, Oil and Refineries companies listed in the National Stock Exchange for the period of 5 years from 2006 to 2010. The month of the year effect is an important component of capital market efficiency analysis of the industries. Month of the year effects refers to the monthly return on a particular month is deferent from other months and such a variation is statistically significant. Two popular variations of month of the year effect are January effect and April effect.

Calendar anomalies, relying on the assumption that a certain pattern of stock markets is formed on the basis of the past stock price, can be used to predict the future stock price. If the pattern is fixed, informed investors can utilize the pattern to earn a risk-free profit by trading the stocks. The study of seasonality implies that investors could employ the findings on anomalies to predict the future behavior of prices (Fama, 1965). Certainly, seasonal anomalies are in contradiction to any form of efficient market hypothesis (EMH), particularly the weak-form efficiency.

Capital market operations consist mainly of primary market operations and secondary market operations or stock market. The origin of stock market in India can be traced to the later part of the Eighteenth Century. The earliest security dealings were transactions in loan securities of the East India Company, the dominant institution of those days. Corporate shares came into the picture by 1830's and assumed significance with the enactment of the Companies Act in 1850. The introduction of limited liability marked the beginning of the era of modern joint stock enterprises. The American Civil War followed this in 1860-65. However, the bubble burst with the end of the Civil War and a disastrous slump followed which lasted for a long time and also resulted in complete ostracism of the broker community. The tremendous social pressure on the brokers led to their forming an informal association called, 'The Native Share and Stock Brokers' Association' (now known as the Bombay Stock Exchange) in 1887.

The Indian capital market is more than a century old. Its history goes back to 1875, when 22 brokers formed the Bombay Stock Exchange (BSE). Over the period, the Indian securities market has evolved continuously to become one of the most dynamic, modern, and efficient securities markets in Asia. Today, Indian market confirms to best international practices and standards both in terms of structure and in terms of operating efficiency. Indian securities markets are mainly governed by a) The Company's Act1956, b) the Securities Contracts (Regulation) Act 1956 (SCRA Act), and c) the Securities and Exchange Board of India (SEBI) Act, 1992. The national stock exchange, or NSE, is a recent entrant in the stock exchange scene in India. It was incorporated in November 1992, at the behest of the Government of India. The shares of about 1,589 companies trade on this exchange. Its daily average turnover for the year 2009-10 is Rs. 28,476 crores. The total market capitalization of stocks trading in NSE is Rs. 67, 45,724 crores, as on 31st March 2010. Regional exchanges also sponsor trading of some firms that are traded on national exchanges. This dual listing enables local brokerage firms to trade in shares of large firms without needing to purchase membership on the larger exchanges like BSE and NSE. Thus, for example, Infosys is listed on the Bangalore Stock Exchange apart from BSE and NSE. However, BSE and NSE are still the preferred exchanges for large traders.

Over the years academicians have been interested in developing and testing models of stock price behaviour. This interest has flowered into a number of theories to describing and predicting share price behaviour. However, it is from the 1960s that a number of investigations have led to the development of the price behaviour theory to describe share behaviour.

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Literature Review

Research reviewed in this area generally attempts to efforts have been directed, in particular, to study price behaviour of common stocks or equity shares as they are popularly called in India with a view to understanding the underlying stochastic processes which determine the prices of these shares.

Boudreaux (1995) investigated seasonality in seven countries' stock markets and found that, three of them evidenced a monthly effect. An inverted monthly effect was found in a Pacific basin market. It was also determined that the January effect, although significant, was not capable of explaining the presence of monthly effect where they exist. The study period covered from March 4, 1978 to December 30, 1992.

Pandey (2002) studied the presence of the seasonal or monthly effect in stock returns has been reported in several developed and emerging stock markets. This study investigates the existence of seasonality in the post-reform period. The study uses the monthly return data of the Bombay Stock Exchange's Sensitivity Index for the period from April 1991 to March 2002 for analysis. After examining the stationarity of the return series, an augmented autoregressive moving average model is specified to find the monthly effect in stock returns in India. The results confirm the existence of seasonality in stock returns in India and the January effect.

Another study by Pandey (2002) used three-year' high-frequency data set of five-minutes returns to construct measures of realized volatility with which some of the extreme-value estimators proposed in the literature and the traditional estimators are compared. Based on five criteria used to evaluate the bias, efficiency and predictive power, the study find that almost all the extreme-value estimators are free of bias and perform well compared to their traditional counterparts for the S&P CNX Nifty stock-index and the 10 constituent stocks studied.

A study of Pandey (2002) investigated the existence of seasonality in Malayasia's stock market. The study used the monthly return data of the Kuala Lumpur Stock Exchange's EMAS index for the period from January 1992 to June 2002. After examining the stationarity of the return series, the study specified a combined time series and regression model to find the monthly effect in the stock returns in Malayasia. The coefficient for the months of February and December were found to be statistically significant and the average returns for these months were different from all other months. The average return for the December was positive and highest.

Al-Saad and Moosa (2005) studied monthly patterns on Kuwait stock markets using the Global Market Index of the Kuwait Stock Exchange. They found that over a sample period from 1984 to 2000 returns were significantly higher on July compared with the other months, therefore creating a July effect rather than January effect.

Chakravarty (2006) in her paper reexamines the relationship between stock price and some key macro economic variables in India for the period 1991-2005 using monthly time series data. The study uses granger non causality test. The results of the study indicate that index of industrial production and inflation granger cause stock price but stock price does not cause either of the two and so the causation is unidirectional. The causal relation between stock price and money supply is unidirectional as stock price granger cause money supply but money supply does not. On the other hand there is no causal relation between stock price and exchange rate. Similarly there is no causal linkage between gold price and stock price.

George, et. al. (2007) observed the month-of-the-year effect in Australian daily stock returns for small capitalization stocks over period from 9th September 1996 to 10th November 2006. A regression-based approach was employed. The results indicate that market wide returns are significantly higher in April, July and December. The analysis of the sub-market returns is also partially supportive of disparate month-of-the-year effects in the diversified financials, energy, retail, telecoms and transport industries.

Silvio (2008) applied different statistical tests to investigate whether monthly volatility patterns prevailing in a cross-section of stock markets are present on the Malta Stock Exchange. A January effect is detected, together with a variant of the Turn-Of-The-Month effect, in that volatility tends to increase towards the end of the month. Whilst these effects may be attributed to sources identified in previous literature, it is also shown that this seasonality is related to announcement patterns of listed companies.

Mollik (2009) in a study investigated the existence of seasonality in return series of Dhaka Stock Exchange (DSE) of Bangladesh. The study uses the monthly return data of the DSE all share price index (DSE All Index) for the period from 1993 to 2006 for the analysis. After examining the stationarity of the return series, the study specify a "combined regression-time series model" with dummy variable for months to find the monthly effect in stock returns in DSE. The results confirm the existence of seasonality in stock returns in DSE but do not support the "tax-loss-selling" hypothesis. Instead of "July effect", the study find an "April effect" in DSE. The results of the study invalidate the paradigm of the efficient market hypothesis in DSE meaning that, investors can time their share investments to improve returns.

Eleftherios (2009) in his study examines the calendar anomalies/effects in 55 Stock market indices of 51 countries around the world. The calendar effects which are examined are the turn-of-the-Month effect, the day-of-the-Week effect, the Month-of the-Year effect and the semi-Month effect. The methodology followed is to the test hypothesis of two unequal data samples with bootstrapping simulated t-statistics. Simultaneously, with the same procedure a seasonality test is applied in order to investigate if more frequent seasonality on expected returns or in volatility is presented. The study rejected all calendar effects in a global level, except from the turn-of-the-Month effect, which is found present in 36 stock indices and that there is higher seasonality in volatility rather on expected returns, concerning the day of the week and the month of the year effects.

Objectives Of Study

The objective of the study is to investigate the existence of seasonality in stock price behavior in Indian stock market. The study of seasonality is segregated into analyzing and measuring the month of the year effect.

The specific objectives of the study are:

a) To present a panoramic view of the Indian stock market.
b) To present the prior studies on stock price seasonality, both in national and international market.
c) To analyze the basic descriptive statistics like mean, median, standard deviation, kurtosis and skewness for monthly return.
d) To examine the significance of regression coefficient for the monthly effect using multivariate technique.

Scope And Significance Of The Study

Our study intends to perform a comprehensive analysis of the stock price behavior, more specifically on the seasonality effect on month of the year effect in the Indian stock market. The seasonality effect is examined by a detailed analysis of month of the year effect of micro level. The micro level analysis uses eight selected leading companies Gas, Oil and Refineries sectors in the Indian economy. Bongaigaon Refinery & Petrochemicals Ltd (BRPL), Bharat Petroleum Corporation Limited (BPCL), Gas Authority India Limited (GAIL), Hindustan Petroleum Corporation Limited (HPCL), Indian Oil Corporation Limited (IOCL), Indian Petrochemicals Corporation Limited (IPCL), Oil & Natural Gas Corporations of India (ONGC) and Reliance Industries Limited(RIL). For the purpose analysis, the study has employed daily price series that have been obtained from the official website of National Stock Exchange (NSE).

Our study is more significant since the period of study spans over five years i.e. from 1st January 2006 to 31st December 2010. The study has employed statistical tools and technique like Regression analysis and others. The present study is one of its kind since it presents a comprehensive picture of seasonality effect in post liberalization era for the Indian stock market.

The study has used basic descriptive statistics like mean and median for central tendency; standard deviation for measuring the dispersion; kurtosis for peakedness of the distribution and skewness to measure the symmetry of the return distribution. The hypothesis to be tested relates to equality of mean returns across all the twelve months. In other words, the null hypothesis is that mean returns across all the twelve months do not exhibit statistically significant differences.

Regression analysis is employed to further examine the month of the year effect for the selected stocks. A regression analysis is a statistical method used to estimate the strength of a relationship between one or more dependent variable and one or more independent variables. It assumes that the relationship between the dependent and independent variables is linear; that these variables have equal variance (homoscedasticity); that there is no correlation between two or more of the independent variable (multicollinearity); and the data is normally distributed. Regression analysis can be simple involving one dependent variable and one independent variable, or multiple involving one dependent variable and two or more independent variable. Regression analysis was used by the researcher to gain a deeper understanding of the relationship between the log return of the closing price of one month with other month of the year. We have used F-test, t-test, adjusted R2 and P test for hypothesis testing and significance test.

Research Methods

It is found from the extensive review of prior studies that most of the earlier works on stock price behavior have used closing price for return generating procedure with an implied assumption of trading done at the closing price. The continuous compounded annual return is well accepted approach to measuring the daily returns. The natural log of daily relative mean index value is, thus the measure of daily used for this study. The log return is calculated based on the closing price and is presented in equation 1

Where: Rt = return on day 't'
Ct = Closing Price on day 't'
C t-1 = Closing on day 't-1'
and ln = natural log.

The study has analyzed the returns on monthly basis. In the first phase, we employ basic descriptive statistics like mean, median, standard deviation, Kurtosis and skewness. In the last phase, the study used multiple regression technique to examine the significance of the regression coefficient for investigating month of year effect.

. Linear regression: In linear regression, the model specification is that the dependent variable, yi is a linear combination of the parameters (but need not be linear in the independent variables). For example, in simple linear regression for modeling n data points there is one independent variable: xi, and other months parameters, β0, β1, β2, β3, β4…….n.(n for month 12).

In order to test month of the year effect on the stock return in the Indian selected companies, The regression equation for month of the year is presented in equation 2

Rt = □ + B2D2t + B3D3t + …….+B12D12t + e……(2)

where Rt is monthly returns, calculated using in above equation 2 ; and D2t , D3t ……. D12t signify the dummy variables from February to December.

For the purpose of regression analysis, the study has employed software application package SPSS 17.0 and Microsoft Excel.

Descriptive Statistics Analysis

Table 1 presents the values of descriptive statistics for each of the months for the selected eight companies. It is observed that relatively higher values of mean return for the months are observed for BPCL in the range of -0.65 to 0.097, with the exception of March mean return with lower value of -0.02. Only RIL evidenced consistently positive mean return for each for the ten months. Lower levels of mean return for the months are observed for GAIL in the range of -0.06 to 0.079 with all month mean return of 0.005. Further, it is found that very high level of mean return is observed for IOCL in the range of -0.06 to 0.126 for May to December, while lower values in range of 0.002 to 0.008 for August and September with all month mean of 0.024. For HPCL, negative mean return is found for seven month with positive values for remaining months and all month average return of -0.04. In case of BRPL, there is evidence of inconsistently higher and lower values of mean return for the month with all month's average being negative at -0.03. Both IOCL and RIL have lower levels of month returns with all month mean of 0.024 and 0.04, respectively. ONGC is found to have the minimum month mean return for September (-0.93), with all months average value of -0.01.

With regard to median, relatively higher values for the months are observed for ONGC in the range of -0.93 to 066. Lower levels of median return for the months are observed for IOCL in the range of -0.08 to 0.08 with all month median return of 0.012. Further, it is found that very high level of median return for some months and lower levels for other months is observed for BPCL in the range of -0.32 to 0.34, while lower values in range of levels of 0.002 to 0.04 for September and May with all month median of 0.033. In case of IPCL, GAIL, HPCL, BRPL there is evidence of inconsistently higher and lower values of median return for the months. Both BRPL and RIL have lower levels of monthly median returns with all month median of -0.012 and 0.03, respectively. ONGC is found to have the minimum month median return for September (-0.93), with all month value of 0.044.

The standard deviation of monthly return is relatively higher for GAIL in the range of 0.029 to 0.392. Lower levels of standard deviation for the months are observed for ONGC in the range of 0.014 to 0.039 with all month standard deviation of return at 0.027. Further, it is found that very high level of standard deviation for some months and lower levels for other months is observed for HPCL in the range of 0.018 to 0.098. BRPL is observed to have consistently positive standard deviation return for each of the twelve months with all month value of 0.031. For BPCL, IOCL, IPCL, ONGC and RIL standard deviation is found consistent over the months. In case of GAIL, the study has evidence of inconsistently higher and lower values of standard deviation with all month value being positive at 0.036. Both IOCL and Reliance have lower levels of standard deviation of month returns with all month standard deviation of 0.019 and 0.023, respectively. ONGC is found to have the minimum monthly standard deviation of return for June (0.014), with all month value of 0.027.

With regard to Kurtosis of monthly return, it is observed that relatively higher values for the months are observed for IPCL in the range of -0.34 to 65.13 with the all month Kurtosis value of 2.02, September more peaked with value of 65.13, followed by October and other month kurtosis relatively lower. Lower range of kurtosis for the months is observed for BRPL in the range of 0.4 to 3.47 with all month kurtosis of 1.61. Further, it is found that very high range of kurtosis for some months and lower levels for other months is observed for BPCL in the range of 1.39 to 40.78 from July and December. IOCL is observed to have consistently positive kurtosis value for each of the twelve months with all month kurtosis of 3.42. Kurtosis is found higher for nine months in HPCL, seven months for BPCL, ONGC and RIL four months in GAIL, three months in IOCL, two months in BRPL and IPCL and one month each of HPCL, IOCL, IPCL and RIL. In respect of all month kurtosis, HPCL, IOCL and ONGC evidenced highest value of more then 3 and remaining companies with lesser kurtosis with the value less then 3.

It is observed that with regard to skewness, of monthly return, higher values for the months are for RIL in the range of -0.97 to 5.39, with the all month skewness with lower value of 0.43. Lower range of skewness for the months are observed for BRPL in the range of -0.78 to 1.61 with all month skewness of 0.151, four months with negative skewness and remaining months (including all month value) very less positively skewed. Very high range of skewness for some months and lower for others is observed for IPCL in the range of -5.85 to 1.83. In respect of all months skewness, IOCL is more skewed with value of 1.46 and BPCL, HPCL and ONGC evidenced negative skewed return distribution.

Regression Result Analysis

Table 2 shows the results of regression analysis regarding month of the year effect for the selected Gas, Oil and Refineries companies. It is observed that for BRPL, there is positive February effect (with B_2 co-efficient of 0.005) and August effect(with B_8 coefficient of 0.022) found significant at 1%, while there is a significant (at 5 % level) positive effect on September with the co-efficient (B_9) value of 0.005.

The return series for BPCL showed negative April effect (B_4 coefficient value -0.045) and September effect (B_9 coefficient value 0.251) found significant at 1%. Similarly, for GAIL there is positive August effect (B_8 coefficient value 0.021) and October effect (B_{10} coefficient value 0.037) found significant at 1%, without any significance for remaining ten months coefficient. In case of HPCL, there is positive April effect (B_4 coefficient value 0.004), September effect (B_9 coefficient value 0.008) found significant at 1%, and positive July effect (with B_7 co-efficient value of 0.006) significant at 5 % level.

Return series of IOCL evidenced negative January effect (with B_1 co-efficient of -0.048) positive March effect (with coefficient value 0.008) found significant at 1% and significant (at 5 % level) positive effect on September with the co-efficient (B_9) value of 0.006. For IPCL, there is positive February effect (with B_2 co-efficient of 0.005) found significant at 1% .while September effect (with B_9 co-efficient value of 0.05) is found significant at 10%.

Again it is observed that for ONGC there is positive February effect (B_2 coefficient value 0.156) and negative September effect (B_9 coefficient value -0.07) found significant at 1%, with regression analysis failing to observe any significance for remaining ten months coefficient

It is seen for RIL that, there is negative January effect (with B_1 co-efficient of -0.008) significant at 1%, while there is a significant (at 5 % level) positive effect on August with the co-efficient (B_8) value of 0.042.

On the analysis of the values of R^2 (coefficient of determination), it is found that highest value of 0.71 is observed for BPCL and lowest value of 0.58 for RIL, with the R^2 values of the other companies in the range of 0.58 to 0.71 which implies that the regression model is an appropriate one and provides good results regarding the significance of the coefficients.

The F-value found from the regression analysis in relatively higher is the range of 1.747 to 7.58 with IOCL showing has highest F-value of 7.58 (with P-value of 0.0017), followed by RIL with F-value 5.085 and the corresponding P-value of 0.0024.

Findings of the study

Findings of descriptive statistics

With regard to average all month return, highest and lowest value is found for IPCL and BPCL, respectively. With regard to standard deviation for all month return, highest and lowest value is found for BPCL and IOCL, respectively. The kurtosis of distribution for all month return is highest and lowest for HPCL and RIL, respectively. Similarly with regard to skewness for all month return, highest and lowest value is found for IOCL and HPCL, respectively.

Findings of Regression analysis

The study has analyzed the month of the year effect in the selected eight Gas, Oil and Refineries companies. It is found that BRPL has February effect, August effect significant (both at 1%) and September effect significant (at 5%). Further, BPCL has April effect and September effect (both significant at 1%). In case of GAIL, the study finds significant August effect and October effect (both at 1%). HPCL is also observed to have significant April effect, September effect (both at 1%) and July effect (significant at 5%). For IOCL, the study finds significant January effect, March effect (both at 1%) and September effect (significant at 5%). With respect to IPCL, the study finds significant February effect (at 1%) and September effect (significant at 10%). ONGC is also observed to have significant February effect (at 5%) and September effect (significant at 1%). In case of RIL the study finds significant January effect, March effect (both at 5%), and September effect (significant at

1%). On the whole, there is an evidence of month of the year effect. Further, the value of R^2 (in the range of 0.58 to 0.71) is relatively higher which indicates that the deviation in the dependent variable is well explained by the independent variables (month dummies). Moreover, the F-value in the range of 1.747 to 5.085 is also relatively higher.

Conclusion

The study presented a comprehensive analysis of the stock price behavior, more specifically on the seasonality effect, in the Indian stock market. The seasonality effect is examined by a detailed analysis of month of the year effect, the period of study spans over five years i.e. from 2006 to 2010. With the help of multiple regression, the study found evidence of month of year effect for the price series with regard to the selected companies. Further, the value of R^2 for the derived regression models for each of the selected companies is relatively higher which indicates that the deviation in the dependent variable is well explained by the independent variables (month dummies). On the whole, the price series in the Indian stock market showed signs of return seasonality with respect to month of the year effect.

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Table 1 Descriptive statistics

Name of company	Parameter	Jan	Feb.	Mar	April	May	June	Jul	Aug	Sep	Oct	Nov	Dec	All months
BRPL	Mean	-0.04	-0.02	-0.004	-0.01	0.022	0.046	-0.05	-0.06	-0.09	-0.07	-0.03	0.038	-0.03
	Median	0.012	0.002	-0.067	-0.18	0.198	0.623	-0.09	-0.31	0.007	-0.07	-.124	0.046	-0.012
	Standard deviation	0.036	0.044	0.035	0.041	0.024	0.027	0.024	0.039	0.039	0.044	0.049	0.028	0.031
	Kurtosis	0.851	0.768	2.544	1.289	3.476	2.489	3.412	0.408	0.966	1.529	0.725	0.721	1.612
	Skewness	-.062	0.238	-0.61	0.338	1.613	1.103	-0.78	0.134	-0.15	-0.18	0.332	0.797	0.151
BPCL	Mean	-0.18	0.074	-0.02	0.097	0.061	0.074	-0.03	-.164	-0.09	-0.65	-0.05	0.068	-0.08
	Median	-0.02	0.341	-0.07	0.078	0.045	0.088	-0.05	-0.324	0.002	-0.61	-0.05	0.075	-0.17
	Standard deviation	0.081	0.067	0.084	0.096	0.062	0.058	0.064	0.057	0.062	0.067	0.055	0.046	0.045
	Kurtosis	23.12	2.819	25.47	2.777	31.02	5.147	40.78	4.442	5.109	2.402	1.752	1.397	2.469
	Skewness	-1.36	0.923	0.102	0.386	4.190	1.842	3.213	0.786	-0.16	0.549	0.429	1.157	-0.122
GAIL	Mean	0.053	0.056	-0.03	0.005	-0.04	0.006	0.078	0.079	0.025	-0.06	0.005	0.044	0.005
	Median	0.045	0.452	0.021	0.002	0.001	-0.023	0.056	0.091	0.128	-0.08	0.002	0.341	0.033
	Standard deviation	0.035	0.031	0.038	0.057	0.033	0.072	0.087	0.051	0.392	0.069	0.037	0.029	0.042
	Kurtosis	1.882	11.85	2.930	1.874	1.544	2.501	9.818	2.292	10.97	2.962	2.171	14.44	2.316
	Skewness	1.363	2.491	-0.42	0.907	0.696	0.494	-1.57	1.478	-1.38	-0.18	0.997	2.982	0.862
HPCL	Mean	-0.01	-0.05	-0.12	0.079	0.039	0.051	-0.06	-0.06	0.034	-0.04	-0.03	0.037	-0.04
	Median	-0.12	-0.11	-0.31	0.022	0.122	0.063	-0.05	0.01	0.077	-0.01	-0.06	0.067	0.07
	Standard deviation	0.098	0.027	0.021	0.089	0.018	0.071	0.018	0.026	0.026	0.028	0.029	0.027	0.036
	Kurtosis	3.077	5.493	2.195	4.252	13.49	9.858	1.905	5.516	18.11	3.512	18.20	8.268	8.222
	Skewness	0.264	-0.79	0.304	1.049	2.942	0.246	0.365	-0.62	3.571	0.008	3.149	2.536	-1.36

Contd..

Name of company	Parameter	Jan	Feb.	Mar	April	May	June	Jul	Aug	Sep	Oct	Nov	Dec	All months
IOCL	Mean	-0.02	0.015	0.017	0.013	-0.06	0.024	-0.02	0.002	0.008	0.015	0.008	0.126	0.024
	Median	0.001	0.077	0.004	0.002	0.005	0.085	0.011	-0.08	0.005	0.017	0.019	0.088	0.012
	Standard deviation	0.026	0.019	0.023	0.023	0.024	0.017	0.022	0.017	0.022	0.019	0.029	0.016	0.019
	Kurtosis	1.308	0.921	1.523	2.542	3.093	2.065	2.256	3.765	2.075	4.643	1.365	10.57	3.422
	Skewness	-0.17	0.352	-0.23	0.363	0.224	1.335	-0.28	1.00	-0.07	1.835	-0.27	-0.80	1.468
IPCL	Mean	0.005	-.018	-0.03	-0.018	0.001	0.002	0.018	0.002	-0.04	0.053	-0.04	-.001	0.057
	Median	0.022	-0.012	0.004	-0.28	0.003	0.003	0.016	-0.08	-0.03	0.288	0.004	-.033	0.213
	Standard deviation	0.038	0.032	0.042	0.035	0.036	0.005	0.040	0.053	0.061	0.030	0.062	0.036	0.032
	Kurtosis	-0.34	3.149	1.496	1.393	1.750	1.818	1.940	1.889	65.13	2.094	34.14	2.156	2.028
	Skewness	0.157	-1.76	-0.34	-1.36	0.083	1.834	0.015	1.822	-5.85	1.270	-3.69	-0.14	1.262
ONGC	Mean	0.005	-0.02	0.096	-0.02	0.044	0.032	-0.02	0.002	-0.72	0.002	-0.01	0.037	-0.01
	Median	0.002	0.002	0.044	-0.08	0.034	0.041	-0.09	0.066	-0.93	0.002	0.001	0.032	0.044
	Standard deviation	0.039	0.018	0.034	0.023	0.028	0.014	0.029	0.023	0.023	0.029	0.023	0.025	0.027
	Kurtosis	9.811	0.429	4.242	0.251	7.896	2.446	4.429	3.573	0.649	3.193	0.715	15.39	4.696
	Skewness	-0.79	0.339	-0.54	0.057	2.407	1.345	-0.75	0.401	0.023	-0.06	0.334	3.364	-0.18
RIL	Mean	0.060	-0.08	0.001	0.005	0.047	0.042	0.008	-0.18	0.009	-0.01	0.003	0.041	0.04
	Median	0.011	-0.06	0.002	0.014	0.055	0.034	0.085	-0.01	0.087	-0.03	0.007	0.064	0.03
	Standard deviation	0.028	0.025	0.048	0.025	0.049	0.027	0.036	0.022	0.032	0.025	0.027	0.023	0.023
	Kurtosis	2.981	1.294	11.41	1.015	38.69	10.79	10.33	-0.67	5.733	0.778	9.525	43.30	0.781
	Skewness	-0.29	-0.55	-0.97	0.219	5.048	2.648	1.721	0.214	-0.25	0.065	0.115	5.393	0.439

Table 2 Regression results of month of the year effect

Company	Constant	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9	B_{10}	B_{11}	B_{12}	R^2	F-value
BRPL	0.005	0.005*	0.052	-.005	0.005	0.045	0.004	0.022*	0.005**	0.036	0.006	0.007	0.63	4.72 (0.0035)
BPCL	0.006	-.052	0.065	-.045*	-0.24	0.062	-.007	0.025	0.251*	-0.05	0.009	0.004	0.71	2.358 (0.057)
GAIL	0.051	0.006	0.008	0.008	0.001	-.005	-.005	0.021*	-0.23	0.037*	-0.03	0.003	0.66	5.025 (0.0064)
HPCL	-0.085	-.052	0.002	0.004*	0.007	0.008	0.006**	-.005	0.008*	0.085	.0025	0.007	0.67	2.67 (0.012)
IOCL	-0.048*	0.002	0.008*	0.012	-0.01	0.002	0.036	-.002	0.006**	-0.23	0.02	-0.01	0.61	7.58 (0.0017)
IPCL	0.002	0.005*	0.006	0.007	0.005	0.0036	0.049	-.034	0.05***	-.005	-0.25	0.005	0.68	4.369 (0.0057)
ONGC	0.056	0.156**	-.052	-.008	0.052	-.0052	0.0054	0.025	-0.07*	-.036	0.008	-.003	0.65	1.747 (0.142)
RIL	-0.008*	0.125	0.023*	0.006	-0.05	-.0011	0.0063	0.042**	0.026	0.005	0.004	-.001	0.58	5.085 (0.0024)

Note: * , ** and ***denote significance at 1%,5% and 10%, respectively; the values in parenthesis under F-value denote the p-value of the regression analysis.