

STATISTICAL PROPERTIES OF MONTHLY EQUITY RETURNS: SOME PRELIMINARY RESULTS FOR BANGLADESH

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INTRODUCTION

Although some research has been conducted to examine the behavior of a number of other emerging equity markets in recent years, to our knowledge, very little empirical research were conducted for Bangladesh presumably because of data unavailability. The purpose of this research is to conduct a preliminary study of the equity market in this country using monthly time series data, which were not previously utilized. More specifically, the study focuses on examining various statistical properties of the stock prices and returns.

This study is expected to make a timely and important contribution towards a better understanding of the behavior and characteristics of the equity market in this country. The results of the study will be of interest to academics, investors, and policy makers both at home and abroad for a number of reasons. First, to our knowledge, there is a general lack of rigorous empirical research to examine the behavior of stock prices and returns in Bangladesh. Second, the level of domestic and foreign participation in this market has been significant over the last two decades. These investors would be interested to know various features and characteristics of this market to improve their investment performance. Finally, the results may also be helpful to policy makers in this and other emerging markets who are interested to improve the performance and operations of their own equity markets.

A BRIEF HISTORICAL BACKGROUND

The stock exchange in Bangladesh was incorporated in April 1954 as the East Pakistan Stock Exchange Ltd. However, formal trading in the Exchange did not commence until 1956. The Exchange remained suspended from 1971 to 1975 due to the liberation war. After liberation, the Exchange opened up in 1976 with only 9 listed companies. As of June 1999, the Exchange has 210 listed companies with 230 listed securities and a market capitalization of 1,046 million US dollars.

As in most other developing countries, the capital market in Bangladesh has a relatively recent beginning. It is gradually evolving as an economic institution in response to the internal requirements of a fledgling modern economy, which has emerged as a result of economic development and industrialization efforts. Bangladesh is still a predominantly agricultural economy. However, the industrialization process over the last three decades since independence has diversified the economic base of the country at least to some degree.

In spite of some degree of industrialization and in spite of the fact that the equity market has existed since 1954, it still displays features of an emerging equity market for several reasons. First, market capitalization is still a very small proportion of the country's GDP. Second, investment in stocks and shareholder participation is limited to a small proportion of the population. Third, domestic resource mobilization for industrialization and economic development is still done primarily through the regular banking system. And finally, with increased liberalization and openness of the economy since the 1990's, the equity market in this country has experienced some growth partly due to increased foreign participation.

TRENDS IN THE EQUITY MARKET

As already mentioned, after liberation, the Dhaka Stock Exchange opened up in 1976 with only 9 listed companies. As of June 1999, the Exchange has 210 listed companies with 230 listed securities and a market capitalization of 1,046 million US dollars.

Figure 1
Dse Index: 1986.09 - 1999.11

Figure 1 displays the monthly DSE all share stock price index from September 1986 to November of 1999, the latest month for which data was available. This constitutes a total of 159 monthly observations. The movement of the index is shown over two distinct time periods, the pre-liberalization period and the post-liberalization period that began in the 1990's. It appears that the index performed modestly during the pre-liberalization period as it shows an increase from 227.56 in September of 1986 to 350.76 in December of 1990. This represents a growth of about 54% over four years, which implies an annual growth rate of 13.50%.

Since the process of economic liberalization and openness of the economy began in the 1990's, the index did perform slightly better during the next four years as the index rose to 754.63 by January of 1994, which represents an increase of 115.14%

over the four years, an annual growth rate of 28.78%. The index began to rise rapidly since then reaching to a peak of 3064.99 in November of 1996. This represents an increase of 306.15% over the next two years since 1994, which represents an annual growth rate of 153.08%, an impressive annual growth in the context of Bangladesh. The market, however, crashed in December of 1996 and the index started to decline significantly since then with the index assuming a value of 507.33 as of November of 1999, a cumulative decline of 83.44% from 1996 to 1999 with the annual rate of 27.82%. As of writing this report, the market has not recovered since then. One reason being cited is the lack of trust and confidence in the integrity of the market caused by alleged corruption, market manipulation, and lack of effective supervision and regulation during the period leading to the crisis.

DATA

Given the aggregate stock price index P_t (ignoring dividend payments), the continuously compounded monthly percentage stock return series R_t can be approximated by the following equation:

$$R_t = (p_t - p_{t-1}) * 100 = (\ln P_t - \ln P_{t-1}) * 100 \quad (1)$$

where: P_t stands for monthly closing DSE stock price index for month 't'; $p_t = \ln P_t$; and 'ln' stands for natural logarithm. Note that the DSE index is a market capitalization weighted all share price index in the Dhaka Stock Exchange.

The primary variable examined in this paper is the monthly stock return series R_t . The paper will discuss some important statistical properties of the monthly stock returns. These include analyses of the mean and median values, maximum and minimum values, standard deviation and studentized range, and skewness and kurtosis. All of these statistics will be calculated for the total sample as well as for each month of the year over the entire sample period. Further, we will also conduct a formal test to examine, for each month, whether the stock price changes (returns) follow a normal distribution by applying the Jarque-Bera test for normality as follows: Under the hypothesis of normality, the skewness and kurtosis follow the following distributions:

$$\text{skew} - N(0, 6/T) \quad (2)$$

$$\text{Kurt} - N(3, 24/T) \quad (3)$$

and the Jarque-Bera test statistics can be calculated as follows:

$$JB = T [(\text{skew})^2 / 6 + (\text{kurt} - 3)^2 / 24] \quad (4)$$

where N stands for normal distribution, T for number of observations, and JB for Jarque-Bera. A rejection of the null hypothesis of 'normal distribution' for the returns series will indicate deviation from normality in the stock return series.

The data used in the empirical analyses that follow were collected from the Dhaka Stock Exchange, the largest stock exchange in Bangladesh. The all share closing DSE index is used to represent the P_t series. The DSE index is a market capitalization weighted all share price index in the Dhaka Stock Exchange. The stock return series R_t was calculated by applying equation (1) to the P_t series. The data

frequency is monthly covering the period from September 1986 to November 1999, the most recent month for which data could be obtained. This constitutes a sample size of 159 monthly observations for the P_t series and 158 for the return series R_t .

STATISTICAL PROPERTIES AND RESULTS

Table 1 presents some important descriptive statistics for the monthly stock returns for each month during the sample period. These statistics include mean, median, maximum and minimum values, standard deviation (SD), skewness, Kurtosis, and the Studentized Range (SR). It also gives results for the Jarque-Bera tests for normality of returns for each month. The mean values show that monthly returns are higher for January, June, September, and October than other months of the year. The maximum and minimum values, the standard deviation (SD) and the studentized range (SR = range divided by standard deviation) statistics all show wide variation of returns from month to month. Further, the returns show positive skewness for eight of the twelve months and negative skewness for the other four months. In terms of kurtosis values, stock returns display excess kurtosis (kurtosis > 3: leptokurtic) for each of the twelve months of the year. Note that in a leptokurtic distribution, the tails are flatter than the normal distribution.

Table 1
Descriptive Statistics and Normality Tests

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	2.46	-2.15	0.59	-0.15	0.77	3.81	-0.87	-1.96	3.36	5.57	-2.27	-2.71
Med	-0.11	-1.01	-2.83	-2.27	-0.50	4.11	-2.29	-0.82	-0.61	1.58	-1.72	-1.12
Max	35.77	4.21	32.33	34.05	23.96	25.10	18.69	5.19	32.79	56.92	10.49	7.48
Min	-15.8	-14.2	-35.7	-21.8	-11.9	-9.0	-13.3	-16.7	-4.28	-11.3	-18.1	-28.7
SD	12.75	5.00	17.67	13.08	8.96	9.05	7.48	5.97	10.06	15.65	6.88	8.59
Sk	1.40	-1.15	0.12	1.05	1.16	0.69	1.08	-1.26	2.05	2.59	-0.40	-2.10
Kur	4.58	3.54	3.21	4.62	4.25	3.17	4.63	3.79	6.25	9.02	3.26	7.23
SR	4.04	3.69	3.85	4.27	4.00	3.77	4.28	3.67	3.68	4.36	4.16	4.21
JB	5.58	3.04	0.05	3.83	3.75	1.05	3.94	3.76	14.84	36.78	0.41	19.27
Prob	0.06	0.22	0.97	0.15	0.15	0.59	0.14	0.15	0.00	0.00	0.81	0.00
N	13	13	13	13	13	13	13	13	13	14	14	13

Based on the skewness and kurtosis values, one can conclude that the stock returns in Bangladesh do not follow a normal distribution for most months. The

hypothesis of normality, however, can be tested formally by the Jarque-Bera test statistics. Under the hypothesis of normality, the JB statistics and their probability values are given in table 1. Using a 5% level of significance, the null hypothesis of normality is clearly rejected for the months of January, September, October, and December only. However, the normality hypothesis could not be rejected for the remaining eight months in this data set.

CONCLUSION

This study empirically examined various statistical characteristics of the equity market in Bangladesh with special emphasis given on examining the hypothesis of normality in stock returns. The study utilizes monthly time series data on the DSE stock price index from September of 1986 to November of 1999, the latest month for which data was available. The preliminary statistical results indicate that the stock returns were higher, on average, in January, June, September, and October compared to other months of the year, and that the returns were found to deviate from the normal distribution for only four out of the twelve months. It is also observed that the DSE index grew slowly during the pre-liberalization period. Growth picked up during the post-liberalization period, especially after 1994. However, the latter rapid growth may not have been sparked by the liberalization of the economy. There is widespread belief that this growth may have been caused by corruption and artificial manipulation of the market.

REFERENCES

- Aggarwal, R. and P. Rivoli (1989), "Seasonal and Day-of-the Week effects In Four Emerging Stock Markets," The Financial Review, 24, 541-550.
- Cooper, J.C.B. (1984), "World Stock Markets: Some Random Walk Test," Applied Economics, 12, 341-349.
- Corhay, A. and A.T. Rad (1994), "Statistical Properties of Daily Returns: Evidence from European Stock Markets," Journal of Business Finance and Accounting, 21, 2, March, 271 -282.
- Dhaka Stock Exchange (1999), Dhaka, Bangladesh, various issues, 1986 to 1999.
- Ghandi, K., A. Saunders, and R. Woodward (1980), "The Capital Markets: A Case Study of the Kuwaiti Stock Market," Applied Economics, 12, 341-349.
- Givoly, D., and A. Ovidia (1983), "Year-End Tax-Induced Sales and Stock Market Seasonality," Journal of Finance, 38, March, 171-185.
- Gultekin, M. N., and N. B. Gultekin (1983), "Stock Market Seasonality: International Evidence," Journal of Financial Economics, 12, December, pp. 469-481.
- IFC (1993), Emerging Stock Markets Fact Book, International Finance Corporation, Washington, DC.
- Koutmos, G., C. Negakis, and P. Theodossiou (1993), "Stochastic Behavior of the Athens Stock Exchange," Applied Financial Economics, 3, 119-126.
- Lee, I., R. Pettit, and M.V. Swankoski (1990), "Daily Return Relationship Among Asian Stock Markets," Journal of Business Finance and Accounting, 17, 265-283.
- Lee, I. (1992), "Stock Market Seasonality: Some Evidence From the Pacific-Basin Countries," Journal of Business Finance and Accounting, 19, 192-209.
- Maddala, G.S. (1992), Introduction to Econometrics, 2nd. Ed., Macmillan, New York.

- Ramcharran, H. (1997), "Seasonality in the Jamaican Stock Market: An Examination of Stock Returns and the Volume Traded", Journal of Emerging Markets, 2, 1, 23-35.
- Stoll, H. R., and R. E. Whaley, (1983), "Transaction Costs and the Small Firm Effect," Journal of Financial Economics, 12, June, 57-79.
- Wachtel, S. B. (1942), "Certain Observations on Seasonal Movement in Stock Prices," Journal of Business, 15, 184-193.