



The Impacts of Interest Rate on Stock Market: Empirical Evidence from Dhaka Stock Exchange

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ABSTRACT

Stock exchange and interest rate are two crucial factor of economic growth of a country. The impacts of interest rate on stock exchange provide important implications for monetary policy, risk management practices, financial securities valuation and government policy towards financial markets. This study seeks evidence supporting the existence of market efficiency on the Dhaka Stock Exchange (DSE) based on the daily general price index 1994 to 2005 and also shows empirical relationship between stock index and interest rate in Bangladesh based on monthly data from May 1992 to June 2004. Stationary of market return is tested and it is found that DSE Index does not follow random walk model, which indicates that DSE is not efficient in week form. The linear relationship between share price and interest rate, share price and growth of interest rate, growth of share price and interest rate, and growth of share price and growth of interest rate are determined through ordinary least-square (OLS) regression. For all of the cases, included and excluded outlier, it is found that Interest Rate has significant negative relationship with Share Price and Growth of Interest Rate also has significant negative relationship with Growth of Share Price. So if the interest rate is considerably controlled in Bangladesh than it will be the great benefit of Dhaka Stock Exchange through demand pull way of more investor in share market and supply pull way of more extensional investment of companies.

Key Words: Efficient Market Hypothesis; Random walk model; Market Return; Interest Rate; Investment; Dhaka Stock Exchange

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INTRODUCTION

Stock market is considered one of the most important economic indicators of a country. From the perspective of overall economy, Ologunde (2006) mentioned that the share market makes it possible for the economy to ensure long-term commitments in real capital. Mankiw (1999) said, 'Whenever the stock market experiences a substantial decline, there is reason to fear that a recession may be around the corner.' So measuring the efficiency form of the stock market is very important to policy makers. There are three forms of measuring stock market efficiency- the weak form, the semi strong form and the strong form. The weak form of market efficiency uses information based on historical or past prices. This form claims that all past prices of a stock are reflected in today's stock price. The semi-strong form makes use of past information as well as all publicly available information. This implies all public information is incorporated into a stocks current share price, meaning that neither fundamental nor technical analysis can be used to achieve superior gains. The strong form holds if the market incorporates all information, both public and private (insider information) it will be more effective. Therefore any information known to the public or a private source should be fully reflected in the security's current price for the Efficient Market Hypothesis (EMH) to hold. Generally, markets in developing and less developed countries or emerging markets are not efficient in semi-strong form or strong form.

On the other hand, the interest rate is one of the more important macroeconomic variables, which is directly related to economic growth. Generally, interest rate is considered to be the cost of capital means, the price paid for the use of money for a period of time. From the point of view of a borrower, interest rate is the cost of borrowing money (borrowing rate). From a point of view of the lender, interest rate is the fee charged for lending money (lending rate).

Good investors always look for investing in an efficient market. In an inefficient market few people are able to generate extraordinary profit which causes the loss of confidence of general people about the market. In such cases, if the rate of interest paid by banks to depositors increases, people switch their capital from share market to a bank. This leads to a decrease in the demand of shares and a decrease in the price of shares. On the other hand, when the rate of interest paid by banks to depositors increases, the lending interest rate also increases, leading to a decrease in the investments in the economy which is also another reason of decreasing share price. Therefore, theoretically there is inverse relationship between share price and interest rate. This paper examines the efficiency of DSE market and also finds the relationship between Share Price and Interest Rate, Share Price and Growth of Interest Rate, Growth of Share Price and Interest Rate, and Growth of Share Price and Growth of Interest Rate.

Dhaka Stock Exchange: A Brief Description

The Dhaka Stock Exchange (DSE) was first incorporated as the East Pakistan Stock Exchange Association Limited on April 28, 1954. Formal trading of EPSE began in 1956 with 196 securities listed on the EPSE with a total paid up capital of about Rupees 4 billion (Chowdhury 1994). It was renamed as the Dhaka Stock Exchange (DSE) Limited on June 23, 1962. After the liberation

of the country, until 1976, the trading activities of the Stock Exchange remained closed due to the liberation war and the economic policy pursued by the then government. The trading activities resumed again in 1976. At that time only 9 companies were listed having a paid up capital of Taka 137.52 million on the stock exchange (Chowdhury 1994). At the end of 2005 it stood 260 Securities listed on the DSE with market capital of Taka 228,574.85 million.

After the establishment of the SEC, investment friendly rules and regulations were introduced. This has increased public interest to invest in the capital market. Foreign portfolio investment started to stream in due to favourable regulatory conditions. In October 1996, a group of brokers, foreign portfolio managers and sponsors of listed companies, manipulated stock prices. All Share Price Index crossed 3600 from less than 1000 within six weeks. As a result, at the end of 1996, only a few local and foreign investors got a huge gain. Conversely, general public *was trended to invest and faced* a huge loss.

In order to revive the confidence of the investors and to ensure a level playing field for all the market participants, the SEC forced the DSE to automate its trading system and introduced new settlement rules. The daily netting system of settlement (which means that an investor will have to pay money or provide securities only on the net amount of a day's transaction) was introduced in DSE. Regular transaction of the securities was made through an automated on-line system everyday, except weekends and other government holidays. There are four markets in the system: (1) Public Market: Only for market lot share (2) Spot Market: Only for spot transactions which must be settled within 24 hours. (3) Block Market: Only for bulk quantities of shares. (4) Odd Lot Market: Only for odd lot scripts. In the Public Market and Spot Market, securities are traded through automatic matching and Block Market and Odd Lot Market is traded through pick and fill basis.

Review of Empirical Evidence

There are two groups of findings - one group of researchers, who found weak-form efficiency in developing and less developed markets, are Barnes (1986) who worked on the Kuala Lumpur Stock Exchange, Chan (1992) on major Asian markets, Dickinson (1994) on the Nairobi Stock Exchange, and Ojah (1999) on the four Latin American countries market. Another group of researchers, who gave evidence that the market of developing and less developed countries are not efficient in weak-sense, are Cheung (1993) who worked on the stock market of Korea and Taiwan, Harvey (1995) for most emerging markets, Claessens (1995) in a World Bank study reported significant serial correlation in equity returns from 19 emerging markets and suggested that stock prices in emerging markets violate weak form EMH (Efficient Market Hypothesis). Khababa (1998) has examined the behavior of stock price in the Saudi Financial market seeking evidence that for weakform efficiency and found that the market was not weakform efficient. He explained that inefficiency might be due to delay in operations and high transaction cost, thinness of trading and illiquidity in the market. Roux (1978) and Poshakwale (1996) found the evidence of non-randomness stock price behavior and the market inefficiency (not weakform efficient) on the Johannesburg stock Exchange and on the Indian market.

Few studies have already been conducted on the Dhaka Stock Exchange (DSE). Hassan (1999) studied on time-varying risk return relationship for Bangladesh by utilizing a unique data set of daily stock prices and returns compiled by the authors which was not utilized in any previous study. He found DSE equity returns held positive skewness, excess kurtosis and deviation from normality and the returns displayed significant serial correlation, implying that the stock market is inefficient. Mobarec (2000) concluded that the Dhaka Stock Exchange does not follow the random walk model and there are significant autocorrelation at different lag causes to DSE is not weak form efficient. Their result did not change for different sub-sample observations, without outlier, and for individual securities. Haque (2001) worked on the cumulative abnormal profit on the study period. He described the experience of the DSE after the scam of November 1996 by applying CAPM and EMH. Based on the data four months before and four months after the automation, the paper measured risk-return performance, estimated SML for big capital and small capital companies before and after automation and tested EMH. The test results indicated that the market does not improve, and even after automation manipulation continued. Kader (2005) has no evidence that the Dhaka Stock Exchange is weak form efficient by testing whether any technical trading strategy yielded abnormal profit or not by using technical trading rule (K% filter rule). Islam (2005) analyzed the predictability of the share price in Dhaka Stock Exchange prior to the boom in 1996, and by using heteroscedasticity-robust tests found evidence in favour of short-term predictability of share prices prior to the 1996 boom, but not during the post-crash period. After a thorough investigation it was concluded that the Securities and Exchange Commission was able to give more transparency to the Dhaka Stock Exchange by taking various steps.

Few studies were also conducted by researchers who tried to link the relationship between interest rate and share price. Arango (2002) found that some evidence of the nonlinear and inverse relationship between the share prices on the Bogotá stock market and the interest rate as measured by the interbank loan interest rate, which is to some extent affected by monetary policy. The model captures the stylized fact on this market of high dependence of returns in short periods. These findings do not support any efficiency on the main stock market in Colombia. Hsing (2004) adopts a structural VAR model that allows for the simultaneous determination of several endogenous variables such as: output, real interest rate, exchange rate, and the stock market index, and found that there is an inverse relationship between stock prices and interest rates. Zordan (2005) said that the historical evidence illustrates that stock prices and interest rates are inversely correlated, with Cycle's observable well back into the 1880s; more relevant to the period subsequent to World War II. From the late 1940's to the mid 1960's, inflation was low, and interest rates were both low and stable. Stocks did well during this period, both in nominal and real terms. The inverse relationship between interest-sensitive asset classes like stocks, bonds, real estate and commodity prices has been known through history. That relationship can be observed in the 1877 to 1906 cycle, the 1906 to 1920 cycle, the 1920 to 1929 cycle, the 1929 to 1949 cycle, and the 1949 to 1966 cycle. Ologunde (2006) examines the relationships between stock market capitalization rate and interest rate. Time series data obtained from the Central Bank of Nigeria (CBN) and the Nigeria Stock Exchange (NSE) were analyzed using

regression. Empirical results showed that the prevailing interest rate exerts positive influence on the stock market capitalization rate while, government development stock rate exerts negative influence on the stock market capitalization rate and prevailing interest rate exerts negative influence on the government stock rate.

Previous researchers measured the market efficiency by focusing on the transparency of DSE, effect of the new information on the market, effect of economic incidents on the market, and any specific policy effect etc. This study is for finding the effect of share price and growth of share prices on interest rate and growth of interest rate on DSE.

Data, Model and Methodology

The sample includes total 3,209 daily observations of DSE daily general price index for the total sample period 1994 to 2005 to test the weak form efficiency of DSE. To find the relationship between interest rate and share price monthly observations of "Schedule Banks Fixed (3-6) Mos." and monthly observations of "Dhaka Stock Exchange Index" is taken from International Financial Statistics (IFS). As representative of interest rate data, bank deposit rate is used because deposit rate usually refers to rates offered to resident customers for demand time or savings deposits. Also as representative of share price, share market index is considered because it is considered to be a less risky return compared to market portfolio. Before June 1992 the interest rate in Bangladesh was directly controlled by the Central Bank (Bangladesh Bank). After that, when government intervention had decreased and month to month interest rate fluctuated more, data from that period has been considered in this paper. Total sample of 146 monthly observations for interest rate and share price from the period of May 1992 to June 2004 data is used for determining the relationship between the interest rate and stock price. For statistical analysis, this paper relies on a reliable software called PC Give, version 10.

To test the EMH (Efficient Market Hypothesis) of DSE, the tools of stationary of share prices is tested by using daily market returns. DSE prepares daily price index from daily weighted-average price of daily transactions of each stock. Daily market returns (R_t) are calculated from the daily price indices such as follows:

$$R_t = \ln (PI_t / PI_{t-1}) \quad (1)$$

Where,

R_t = market return at period t ;

PI_t = price index at period t ;

PI_{t-1} = the price index at period $t-1$ and

\ln = natural log.

This calculation of market return (Eq-1) is used in the efficiency test. The reasons to take logarithm returns are justified both theoretically and empirically. Theoretically, logarithmic returns are analytically more tractable when linking returns over longer intervals. Empirically, logarithmic returns are more likely to be normally distributed which is a prior condition of standard statistical techniques (Strong 1992).

After that, the linear relationship between the dependent and the independent variables

is determined through ordinary least-square (OLS) regression. Here four different simple regressions in two categories of with outlier and without outlier were used for the regression analysis and inferences were drawn based on the regression analysis.

$$Y_{1t} = \beta_0 + \beta_1 X_{1t} + u_t \quad (2)$$

In equation-2, it is regress share price (Y_1) on interest rate (X_1) to look at how prevailing interest rate influences the price of stock market.

$$Y_{1t} = \beta_0 + \beta_1 X_{2t} + u_t \quad (3)$$

In equation-3, it is regress share price (Y_1) on growth of interest rate (X_2) to look at how prevailing growth of interest rate influences the price of stock market.

$$Y_{2t} = \beta_0 + \beta_1 X_{1t} + u_t \quad (4)$$

In equation-4, it is regress growth of share price (Y_2) on interest rate (X_1) to look at how prevailing interest rate influences the growth of price of stock market.

$$Y_{2t} = \beta_0 + \beta_1 X_{2t} + u_t \quad (5)$$

In equation-5, it is regress growth of share price (Y_2) on growth of interest rate (X_2) to look at how prevailing growth of interest rate influences the growth of price of stock market. Growth of share price and growth of interest rate are calculated from monthly share price and

$$Y_2 = 100 * [Y_{1(t)} - Y_{1(t-1)}] / Y_{1(t-1)} \quad (6)$$

$$X_2 = 100 * [X_{1(t)} - X_{1(t-1)}] / X_{1(t-1)} \quad (7)$$

Where, Y_2 = growth of share price at period t; $Y_{1(t)}$ = share price at period t; $Y_{1(t-1)}$ = share price at period t-1; X_2 = growth of interest rate at period t; $X_{1(t)}$ = interest rate at period t; $X_{1(t-1)}$ = interest rate at period t-1.

Empirical Result and Analysis

The statistical output of unit root test for market return series suggests that there are serial dependencies of return of Dhaka Stock Exchange. ADF calculated values are significant at 1% level for all 10 degrees of freedom (lags) suggests that the return series does not follow random walk model (Table-1) which means DSE is not efficient in weak form. Table 1:

Output for Unit Root Test on DSE Return (for 10 lag period) (Eq-1)

Lag Year	ADF Calculated Value	ADF Critical Value at 1%	ADF Critical Value at 5%
1	-37.48	-3.923	-3.066
2	-28.89	-3.923	-3.066
3	-24.55	-3.923	-3.066
4	-22.02	-3.923	-3.066
5	-21.04	-3.923	-3.066
6	-19.27	-3.923	-3.066
7	-18.02	-3.923	-3.066
8	-17.00	-3.923	-3.066
9	-15.23	-3.923	-3.066
10	-14.20	-3.923	-3.066

At a very low (0.00%) significance level (Table-2: Eq-2), it is found that the interest rate (X_1) has significant relationship on the share price (Y_1) and the coefficient of independent variable (-19.846) shows that there is a high negative relationship between the two variables. However, the coefficient of determination (R_2) indicates that only 9% of the total variation in the dependent variable is account for by the independent variable while the remaining 91% is account for by other variables. When the regression is run on without outlier (Table-3: Eq-2), the value of the coefficient of determination (R_2) improve to 0.27 means 27.1 % of the total variation is account for by the independent variable and the coefficient of independent variable (-17.9) also shows significantly high negative relationship between Interest Rate and Share price.

At 5% significance level (Table-2: Eq-3), it is found that growth of interest rate (X_2) has significant relationship on Share price (Y_1) and the coefficient of independent variable (4.71) shows that there is a positive relationship between the two variables. However, the coefficient of determination (R_2) indicates that only 2.7% of the total variation in the dependent variable is account for by the independent variable while the remaining 97.3% is account for by other variables. When the regression is run on without outlier (Table-3: Eq-3), at 5% significance level it is found that there is no relationship between growth of interest rate and share price.

Table 2:

Output of Regression (All Observations Used)

Equation No.	Model	Coefficient	t-value	p-value	R ²
DSE Index on Interest Rate (Eq-2)	Constant	289.042	6.88	0.000	0.090
	Interest Rate	-19.847	-3.78	0.000	
DSE Index on Growth of Interest Rate (Eq-3)	Constant	133.965	23.7	0.000	0.027
	Changes of Interest Rate	4.708	2.02	0.045	
Changes of DSE Index on Interest Rate (Eq-4)	Constant	9.336	1.18	0.240	0.006
	Interest Rate	-0.976	-0.98	0.328	
Changes of DSE Index on Growth of Interest Rate (Eq-5)	Constant	1.336	1.36	0.176	0.026
	Changes of Interest Rate	-0.797	-1.97	0.051	

At 5% and also at 10% significance level (Table-2: Eq-4), it is found that interest rate (X_1) has no relationship on growth of share price (Y_2) and when the regression is run on without outlier (Table-3: Eq-3), the result is also same.

At 5% significance level (Table-2: Eq-5), it is found that growth of interest rate (X_2) has significant relationship with growth of share price (Y_2) and the coefficient of independent variable (-0.797) shows that there is a negative relationship between the two variables. However, the coefficient of determination (R_2) indicates that only 2.6% of the total variation in the dependent variable is account for by the independent variable while the remaining 97.4% is account for by other variables. When the regression is run on without outlier (Table-3: Eq-5), the value of the coefficient of determination (R_2) improves to 0.046 means 4.6 % of the total variation is account

for by the independent variable and the coefficient of independent variable (-0.615) also shows negative relationship between growth of interest rate and growth of share price.

Table 2:

Output of Regression (All Observations Used)

Equation No.	Model	Coefficient	t-value	p-value	R ²
DSE Index on Interest Rate (Eq-2)	Constant	262.510	13.1	0.000	0.271
	Interest Rate	-17.905	-7.18	0.000	
DSE Index on Growth of Interest Rate (Eq-3)	Constant	121.831	40.0	0.000	0.022
	Changes of Interest Rate	2.184	1.77	0.080	
Changes of DSE Index on Interest Rate (Eq-4)	Constant	6.585	1.42	0.157	0.046
	Interest Rate	-0.822	-1.41	0.160	
Changes of DSE Index on Growth of Interest Rate (Eq-5)	Constant	0.220	.376	0.708	0.014
	Changes of Interest Rate	-0.615	-2.55	0.012	

For both cases of included and excluded outlier, it is found that the interest rate has significant negative relationship with the share price and growth of interest rate also has significant negative relationship with Growth of Share Price.

CONCLUSION

This study examines the efficiency of the DSE and also looks at the effect of share prices and growth of share prices on interest rate and growth of interest rate. The randomness of stock return is the basic assumption of the Efficient Market Hypothesis that is violated for the Dhaka Stock Exchange this means that the DSE market is not efficient in weak form. The theoretical argument of negative relationship between stock price and prevailing interest rate is not rejected. So if the interest rate is considerably controlled in Bangladesh than it will be a great benefit of the Dhaka Stock Exchange through demand pull way of more investors in the share market and a supply pull way of more extensional investment of companies.

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