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INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 3, Issue, 3, pp.071-076, March, 2011

ISSN: 0975-833X

RESEARCH ARTICLE

ESTIMATING THE RISK OF DAY SPECIFIC POSITIVE RETURN UNDER THE INFLUENCE OF FUTURES CONTRACTS

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ARTICLE INFO

Article History:

Received 19th January, 2011
Received in revised form
8th February, 2011
Accepted 27th February, 2011
Published online 13th March, 2011

Key words:

Day specific return,
Calendar anomalies,
Futures trading,
Logistic regression.

ABSTRACT

The unpredictability of return experienced by any stock market is a pivotal factor to open out the issue which is extremely sensitive on the part of investors, regulators and policy makers in parlance. The effect of different day implies that the return is not independent. Investment opportunities can therefore turn out to be very complicated due to this abnormal behavior. The present study focuses on this type of opportunity, specifically on the analysis of the effect of different day on the return of Indian Stock Market under the influence of futures contract. In order to capture the exclusive effect of futures contracts introduction, the data on daily price of CNX-Nifty Index has been taken from June 1999 to June 2001.The findings indicate that abnormal behavior is present in the returns of the Indian Stock Market. Mean return is found maximum on Wednesday in comparison to other trading days. The difference in mean return within the trading days is statistically significant and the introduction of index futures trading does not influence the behavior of day specific positive return. The finding is fruitful particularly to small investors in relation to their decision regarding the timing of entry and exit from the financial market.

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INTRODUCTION

Financial markets have been witnessing calendar anomalies for the last three decades and the 'day of the week effect' is significant one that attracted many researchers from different economies to explore the issue. The day of the week effect implies that stock return is not independent of the day of the week in which they are generated. The existence of abnormal behavior in return and volatility is well documented in financial literature and it is critical on the part of investors to decide about the timing of entry and exit. The growing use of daily data has led to additional research in the financial literature, specifically extending the analysis of seasonal behavior to include the day of the week effect, the weekend effect and the bank holiday effects. The financial literature on this topic has offered several justifications for these anomalies: the absence of negotiations during the weekends; Monday availability of information regarding responses to generated information

during non-listing days; market transaction payment procedures; effects derived from liquidity etc. This seasonality has been the subject of different studies that detected empirical evidence of abnormal yield distributions based upon the day of the week. The pioneering work was carried out using data from the U.S. market. The following authors, among others, made important contributions: Osborne (1962), Cross (1973), French (1980), Gibbons and Hess (1981), Lakonishok and Levi (1982), Keim and Stambaugh (1984) and Rogalski (1984). This effect has also been analyzed in security markets under an international setting in works by Jaffe and Westerfield (1985a), (1985b), Aggarwal and Rivoli (1989), Solnik and Bousquet (1990), Chang, Pinegar and Ravichandran (1993), Athanassakos and Robinson (1994), Dubois and Louvet (1996) and Kyimaz and Berument (2001). The objective of this paper is to empirically contrast the day of the week effect in Indian stock market from June 1999 to June 2001. French and Roll (1986) propose that the variances for the days following an exchange holiday should be larger than other days. Harvey and Huang (1991) observe higher volatility in the interest rates and foreign exchange futures markets during first trading hours on Thursdays and Fridays. It is important to know whether there are variations in volatility of stock returns by day of the week patterns and whether a high (low) return is associated with a corresponding high (low) return for a given day. Having such knowledge may allow investors to adjust their portfolios by taking into account day of the week variations in volatility. Finding certain patterns in volatility may be useful in several ways, including the use of predicted volatility patterns in hedging and speculative purposes and use of predicted volatility in valuation of certain assets specifically stock index options.

Osborne (1962) and Cross (1973) discovered empirical evidence demonstrating that Monday yields were lower than Friday ones for the S&P 500 Index. Similar results are presented in French (1980), upon comparing Monday, Friday and weekly average returns for the same index. He observed that Friday returns were greater than the average while Monday returns were lesser than the average. Gibbons and Hess (1981) also came to the conclusion that Mondays resulted in negative returns. Their study was based on a sample of 30 stocks from the Dow Jones Industrial Index. Lakonishok and Levi (1982) have offered market transaction payment procedures as an explanation for the seasonal behavior in the daily yields. Keim and Stambaugh (1984) tried to explain the weekend effect in the American market as being related to the measurement errors in stock prices. These earlier studies of the day of the week effect were based on yield calculations at closing between two dates. Rogalski (1984) approached the problem by dividing yields into non-trading periods (from close to opening) and trading periods (from opening to close). He came to the conclusion that negative Monday returns were generated between the Friday closing and Monday opening, thus not taking into account the differences in average returns on specific days of the week when considering the trading period. These studies were first carried out in U.S. Stock Market and later in other international financial markets. This approach allowed Jaffe and Westerfield (1985a) to obtain evidence of the weekend effect for the markets in Canada, Australia, Japan and the United Kingdom. Negative Tuesday returns were also obtained for the Japanese market (see Jaffe and Westerfield (1985b)). Similar results are presented in Condoyanni, O'Hanlon and Ward, (1987) for the Singapore, Japan and Australia markets. The French and Italian markets are studied by Solnik and Bousquet (1990) and Barone (1990), respectively.

Evidence has also been found showing the disappearance of the day of the week effect in Belgium, Denmark, Germany and the U.S. for a sample of 24 national indexes. Athanassakos and Robinson (1994) observed negative Tuesday returns in the Canadian market that exceeded those from Mondays. Nevertheless, Dubois and Louvet (1996) did not arrive at any clear conclusions when they studied nine international markets using both parametric and non-parametric tests. Several conditional autoregressive heteroskadastic models have been developed and applied to the analysis of financial series by several researchers since the work of Engle (1982). This approach has also been widely used in the analysis of seasonality, as can be specifically seen in Corhay and Rad (1994),

Theodossiou and Lee (1995) and Miralles and Miralles (2000). They observed daily seasonality in London, Paris, Madrid and Milan. Miralles and Miralles (2000) analyzed daily seasonality in the Lisbon Stock Exchange using the same model. Kyimaz and Berument (2001) studied daily seasonality in five international markets. Though substantial literature is available with regard to day of the week effect in the context of developed market, studies pertaining to developing markets are scanty. In particular, the said issue has been overlooked in the context of Indian capital market and that provided us impetus to undertake research on the day of the week effect. The finding is fruitful particularly to small investors in relation to their decision regarding the timing of entry and exit from the financial market.

MATERIALS AND METHODS

The time series of daily price from the S&P CNX Nifty Index of the Indian stock market have been used in this paper. It is worthwhile to mention here that futures contract on index was introduced in India on June 14, 2000 and to capture the exclusive effect of futures contract introduction, the data on daily price of CNX-Nifty Index has been taken from June 14, 1999 to June 12, 2001. The returns have been calculated as first differences in natural logarithms according to the following expression:

$$r_t = \ln\left(\frac{p_t}{p_{t-1}}\right)$$

where p_t and p_{t-1} are the closing value of the index for period *t* and *t-1* respectively. These returns are assumed to be independent and the analysis of the day of the week effect was carried out by taking the observations on trading day in continuous manner to avoid possible bias from the loss of information due to holidays. A total of 502 observations were used for the analysis. One of the most common seasonality anomalies is the effect of the different days on the return. This analysis is based on the hypothesis that the return produced by each security is not independent of the different days of the week. An initial approximation that could contrast the different days of the week effect can be carried out with a regression model, similar to Miralles and Miralles (2000). They included five dummy variables, one for each day of the week.

$$r_{it} = \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_5 D_5 + \varepsilon_t$$

where r_{it} is the daily return

D_j 's are the dummy variable for the different days of the week (for Monday j=1, Tuesday j=2, Wednesday j=3, Thursday j=4 and Friday j=5)

β_j 's are the coefficients which represent the average return for the respective day of the week

ε_t is the error term

It is worth noting that even though the corresponding return on a specific day of the week is significantly different than zero, this does not imply seasonality. Thus it is necessary to perform a means test. This test verifies if the returns are independent of the day of the week that they are produced in, or on the contrary, they are characterized by statistically similar average returns. The rejection of the null hypothesis would imply that a day of the week effect is indeed present. Further, an attempt has been made in this study to analyse the data with another technique after hypothesizing day specific return that it is a dichotomous variable i.e. if return is positive, 1 is assigned and 0 is assigned for negative return. Then, logistic regression techniques have been applied to explore the effect of different trading day on the return. The logit of the probability of return can be modeled as follow:

The basic form of Logistic function is

$P = \frac{1}{1+\exp(-z)} = \frac{\exp(z)}{1+\exp(z)}$; where z is the predictor variable.

Let us suppose that z instead of being a single predictor variable, is a linear combination of a set of predictor variables i.e.

$$z = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + \ldots\ldots\ldots\ldots\ldots + b_n x_n$$

and therefore

Table 1. Descriptive statistics of S&P CNX NIFTY daily return

From June 1999 to June 2001						
Statistics	**All**	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Mean	-0.0000603	-0.001517	-0.002138	0.006795	0.0000297	-0.003806
Median	0.000866	-0.000713	0.000125	0.006031	0.000649	-0.002662
Maximum	0.072771	0.072771	0.047815	0.059960	0.053848	0.069261
Minimum	-0.072023	-0.058580	-0.072023	-0.033416	-0.047609	-0.048848
Std. Dev.	0.018540	0.020559	0.017921	0.018006	0.016773	0.017790
Skewness	-0.074620	0.018338	-1.025478	0.208426	0.023054	0.370435
Kurtosis	4.602196	4.428024	6.118768	3.119445	4.284848	4.967365
Jarque-Bera	54.15959	8.417467	58.05473	0.806970	7.093956	17.86180
Probability	0.000	0.015	0.000	0.668	0.029	0.000
Observations	502	99	100	103	103	97
From June 1999 to June 2000						
Mean	0.000937	0.000936	-0.00443	0.008928	-0.00032	-0.0006
Median	0.001168	0.002711	-0.00329	0.008355	0.001567	-0.00221
Maximum	0.072771	0.072771	0.047815	0.054851	0.053848	0.069261
Minimum	-0.072023	-0.05072	-0.07202	-0.02653	-0.04761	-0.03423
Std. Dev.	0.020060	0.023377	0.019618	0.017767	0.019585	0.017871
Skewness	0.087697	0.291124	-0.82319	0.113292	0.025991	1.178238
Kurtosis	4.486860	3.814735	5.636917	2.722283	3.819121	6.403101
Jarque-Bera	23.25573	2.005612	20.13306	0.272993	1.4596	34.26814
Probability	0.000	0.367	0.000	0.872	0.482	0.000
Observations	249	48	50	51	52	48
From June 2000 to June 2001						
Mean	-0.001042	-0.00383	0.000156	0.004703	0.000384	-0.00695
Median	0.000527	-0.00111	0.00254	0.005027	0.000649	-0.00318
Maximum	0.059960	0.023851	0.0284	0.05996	0.036528	0.021934
Minimum	-0.063095	-0.05858	-0.0631	-0.03342	-0.04007	-0.04885
Std. Dev.	0.016894	0.017422	0.015914	0.018165	0.013506	0.017318
Skewness	-0.412316	-0.92225	-1.20456	0.319258	0.097436	-0.49592
Kurtosis	4.340607	4.200297	6.546511	3.579264	3.755479	2.336013
Jarque-Bera	26.11429	10.29106	38.29505	1.610373	1.293538	2.908586
Probability	0.000	0.006	0.000	0.447	0.524	0.234
Observations	253	51	50	52	51	49

Table 2. Univariate logistic regression analysis to assess the risk of day specific positive return according to the different characteristics

Characteristics	*Odds Ratio*	*Standard Error*	*Z Value*	*95% Confidence interval*	
Futures Contracts	*1.031*	*0.184*	*0.864*	*0.726*	*1.463*
Monday	*0.790*	*0.178*	*0.295*	*0.509*	*1.228*
Tuesday	*0.896*	*0.200*	*0.624*	*0.578*	*1.389*
Wednesday	*2.287*	*0.535*	*0.000*	*1.446*	*1.616*
Thursday	*1.012*	*0.223*	*0.957*	*0.656*	*1.561*
Friday	*0.610*	*0.139*	*0.030*	*0.390*	*0.954*

Table 3. Multivariate logistic regression analysis to assess the risk of day specific positive return according to the different characteristics

Characteristics	*Model I*				
	Odds Ratio	*Standard Error*	*Z Value*	*95% Confidence interval*	
Monday	*0.426*	*0.124*	*0.003*	*0.241*	*0.755*
Tuesday	*0.471*	*0.137*	*0.010*	*0.267*	*0.634*
Thursday	*0.520*	*0.150*	*0.023*	*0.295*	*0.915*
Friday	*0.345*	*0.102*	*0.000*	*0.194*	*0.615*
Futures Contracts	-	-	-	-	-
-2Log likelihood	*679.502*				
Characteristics	*Model II*				
	Odds Ratio	*Standard Error*	*Z Value*	*95% Confidence interval*	
Monday	*0.426*	*0.124*	*0.003*	*0.240*	*0.755*
Tuesday	*0.472*	*0.137*	*0.010*	*0.267*	*0.834*
Thursday	*0.520*	*0.150*	*0.024*	*0.295*	*0.916*
Friday	*0.345*	*0.102*	*0.000*	*0.194*	*0.615*
Futures Contracts	*1.034*	*0.188*	*0.856*	*0.724*	*1.475*
-2Log likelihood	*679.470*				

Reference category: Wednesday

$$P = \frac{1}{1+\exp[-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + ... + b_nx_n)]}$$

so that

$$1-P = \frac{\exp[-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + ... + b_nx_n)]}{1+\exp[-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + ... + b_nx_n)]}$$

Therefore

$$odds = \frac{P}{1-P} = \frac{1}{\exp[-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + ... + b_nx_n)]}$$

$$= \exp[b_0 + b_1x_1 + b_2x_2 + b_3x_3 + ... + b_nx_n]$$

$$\text{Ln}(Odds) = (b_0 + b_1x_1 + b_2x_2 + b_3x_3 + ... + b_nx_n)$$

Where $b_0, b_1, b_2, b_3 ..... b_n$ are predictors.

RESULT AND CONCLUSIONS

The study of the effect of the different days of the week in the returns for the S&P CNX Nifty Index that are included in our sample is carried out based on the estimates obtained from the daily returns of the stock market considered. The descriptive statistics of the return for the observed period under study have been presented in the Table 1, which reveals that the mean return is negative on all days except Wednesday and Thursday. But, the return on Wednesday is much higher than the return on Thursday during the period under study.

Further, four dummy variables have been used to account for daily effect in the stock market for each trading day except Wednesday. For this purpose, the univariate and multivariate logistic regression model is used. The meaning of odds ratio for each one of the dummy variables could reveal the presence of a return during a day of the week with respect to that of Wednesday. The obtained results are summarized in Table 2 & 3, which indicate that the day of the week effect is present in the Indian stock market since the return for each day of the week is especially different than that of other days. Further, the return on Wednesday has been found significantly positive in comparison to other days of trading. Table 2 shows that the return on Wednesday is 2.29 times more than other trading day. On Thursday the likelihood of positive return is 12 percent more than other trading day while Monday, Tuesday and Friday have less chance to have positive return i.e. 21, 10 and 39 percent respectively less chance to have a positive return. The impact of futures contracts on positive return is not significant; the chance of positive return is only 3 percent in case of futures introduction. Table 3 reveals the impact of futures introduction on positive return after controlling all trading days by setting two different models. Model I shows that there is a less chance to get positive return on each trading day in comparison to Wednesday. The chance of having positive return on Monday, Tuesday, Thursday and Friday are 57, 53, 48 and 65 percent respectively significantly less in comparison of positive return on Wednesday. In the Model II, futures contract has been introduced and the odds ratios are found similar to the Model I. Model II disclose that there is no significant impact of futures contract on the positive return on each trading day but it is 3.4 percent more but statistically insignificant. The -2log likelihood for Model II is slightly less than the -2log likelihood for Model I which shows that the Model II is a better model than Model I. This fact tells us that the return for the Indian market is dependent on the different days of the week.

The importance of an analysis of the anomalies for stock market with respect to return encountered for the day of the week can not be ignored. The aim of each investor is to maximize the binomial yield-risk from his investment. Thus, it is especially important to analyse fluctuations, which are produced in the market. Table II reveals that there is the presence of abnormal volatility i.e. behavior of market in terms of return on Wednesday in the Indian Stock Market during the period under study. This finding is not in agreement with Kyimaz and Berument (2001). There is, however, presence of abnormal volatility on Mondays and Fridays in Denmark. Other observations include significantly distinct volatility on Mondays and Thursdays, with respect to Wednesday, in Spain, Holland, Italy and Switzerland. The case is different for abnormal volatilities for the United Kingdom and France, where the days are Tuesdays and Thursdays, respectively. Seasonal behavior is also apparent on Tuesdays and Fridays for the cases of Germany, Austria and Sweden. Abnormal volatility occurs on Thursdays and Fridays in Belgium. Finally,

Portugal and the Czech Republic show no changes with regards to the day of the week. The highest return on Wednesday might be due to the fact that Wednesday comes in the middle of the week and naturally provides the highest number of trading days before and after any transaction. On Wednesday, investors have information sets of the last two days and they can develop better investment strategies for the next two days and have more time to inculcate the information.

Calendar anomalies in general and day of the week effect in specific have been well documented in the financial literature. The said issues have been explored extensively in developed market in the world. However, empirical studies are scanty in the context of developing market like that of Indian stock market. The present study in intended to explore the day of the week effect on the return and also analyses any change in the abnormal behavior of day specific return after the introduction of index future trading in India in June, 2000. our analysis focused on an empirical comparison of the day of the week effect in the Indian stock market. The findings indicate that abnormal behavior is present in the returns of the Indian Stock Market. Mean return is found maximum on Wednesday in comparison to other trading days. The difference in mean return within the trading days is statistically significant and the introduction of index futures trading does not influence the behavior of day specific positive return. The finding is fruitful particularly to small investors in relation to their decision regarding the timing of entry and exit from the financial market.

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