

Variability Analysis of Weekly Trading of Dhaka Stock Exchange

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Abstract

Day-of-the-week effect is a popular focus of study in finance and economics. Several studies on Dhaka Stock Exchange (DSE) recognize presence of this effect under six-days-a-week trading. This paper investigated the presence and nature of trends under five-days-a-week trading at DSE regarding its three practised indices. The study uses Markov chain model and found that the probability of getting lower returns is highest on Mondays, and that of getting higher returns is highest on Thursdays.

Key Words: Variability, seasonality, day-of-the-week effect, probability, Markov Chain.

1. Introduction

Trend analysis of stock market indices in any country is an important area of research. Directed changes in indices are studied and analysed in many different ways. Such study within a certain time frame can be considered as a seasonal study, and the effect within a seasonal time frame is the seasonal effect. In a broader sense it is a focused point of calendar effect. Fiscal years are of one year. Business firms are supposed to prepare statements and declare dividends at the end of the year; sometimes, twice in a year after every two quarters. Year-ending time of companies does not necessarily match with the fiscal year of the country. So, eventually the calendar effect is a very common phenomenon in every stock markets. One year cycle can be narrowed down to seasonal effect, which can further be pointed to the time frame of a week. Day-of-the-week effect is one of the popular focuses of study in finance and economics. It was started back in late 1920's. In 1930 Kelly found existence of Monday effect in US markets. A number of researchers have drawn conclusions on different stock markets in many countries. After that, many researchers have studied various capital markets in USA and other countries. One influential research was done by Gibbons and Hess (1981) who found that the returns are higher in Wednesdays and Fridays, and lowest in Mondays in US markets. Keim and Stambaugh (1984) observed consistently lowest returns on Mondays irrespective to the size and diversity of portfolio. On the other hand Fridays are likely to bring higher returns. According to these arguments, so called Monday Effect occurs due to the first day of trading in the week. Jaffe and Westerfield (1985) found that the lowest return occurs on Tuesdays in the markets of Australia and Japan. Studying on Malaysia

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and Thailand stock exchanges Brooks and Persaud (2001) showed that there were substantial evidence of positive Monday effect even after controlling risk factor. Islam and Hasan (2002) found presence of monthly effect in returns at the Dhaka Stock Exchange. They concluded that the DSE is likely to ensure higher returns in January, June, September and October compared to other months of the year. Syed A Basher and Perry Sadorsky (2006) of York University, Canada investigated for this effect in 21 emerging stock markets around the world. They found that the effect is present in Philippines, Pakistan and Taiwan markets. They have studied all these markets taking respective market risks into consideration. Meanwhile the monthly reviews of DSE shows that there is a strong positive correlation between DSE indices and those in Karachi Stock Exchange, Pakistan or NIKKEI index, Japan. Ankur Singhal and Vikram Bahure (2009) of IIT, Kharagpur studied the Indian stock markets and came to a conclusion that there is presence of weekend effect in stock returns. Lutfor Rahman, Nurun Nahar and Farid Ahmed Molla (2010) recently studied DSE under the six-day trading system and recognized the presence of day-of-the-week effect. They came up with the conclusion that the significant negative mean returns (-0.10%) come on Mondays and positive mean returns (0.12%) come on Thursdays. Trading under DSE is presently practised five-day-a-week. Thursday, September 08, 2005 was the last day of six-day trading in Bangladeshi stock markets. From the following week, securities were traded under five-day trading system, i.e. from Sunday through Thursday. In this paper the author aims to study the nature of trends of indices under five-day trading at DSE.

2. Research objective

Objective of this research is to find any significant presence of day-of-the-week effect in day-to-day returns in the DSE under the five-day trading. In case of the effect remains from previously practised six-day trading, the findings will also show its nature whether it changes from previous effect under six-day trading. Number of days to maturity of securities at DSE for being traded to next hand is three, which might have influence in investors' mind. This study is also aimed to know about the new day of lowest return and that of highest return in a week.

Hypotheses are:

- Presence of day-of-the-week remains in the five-day trading.
- There will be new days of lowest and highest returns compared to other days in a week.

3. Stock exchanges in Bangladesh

There are two stock markets in Bangladesh: Chittagong Stock Exchange (CSE) and Dhaka Stock Exchange (DSE). In terms of number of securities, their traded volumes, and market capitalizations the CSE is very small compared to those in the DSE. This paper sticks its study on the DSE only. Both of the stock exchanges in Bangladesh are

under the legal supervision of Securities and Exchange Commission (SEC) of Bangladesh, which is a constitutional autonomous regulatory body.

DSE is physically located in Dhaka, the capital city of Bangladesh. It is a public limited company regulated by SEC Act 1993 and Companies Act 1994. Number of securities and market capitalization at DSE are as follows:

DSE summary in year >>	2006	2007	2008	2009
No. of securities	310	350	412	443
Market capitalization (mn BDT)	323367.94	742195.87	1059530	1312773

3.1 Indices of DSE

With the guidelines of IOSEC the most recently modified index at DSE is the DSI or DSE All share index. It was reintroduced in March 2005. Other two indices are DSE 20 and DSE GEN. DSE 20 index is calculated only on twenty selectively healthy companies from various sectors. DSE GEN i.e. the DSE General index is comprised of securities including the securities of A, B, G and N categories. DSE 20 was introduced in January 2001 while the DSE GEN was introduced in November 2001. The indices recorded at the end of trading on 30 June, 2010 were 5111.63, 3650.04, and 6153.68 of DSI, DSE 20 and DSE GEN respectively.

4. Methodology

This paper is focused on the direction of changes of indices from a day to the next. The absolute value of the index or the absolute change in index is not considered as the significant factor. Methodology of this study is based on the changing direction, positive sign or negative sign, of indices on the basis of day-to-day trading. The changing sign is calculated as:

$C_s = I_d - I_{d-1}$, where I_d is the index after the trading on the day d . Here, the domain for d is {Sunday, Monday, Tuesday, Wednesday, Thursday}. All the C_s 's are counted separately as positive and negative according to the changes from Sunday to Monday, Monday to Tuesday, and so on to Thursday to Sunday. All these observations are then considered as a basis of probability tree to make comments on the trend of the indices at DSE.

Finally, the Markov Chain model is also applied to investigate the nature of chain of changes on day-to-day returns. Bivariate probabilities are calculated for each pair of days of tradings from Sunday through the week.

4.1 Sample data and design

Data of three indices DSI, DSE 20, and DSE GEN at the Dhaka Stock Exchange are collected for this study. Daily indices from September 08, 2005 to June 30, 2010 are the

base of data. This study is aimed to investigate the return behavior under the five-day trading. The September 08, 2005 was taken as the first day of index as this was the first day of five-day trading in DSE. Number of trading days in this period was 1139. There was 2 ‘no change’ indications in DSI and in DSE GEN, and 3 ‘no change’ indications in DSE 20. ‘No change’ indication means the index on a particular day remains exactly same as on the immediately previous day. In this case, $C_s = 0$, neutral in sign, regarding up to the two decimal places. So, finally 1137 data of DSI and of DSE GEN were taken into consideration in this study. While, 1136 data of DSE 20 index were considered.

4.2 Research pathway C_s binary value counts are the basis of further calculations.

DSE All share index:

	2005		2006		2007		2008		2009		2010	
	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve
Thu->Sun	4	9	18	28	27	19	22	25	28	21	14	11
Sun->Mon	7	8	16	29	26	22	15	32	23	25	12	14
Mon->Tue	11	3	25	20	29	18	28	21	28	21	16	10
Tue->Wed	7	7	25	21	28	20	28	21	22	26	17	7
Wed->Thu	9	3	24	22	30	18	30	15	30	18	16	8

DSE General Index:

	2005		2006		2007		2008		2009		2010	
	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve
Thu->Sun	4	9	17	29	27	19	23	24	28	21	14	11
Sun->Mon	7	8	14	31	28	20	14	33	24	24	11	15
Mon->Tue	10	4	24	21	27	20	27	22	28	21	15	11
Tue->Wed	6	8	24	22	28	20	27	22	23	25	16	8
Wed->Thu	9	3	26	20	31	17	30	15	29	19	16	8

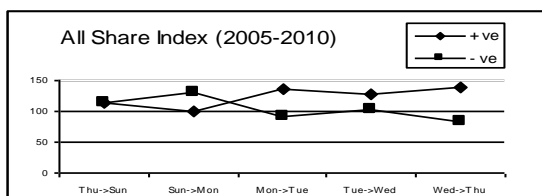
DSE 20 Index:

	2005		2006		2007		2008		2009		2010	
	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve	+ ve	- ve
Thu->Sun	3	10	17	29	25	21	23	24	24	25	16	9
Sun->Mon	5	10	14	31	25	23	15	32	19	29	10	16
Mon->Tue	10	4	24	21	28	19	24	25	26	23	19	7
Tue->Wed	5	9	25	21	23	25	26	23	24	24	19	5
Wed->Thu	6	6	27	19	30	18	28	17	27	20	17	7

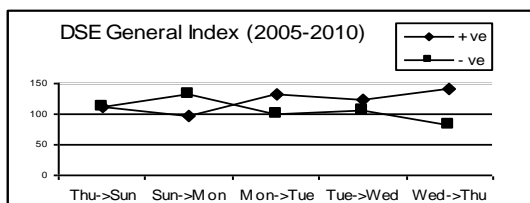
5. Analysis and findings

Total number of positive changes and that of negative changes are counted. For each pair of days, such as Thursday-to-Sunday, Sunday-to-Monday and so on, totals of binary C_s values are summed up. It is observed that there is significant difference in the changes of DSI and DSE GEN indices. DSE GEN differs from DSI by the Z categories of securities. This category is of the unhealthy companies in terms their quality of governance, regular AGM's, and declared dividends. Observations of totals of changes in five pairs of days in weeks are given below.

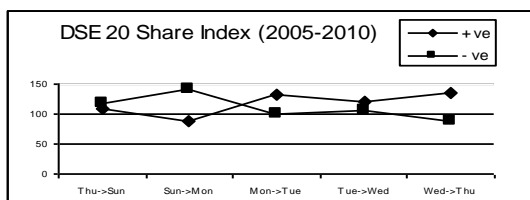
	Total (DSI)	
	+ ve	- ve
Thu->Sun	113	113
Sun->Mon	99	130
Mon->Tue	137	93
Tue->Wed	127	102
Wed->Thu	139	84



	Total (DSE GEN)	
	+ ve	- ve
Thu->Sun	113	113
Sun->Mon	98	131
Mon->Tue	131	99
Tue->Wed	124	105
Wed->Thu	141	82



	Total (DSE 20)	
	+ ve	- ve
Thu->Sun	108	118
Sun->Mon	88	141
Mon->Tue	131	99
Tue->Wed	122	107
Wed->Thu	135	87



For all three indices, the highest negative counts are on Sunday-to-Monday, and highest positive counts are on Wednesday-to-Thursday pairs. There is significant difference in changing patterns between DSE 20 and any of other two indices. Total number of positive and negative changes are same in Thursday-to-Sunday for both DSI and DSE GEN. But for DSE 20 it is differed by 10 more occurrences in negative trends.

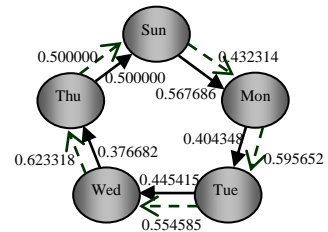
5.1 Markov Chain model

With the independent bivariate trends between two consecutive days of week Markov chain model is applied. In this section two chains are prepared for DSI and DSE 20,

because DSI and DSE GEN trends exhibit nearly identical chains. Two chains exhibit the binary probability allocations for each pair of two consecutive days in the week. In the table, probability of positive changes for Sun-to-Mon is shown as left-to-up direction. Likewise, probability of negative changes for the same Sun-to-Mon is shown as up-to-left direction. Binary values of probabilities are calculated from the occurrences of positive or negative changes on indices in the respective pair of days in the week. In the chains, outer directions are used for the positive movements, and inner ones are for negatives. Negative movements are in parentheses in the table

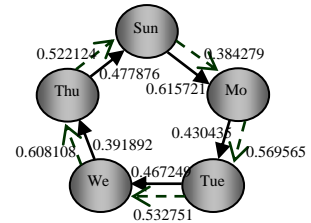
Markov's chain for DSI:

	Sun	Mon	Tue	Wed	Thu
Sun		0.432314			(0.500000)
Mon	(0.567686)		0.595652		
Tue		(0.404348)		0.554585	
Wed			(0.445415)		0.623318
Thu	0.500000			(0.376682)	



Markov's chain for DSE 20:

	Sun	Mon	Tue	Wed	Thu
Sun		0.384279			(0.522124)
Mon	(0.615721)		0.569565		
Tue		(0.430435)		0.532751	
Wed			(0.467249)		0.608108
Thu	0.477876			(0.391892)	



Regarding the chain of DSI, binary probability allocations exhibit that there is equal number of occurrences of positive and negative changes from Thursday to Sunday. This shows that return at the first day of the next week is likely to be same to that of the last trading day of the previous week. This result is different in DSE 20, which shows that there is likely to get lower returns at the first day of the week than that at the last day of the previous week in particular.

6. Measuring variability

Markov chains of two indices DSI and DSE20 show significant variability on Mondays and Thursdays. Following tables depict measurement of variabilities regarding p as positive change and n as negative changes. From Monday to Thursday all possible trends are calculated accordingly.

Monday to Thursday (DSI)	
ppp	0.205906659
ppn	0.124433005
pnp	0.165373954
pnn	0.099938381
npp	0.139776154
npn	0.084469181
nnp	0.112261233
nnn	0.067841432
Total =	1.000000000
At least two p	0.635489773

Monday to Thursday (DSE20)	
ppp	0.184522191
ppn	0.118914301
pnp	0.161835036
pnn	0.10429369
npp	0.139448068
npn	0.089866533
nnp	0.122302814
nnn	0.078817369
Total =	1.000000000
At least two p	0.604719595

Through the path from Monday to Thursday, probability of having at least two positive changes is 63.55% for DSI, and is 60.47% for DSE20.

7. Conclusion

This paper has studied the daily returns in the Dhaka Stock Exchange from September 08, 2005 to June 30, 2010. The findings show that there is significant presence of day-of-the-week effect regarding all indices practised at DSE. Though the change trends are identical with DSE All share index and DSE General index. The lowest returns are found on Mondays, that is, the highest probability (56.7686% regarding DSI, and 61.5721% regarding DSE 20) of experiencing the negative changes at Sunday-to-Monday pair of days. On the other hand, the highest returns are found on Thursdays, that is, the highest probability (62.3318% regarding DSI, and 60.8108% regarding DSE 20) of experiencing the positive change at Wednesday-to-Thursday pair of days. Three work days are required to get matured of any security at DSE to its next transaction. So, it is found that a portfolio can make substantial profits if the securities are bought on Mondays before 12:00 pm and sold on Thursdays after 12:00 pm.

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