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MONTHLY SEASONALITY IN EMERGING MARKET: Evidence from Bangladesh

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ABSTRACT

The presence of the seasonal anomaly in stock returns has been reported extensively in finance literature. This paper examines the presence of monthly anomaly in Dhaka Stock Exchange (DSE), the premier stock exchange of Bangladesh. Data used in the study include daily closing prices of DSE indices such as DSE all share prices index (DSI), DSE general index (DGEN) and DSE 20 index for a period of 01.01.2001-30.06.2010. Several hypotheses have been formulated; those hypotheses have been tested and dummy variable regression was used in the study. The result indicates that May and June returns are positive and statistically significant. Result also reveals that the mean daily returns between two consecutive months differ significantly for the pairs April-May, June-July and December-January. Result also shows that the average monthly returns of every month of the year are not statistically equal. Dummy variable regression result shows that only May have positive and statistically significant coefficient. The conclusion of all the findings is that significant monthly seasonality is present in DSE which is a denial of efficient market hypothesis.

Keywords: Efficient Market Hypothesis, Stock market anomaly, Monthly seasonality, Dhaka Stock Exchange, Dummy variable regression.

1. INTRODUCTION

This paper examines monthly seasonality in an emerging stock market of Bangladesh. The presence of monthly seasonality will have important policy implication for the investors to formulate investment strategy to earn some excess return and presence of monthly seasonality will be denial of efficient market hypothesis (EMH).The efficient market hypothesis (EMH) was introduced by Eugene Fama (1965) few decades ago which claims that in an efficient market stock prices fluctuate randomly through time, that is stock prices are supposed to follow random walk in an efficient market. This implies that future stock prices are not predictable on the basis of past prices, which means stock price changes are unpredictable. Since the introduction of EMH by Fama (1965) a large body of empirical researches has been conducted to examine the randomness of stock price behavior to conclude about the efficiency of a capital market.

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Now a days one of the popular areas of research in finance literature is finding out a particular seasonality in stock returns which invalidate the paradigm of efficient market hypothesis. EMH also states that the expected return on a financial asset should be uniformly distributed across different units of time. But till date researchers have documented several calendar anomalies in the stock returns such as January effect, Turn of the month effect, Day of the week effect or Monday effect, Holiday effect and so on. The presence of the calendar anomalies is a rejection of the weak form of efficient market hypothesis which states that stock returns are time invariant which means that there is no short-term seasonal pattern in the stock returns. The subsistence of seasonal pattern in the stock return infers that a market is inefficient and investors should be able to earn abnormal return. That's why finance researchers have been interested to find out the existence of the calendar anomalies or seasonality in the stock returns in different markets. Numerous studies have investigated the seasonal behavior of monthly stock returns of a number of countries. But most of the studies were conducted on developed countries (see Rozeff and Kinney (1976), Lakonishok and Smidt (1988), Keim (1983) and Reinganum (1983), Haugen and Jorion (1996), Riepe (1998, 2001). The "January effect" is the most important hypothesis tested extensively in the literature to find out monthly seasonality. Researchers are giving more attention to emerging capital markets now a days to know the monthly seasonal pattern in those markets [see, Maghyereh (2003), Pandey (2002), Alagidede and Panagiotidis (2006), Al- Saad and Moosa (2005), Doran et al. (2008)]. In Bangladesh only one study has been conducted so far on the DSE return series of Bangladesh to examine the monthly seasonality [see, Bepari and Mollik (2009)]. But the study considers only one index of DSE (DSI index). No study has been conducted so far considering all the indices of DSE Thus this study is an attempt to examine the presence of any monthly seasonality in DSE considering all the three indices of DSE.

So the specific objective of this paper is to investigate the existence of monthly seasonality in stock returns in Dhaka Stock Exchange (DSE). The study uses daily closing share price data of the DSE all share price index (DSI), DSE 20 (DSE-20) and DSE General Index (DGEN) from 01.01.2001 to 30.06.2010 for this purpose. The results of the study confirmed the presence of monthly anomaly in stock returns in DSE. This finding has important implications for financial managers, financial analysts and investors for devising investment strategies in DSE.

The remainder of the paper is organized as follows. Section 2 provides literature review. Section 3 discusses testable hypotheses, the data, time frame considered right through the study and methodological issues. Section 4 provides empirical results and findings. A summary is given in section 5.

2. LITERATURE REVIEW

A large body of empirical literature already exists to explain monthly seasonality in different stock market across the globe. In an early attempt Wachtel (1942) showed that January returns exceed those of other returns. In some later studies Officer (1975) and Rozeff and Kinney (1976) revisited the phenomenon and mostly supported Wachtel (1942). Gultekien and Gultekien (1983) and Schultz (1985) also found unusually high returns in January. Many researchers have found that there is a close relationship between January effect and size effect. Many researchers have concluded that small capitalization firms earn greater returns in January than that of large capitalization firms. Banz (1981) and Reinganum (1981) were the pioneer to the concept of January effect and size effect. Later Brown, Keim, Kelidon and Marsh (1983), Kato and Schallheim (1985), Fama and French (1992), Berk (1995), Baker and Limmack (1998) and Garza-Gomez, Hodoshima and Kunimura (1998) also have found out that small capitalization firms make superior returns than those with higher capitalization firms. Some researchers also found that the unusually high returns that occur in January concentrate in the first few weeks of the month, such as, Keim (1983) and Roll (1983).

Agrawal and Tandon (1994) investigated the monthly seasonality in an international perspective and concluded the mean January returns are high. They used non-parametric Kruskal-Wallis test to test the hypothesis of equality of monthly mean returns and rejected the hypothesis in 11 instances. They also found that the January return ranges from 3% to 6%, where as other monthly returns were lower. Hawawini and Keim (2000) also made an international study of January anomaly and showed that January returns are high relative to other months.

Rozeff and Kinney (1976), Lakonishok and Smidt (1988), Keim (1983) and Reinganum (1983), Haugen and Jorion (1996), Riepe (1998, 2001) and many other examined the monthly seasonality in the US markets. Rozeff and Kinney (1976) investigated January effect using data from 1904 to 1974. They found that the mean January return in the US market was the largest of all months. They also concluded that this finding was robust over most sub-time periods. They showed that mean daily return in January was 0.0348% and next highest monthly return was in July, which was 0.0190%. Lakonishok and Smidt (1988) used Dow Jones index from 1897 to 1986 and found a different result. They found that the January return of 0.818% was the fourth largest return after July, August and December. So they concluded that July, August and December produce superior return than that of January.

A good number of empirical studies regarding the monthly seasonality are also available in European market. In an early study Reinganum and Shapiro (1987) examined the monthly seasonality in UK market. They used a variety of data sources and found that April produced superior returns in the period prior to the introduction of capital gains taxation in 1965. But after the introduction of capital gains taxation in 1965 they found that January returns were superior to those of others. Mills and Coutts (1995) also did a similar study for a period of January 1986 – October 1992. They concluded that January generated the largest returns of any month of the year. They used FT-SE 100 index and FT-SE 250 index for the study. Their results reveal that the mean January daily returns were 0.159% for FT-SE 100 index. But their results also reveal that February generated highest return than any other months for the FT-SE 250 index. They also concluded that in case of both the indices April returns were low and insignificant which contradicted with Reinganum and Shapiro (1987). Arsad and Coutts (1997) did an analogous study for the period of 1935-1994 using FT30 index and supported the results of Reinganum and Shapiro (1987) that overall January returns were the highest of all months.

Mckillop and Hutchinson (1989), Donnelly (1991), Gahan (1993) and Lucey (1994) all have examined the monthly seasonal pattern of the stock returns in various markets. Mckillop and Hutchinson (1989) investigated monthly effect in the context of small firms. They found an April effect but not an August effect. A comprehensive study was made by Donnelly (1991) for a period of 1951-1988 using an index produced by central statistics office. He splitted the data into pre- and post- 1969 samples. He found the conclusive evidence that January return is largest of all months. The mean January return was 2.77% which was higher than the second highest of April mean return of 2%. Gahan (1993) investigated similar seasonal pattern for a period of 1983-1993. She used ISEQ index, the official index of the Irish Stock Exchange for the study. She found the similar result that January returns are the highest. But February and April produced second and third highest return respectively. Lucey (1994) used a comparatively shorter time span to study monthly seasonality using the ISEQ index, the official index of the Irish Stock Exchange, for a period of 1987-1991. Lucey (1994) supported Donnelly (1991) and concluded that January daily returns are the highest.

Although empirical evidence of monthly seasonality have been well documented but most of the studies concentrate on developed markets. Empirical studies in this area on emerging markets are very few. Maghyereh (2003) used the standard GARCH, exponential GARCH (EGARCH) and the GJR models to find out monthly seasonality in Amman Stock Exchange (ASE) of Jordan. But he concluded that there is no evidence of monthly seasonality as well as January effect in the ASE returns. Pandey (2002) and Lazar et al. (2005) examined monthly seasonality in Bombay Stock Exchange of India. They used data from Bombay Stock Exchange's Sensitivity Index. They found out the monthly effect in the stock returns in India. Alagidede and Panagiotidis (2006) investigated day of the week and month of the year effect in the stock exchange of Ghana. They employed rolling techniques to asses the affects of policy and institutional changes. They concluded that rather than January anomaly an April effect is present in Ghana's stock market. Al- Saad and Moosa (2005) studied monthly seasonality in Kuwait Stock Exchange (KSE) using a general index. They applied structural time series model incorporating stochastic dummies. They found that seasonality is present in the monthly stock returns of KSE. They also concluded that a July effect exists in KSE rather than well documented January effect. Doran et al.(2008.) invested seasonal pattern in stock returns of Chinese stock markets. They found that there is significant stock return at the turn of the Chinese New Year, not in January. A good number of empirical studies have been conducted to test the weak form of efficiency in Dhaka Stock Exchange and most the studies provide evidence in contrary to the weak form of efficiency in the DSE (see, for instance Mobarek and Keasey (2000), Ahmed (2002), Rahman, Salat and Bhuiyan (2004), Mohiddin, Rahman and Uddin (2008), Rahman and Hossain, 2006.). But empirical evidence regarding the seasonality in the DSE is very few. Bepari and Mollik (2009) investigated the existence of monthly seasonality in return series of Dhaka Stock Exchange (DSE) of Bangladesh. They used the monthly return data of the DSE all share price index (DSE All Index) for the period from 1993 to 2006 for the analysis. First they tested the stationarity of the return series, and then they used a "combined regression-time series model" with dummy variable for months to find the monthly effect in stock returns in DSE. They concluded that significant monthly seasonality exists in DSE and they found an "April effect" rather than January effect in DSE.

3. HYPOTHESIS, DATA AND METHODOLOGY

3.1. Testable Hypothesis

Hypothesis 1

H_0: The average monthly return of every month of the year is not statistically different from zero

H_1: The average monthly return of every month of the year is statistically different from zero

That is,

Null Hypothesis is H_0: $\mu_{ij} = 0$

Alternative Hypothesis is H_1: $\mu_{ij} \neq 0$

i = 1, 2, 3 (the examined index)

j = 1, 2 …5 (the working days from January to December)

Hypothesis 2

H_0: The average monthly returns between two sequential months are not statistically different

H_1: The average monthly returns between two sequential months are statistically different

That is,

Null Hypothesis is H_0: $\mu_1 - \mu_2 = 0$

Alternative Hypothesis is H_1: $\mu_1 - \mu_2 \neq 0$

Hypothesis 3

H_0: The average monthly return of every month of the year is statistically equal

H_1: The average monthly return of every month of the year is statistically different

Null hypothesis is H_0: $\mu_1 = \mu_2 = \ldots\ldots\ldots\ldots\ldots\ldots = \mu_{12}$

Alternative hypothesis: H_1: $\mu_1 \neq \mu_2 \neq \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \neq \mu_{12}$

$\mu_{1\ldots\ldots\ldots\ldots}$ μ_{12} = Average monthly return of January to December

3.2. Data

Data used in the study include daily closing prices of DSE indices such as DSE all share prices index (DSI), DSE general index (DGEN) and DSE 20 index for a period of 01.01.2001-30.06.2010. All the data have been collected from DSE library.

3.3. Methodology

The paper uses the following equation to determine the average monthly return of the particular index for each day.

$$\frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \qquad (1)$$

$R_{i,t}$ is the return of index i on day t, $P_{i,t}$ is the price of index i on day t and $P_{i,t-1}$ is the price of index i on day t-1.

After calculating daily return, mean monthly return is calculated using the following formula.

$$R_m = \sum \frac{R_{t1} + R_{t2} + \ldots\ldots\ldots\ldots\ldots\ldots + R_{tn}}{N} \qquad (2)$$

Where, R_m is the mean return for each month month, R_{t1} to R_{tn} are the daily mean return for the month, and N is the number of observations during the month

To test the first hypothesis one-sample t-test is used. The t-statistic is calculated according to the following formula:

$$t = \frac{\overline{X - \mu}}{\frac{\delta}{\sqrt{n}}} \tag{3}$$

Where, x is the average return for each month of the year from January to December and for each index, μ is hypothetical mean which equal to zero, δ is the standard deviation of the each month's return from January to December, n is the number of observations of each month from January to December and $\frac{\delta}{\sqrt{n}}$ is the standard error.

In order to test the second hypothesis the study uses two-sample t-test. The t-statistic is calculated according to the following formula:

$$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{SD_1^{\ 2}}{\eta_1} + \frac{SD_2^{\ 2}}{\eta_2}}} \tag{4}$$

Where, $\overline{x}_1$ is the average return of month 1 (e.g. January's average return), $\overline{x}_2$ is the average return of month 2 (e.g. February's average return), SD_1^2 is the standard deviation of returns of month 1(e.g. January), SD_2^2 is the standard deviation of returns of month 2 (e.g. February), η_1 is sample size of month 1(e.g. January) and η_2 is sample size of month 2 (e.g. February).

In the next step, in order to test the third hypothesis the paper uses single factor ANOVA. The standard F-statistic is calculated as following:

$$F = \frac{BSS / df_B}{WSS / df_W} \tag{5}$$

where, BSS is between sum of squares, WSS is within sum of squares and df_B is degrees of freedom between groups and df_w is degrees of freedom within groups.

BSS and WSS are calculated as follows:

$$BSS = \eta_1 \left(\overline{x}_1 - \overline{x}\right)^2 + \eta_2 \left(\overline{x}_2 - \overline{x}\right)^2 + \ldots\ldots\ldots\ldots\ldots\ldots + \eta_n \left(\overline{x}_n - \overline{x}\right)^2 \tag{6}$$

where, η_1, η_2…….η_n is the sample size of every month from January to December, ,…….. $\overline{x}_n$ is the mean return of every month from January to December, and $\overline{x}$ is the population mean.

$$WSS = (\eta_1 - 1)SD_1^{\ 2} + (\eta_2 - 1)SD_2^{\ 2} + ... + (\eta_n - 1)SD_n^{\ 2} \qquad (7)$$

where, η_1, η_2....... η_n is the sample size of every month from January to December, SD_1^2, SD_2^2......SD_n^2 is the standard deviation of returns of each month from January to December

To identify the existence of monthly anomaly the following dummy variable regression will be used:

$$R_{it} = \alpha_1 + \sum_{i=1}^{12} \alpha_i D_{it} + \varepsilon_t \qquad (8)$$

Where, where R_{it} is the monthly return for the stocks in a portfolio for month t, D_{it} are the dummy variables indicating the month of the year, α_1 is the intercept that measures the mean return of January, α_2 through α_{12} are the coefficients that measure the differences between the mean return for January and the mean return for each individual other month, and ε_t is the disturbance term.

4. RESULTS AND FINDINGS

Table 1.1, 1.2 and 1.3 show monthly mean returns, standard deviation of returns and coefficient of variation. To test the first hypothesis, the tables also signify t-values and their corresponding p-values for DSI, DSE-20 and DGEN index respectively. Table 1.1 shows that mean returns for January, February, March, April and July are negative but none of the returns are statistically significant. Rest of the months has positive returns. But among those only May, June, August and September returns are statistically significant. Table 1.2 shows that May, June, September, November and December have positive returns but only May and June returns are statistically significant. According to this table January, February, March, April, July, August and October returns are negative but only January and March returns are statistically significant. Table 1.3 shows that May, June, August, September and December have positive and statistically significant returns. October and November also have positive returns but not statistically significant. Rest of the month has negative returns but the returns are not statistically significant. From the tables (1.1, 1.2, 1.3) it is evident that for all the three indices mean returns for January, February, March, April and July are negative and for May, June, September, November and December monthly mean returns are positive. It is also evident that only positive returns on May and June are statistically significant at 1% significance level for all the three indices thus our testable first hypothesis is rejected for all the three indices. So we can say that significant monthly seasonality effect observed in DSE for all the three indices.

Table 2.1, 2.2 and 2.3 signify monthly mean returns for the pair of months. To test the second hypothesis, the tables also signify t-values and their corresponding p-values for DSI, DSE-20 and DGEN index respectively. Table 2.1 shows that the mean monthly returns between two consecutive months differ significantly for the pairs April-May, June-July, July-August and December-January. For the other pair of months mean returns do not vary significantly. From table 2.2 we find that the mean monthly returns between two consecutive months differ significantly for the pairs April-May, June-July and December-January. Table 2.3 signifies that

Table 1.1
Mean Monthly Return of DSI

Month	Mean Return (%)	Standard Deviation (%)	Coefficient of Variation	t-value	p-value
January	-0.005	0.765	15300	-0.077	0.938
February	-0.082	1.075	1311	-0.926	0.356
March	-0.001	0.904	90400	-0.018	0.986
April	-0.053	1.049	1979	-0.693	0.489
May	0.200	1.07	535	2.633***	0.009
June	0.165	0.945	573	2.489**	0.014
July	-0.089	0.908	1020	-1.418	0.158
August	0.222	1.091	491	2.893***	0.004
September	0.130	0.897	690	1.992**	0.048
October	0.045	1.112	2471	0.562	0.574
November	0.084	2.429	2892	0.476	0.635
December	0.154	0.959	623	1.877	0.063

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level

Table: 1.2
Mean Monthly Return of DSE-20

Month	Mean Return (%)	Standard Deviation (%)	Coefficient of Variation	t-value	p-value
January	-0.196	1.139	581	-2.386**	0.018
February	-0.109	1.080	991	-1.295	0.197
March	-0.067	1.115	1664	-0.846**	0.018
April	-0.059	1.210	2051	-0.668	0.505
May	0.244	1.244	510	2.764***	0.006
June	0.25	1.042	417	3.417***	0.001
July	0.001	1.119	111900	-0.007	0.994
August	-0.047	1.263	2687	-0.525	0.600
September	0.027	0.933	3456	0.397	0.692
October	-0.028	1.048	3743	-0.371	0.711
November	0.084	1.140	1357	0.958	0.340
December	0.178	1.212	681	1.809	0.072

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level

Table: 1.3
Mean Monthly Return of DGEN

Month	Mean Return (%)	Standard Deviation	Coefficient of Variation	t-value	p-value
January	-0.132	1.248	945	-1.384	0.168
February	-0.054	1.193	2209	-0.551	0.582
March	-0.024	1.007	4196	-0.315	0.753
April	-0.068	1.110	1632	-0.809	0.420
May	0.174	1.130	649	2.027**	0.044
June	0.219	0.952	435	3.101***	0.002
July	-0.028	1.000	3571	-0.382	0.703
August	0.211	1.131	536	2.486**	0.014
September	0.145	0.805	555	2.296**	0.023
October	0.090	0.976	1084	1.190	0.236
November	0.118	1.274	1080	1.113	0.268
December	0.195	1.170	600	2.055**	0.042

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level the mean monthly returns between two consecutive months differ significantly for the pairs April-May, June-July, July-August and December-January. It is apparent from the tables (21., 2.2, 2.3) that the mean monthly returns between two consecutive months differ significantly for the pairs April-May, June-July and December-January for all the three indices thus the second hypothesis is rejected for these pair of months. For the other pair of months mean returns do not vary significantly. So we can draw the similar conclusion that the DSE is experiencing monthly seasonality.

Table 2.1
Mean Return of Two Sequential Months of DSI

Pair Months	Mean Return (%)	t-value	p-value
January	-0.005	0.790	0.431
February	-0.082		
February	-0.082	-0.943	0.347
March	-0.001		
March	-0.001	0.546	0.586
April	-0.053		
April	-0.053	-2.256**	0.025
May	0.200		
May	0.200	0.546	0.585
June	0.165		
June	0.165	2.936***	0.004
July	-0.089		
July	-0.089	-3.257***	0.001
August	0.222		
August	0.222	1.175	0.241
September	0.130		
September	0.130	0.816	0.415
October	0.045		
October	0.045	-0.219	0.827
November	0.084		
November	0.084	0.473	0.637
December	0.154		
December	0.154	-1.958*	0.052
January	-0.005		

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level, * denotes significant at 10% significance level

Table 2.2
Mean Return of Two Sequential Months of DSE-20

Pair Months	Mean Return (%)	t-value	p-value
January	-0.196	-0.488	0.626
February	-0.109		
February	-0.109	-0.847	0.398
March	-0.067		
March	-0.067	0.472	0.637
April	-0.059		
April	-0.059	-2.382**	0.018
May	0.244		

table 2.2 contd.

Pair Months	Mean Return (%)	t-value	p-value
May	0.244	0.136	0.892
June	0.250		
June	0.250	2.366**	0.019
July	0.001		
July	0.001	0.27	0.788
August	-0.047		
August	-0.047	-0.389	0.698
September	0.027		
September	0.027	0.530	0.597
October	-0.028		
October	-0.028	-0.958	0.340
November	0.084		
November	0.084	-0.356	0.722
December	0.178		
December	0.178	-2.693***	0.008
January	-0.196		

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level, * denotes significant at 10% significance level

Table 2.3
Mean Return of Two Sequential Months of DGEN

Pair Months	Mean Return (%)	t-value	p-value
January	-0.132	-0.581	0.562
February	-0.054		
February	-0.054	-0.426	0.671
March	-0.024		
March	-0.024	0.679	0.498
April	-0.068		
April	-0.068	-2.06**	0.041
May	0.174		
May	0.174	-0.134	0.893
June	0.219		
June	0.219	2.356**	0.020
July	-0.028		
July	-0.028	-2.156**	0.032
August	0.211		
August	0.211	0.786	0.433
September	0.145		
September	0.145	0.611	0.542
October	0.09		
October	0.09	-0.56	0.577
November	0.118		
November	0.118	-0.03	0.976
December	0.195		
December	0.195	-2.027**	0.044
January	-0.132		

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level, * denotes significant at 10% significance level

Table 3.1, 3.2 and 3.3 symbolize ANOVA tables for DSI, DSE-20 and DGEN index respectively. It is obvious from the tables that for all the indices calculated F-values are greater than critical F-values thus our third hypothesis is rejected. So we can infer that the average monthly return of every month of the year is not statistically equal which supports the existence of monthly seasonality in DSE.

Table 3.1
ANOVA Table of DSI

Source of Variation	SS	df	MS	f-calculated	p-value	f-critical
Among the groups	0.00248	11	0.00023	2.61389***	0.001	2.25567
Within the groups	0.31171	2227	0.00014			
Total	0.31419	2238				

*** denotes significant at 1% significance level

Table 3.2
ANOVA table of DSE20

Source of Variation	SS	df	MS	f-calculated	p-value	f-critical
Among the groups	0.003978	11	0.000361661	2.79269***	0.001	2.255569
Within the groups	0.292158	2256	0.000129502			
Total	0.296136	2267				

*** denotes significant at 1% significance level

Table 3.3
ANOVA table of DGEN

Source of Variation	SS	df	MS	f-calculated	p-value	f-critical
Among the groups	0.0029405	11	0.000267315	2.274577***	0.009	2.256522
Within the groups	0.2364557	2012	0.000117523			
Total	0.2393962	2023				

*** denotes significant at 1% significance level

Table 4.1, 4.2 and 4.3 represent regression results for DSI, DSE-20 and DGEN index respectively. Table 4.1 portrays that May, June August and December have positive coefficients but not statistically significant. Rest of the months has negative coefficients but only February and July returns are significant statistically. Table 4.2 shows that April, May and November have positive and statistically significant coefficients. Only January has negative but statistically insignificant coefficient. Other months have positive coefficient but not significant statistically. Table 4.3 represents that April, May, July, August and November have positive and statistically significant coefficients. February, June, September, October and December also have positive coefficients but statistically insignificant. It is clear from the tables that April, May and November have positive and statistically significant coefficients for all the three indices except DSI index which are consistent with our previous results. February and July have statistically significant and negative coefficients in DSI index which are also consistent with our previous result. Thus we can further conclude that significant monthly seasonality effect present in DSE.

Table 4.1
Regression Result of DSI Index

Variable	Coefficient	Standard Error	t-statistic	Prob.
Intercept	0.1533	0.1011	1.5167	0.1295
January	-0.1619	0.1313	-1.2323	0.2180
February	-0.2357	0.1403	-1.6806*	0.0930
March	-0.1516	0.1346	-1.1258	0.2604
April	-0.2109	0.1329	-1.5868	0.1127
May	0.0438	0.1312	0.3337	0.7386
June	0.0086	0.1307	0.0662	0.9472
July	-0.2419	0.1299	-1.8615**	0.0628
August	0.0629	0.1308	0.4810	0.6305
September	-0.0203	0.1326	-0.1529	0.8785
October	-0.0731	0.1320	-0.5539	0.5797
November	-0.0742	0.1327	-0.5593	0.5760
December	0.1533	0.1011	1.5167	0.1295
R-squared	0.0079	Sum squared residual		31.17093
Adjusted R-squared	0.0026	F-statistic		1.6139
Standard Error	0.0118	Prob. (F-statistic)		0.0810

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level, * denotes significant at 10% significance level

Table 4.2
Regression Result of DSE20 Index

Variable	Coefficient	Standard Error	t-statistic	Prob.
Intercept	-0.1089	0.0886	-1.2292	0.2191
January	-0.0868	0.1205	-0.7200	0.4716
February	0.0423	0.1197	0.3535	0.7237
March	0.0492	0.1214	0.4056	0.6850
April	0.3463	0.1197	2.8934***	0.0038
May	0.3530	0.1192	2.9630***	0.0031
June	0.1075	0.1184	0.9078	0.3641
July	0.0608	0.1193	0.5094	0.6105
August	0.1427	0.1212	1.1766	0.2395
September	0.1141	0.1205	0.9466	0.3440
October	0.1973	0.1247	1.5817	0.1138
November	0.2859	0.1277	2.2385**	0.0253
December	0.0423	0.1197	0.3535	0.7237
R-squared	0.0134	Sum squared residual		29.2158
Adjusted R^2	0.0082	F-statistic		2.7927
Standard Error	0.0114	Prob. (F-statistic)		0.0009

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level, * denotes significant at 10% significance level

Table 4.3
Regression Result of DGEN Index

Variable	Coefficient	Standard Error	t-statistic	Prob.
Intercept	-0.0583	0.0882	-0.6605	0.5090
January	-0.0696	0.1211	-0.5747	0.5656
February	0.0379	0.1198	0.3166	0.7515
March	-0.0116	0.1207	-0.0958	0.9237
April	0.2274	0.1204	1.8885**	0.0591
May	0.2800	0.1192	2.3492**	0.0189
June	0.0307	0.1190	0.2581	0.7964
July	0.2734	0.1199	2.2793**	0.0228
August	0.2066	0.1224	1.6871**	0.0917
September	0.1456	0.1216	1.1979	0.2311
October	0.1820	0.1258	1.4465	0.1482
November	0.2557	0.1244	2.0559**	0.0399
December	0.0379	0.1198	0.3166	0.7515
R-squared	0.0123	Sum squared residual		23.6456
Adjusted R^2	0.0064	F-statistic		2.2746
Standard Error	0.0108	Prob. (F-statistic)		0.0073

*** denotes significant at 1% significance level, ** denotes significant at 5% significance level, * denotes significant at 10% significance level

5. CONCLUSION

This study examines the existence of monthly seasonality effect in DSE. The data and time period considered in this study are daily closing values of DSE indices for a period of 01.01.2001-30.06.2010. This paper formulated several hypotheses and used one-sample t-test, paired sample t-test and ANOVA to test those hypotheses. Dummy variable regression was also used to infer whether seasonal anomaly exist in DSE. The result indicate that for all the three indices mean returns for January, February, March, April and July are negative and for May, June, September, November and December monthly mean returns are positive. It is also evident that only positive returns on May and June are statistically significant at 1% significance level for all the three indices. Result also reveals that the mean daily returns between two consecutive months differ significantly for the pairs April-May, June-July and December-January for all the three indices. For the other pair of months mean returns do not differ significantly. It is obvious from the result that for DSE-20 and DGEN indices calculated F-values are greater than critical F-values thus our third hypothesis is rejected for those two cases. Only for the DSI index, calculated F-values are smaller than critical F-values thus our third hypothesis is accepted. Dummy variable regression result shows that April, May and November have positive and statistically significant coefficients for all the three indices except DSI index.

The results have important practical implications to different capital market participants such as investors, managers and regulatory authorities. Investors can formulate their investment strategies and timing on the basis of this result and can earn some abnormal return by predicting future prices. More specifically said, as we conclude negative February and July returns and significantly positive return on May so investors can buy the shares on February and July and can sell the share on May. By following this trading strategy investors are expected to earn some abnormal return. One weakness of the study is that it does not consider individual share price rather it considers market index. So investment strategy on the basis of the finding of this study in case of individual share may not provide expected result. But if the size of the portfolio is larger that closely represent the market then investment strategy on basis of the finding of this study is expected to provide some abnormal return to the investors. As the presence of the monthly effect anomaly indicates inefficiency of the market, it informs the regulators and policy markers that appropriate measures should be taken to bring informational and operational efficiency in the market.

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