MEASURING THE EFFECT OF MACROECONOMIC VARIABLES ON THE STOCK MARKET RETURN: EVIDENCE FROM CHITTAGONG STOCK EXCHANGE

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***Abstract*:** *It is very important for the policy makers to understand the impact of macroeconomic variables on the stock market return to formulate appropriate policies for the socio-economic development of a country. This paper attempts to find the impact of macroeconomic factors like inflation rate, interest rate, money supply, unemployment rate risk premium, and exchange rate on the return of stocks listed on Chittagong Stock Exchange. Arbitrage Pricing Theory (APT)is used considering monthly data of different factors viz., inflation rate, interest rate, money supply, unemployment rate, risk premium and exchange rate in Bangladesh from 2005 to 2014. Durbin Watson statistics is applied to examine the nature of autocorrelation among data series. Ordinary Least Square method is applied and it finds a substantial pricing linkage between selected macroeconomic factors and stock return. The weak correlations among the selective factors indicate that other macroeconomic variables influence stock market return in CSE.*

Keywords: *APT, Correlation, CSE, Macroeconomic Variables*

1. INTRODUCTION

Investment in stock market is long-term in nature. At least one risk or more risk is associated with every single investment. This fact is clearly noticeable when people want to increase their wealth by investing in stock markets. Stock market is a place where people can invest by purchasing shares and debentures of different companies and earn return. The return on these securities depends on the nature of the company and other related factors. Risk and return are positively correlated. This means, higher the risk, higher the return and vice-versa. The risk-return relationship may vary due to influence of many variables like managerial efficiency and structural capacity of a company, government policies toward specific sector, socio-economic condition of a country, internal corporate policies etc. (Oludoyi, 2003).

Both individual and institutional investors invest in stocks intending to earn their desired return. This expectation of returns usually increases the rate of subscription of public offerings. As a result, it becomes very tough for the investors with limited resources to earn maximum return. Most of the investors in Chittagong Stock Market are illiterate and do not possess necessary analytical ability to forecast the performance of listed companies in terms of risk and return. They lack practical experience and take investment decisions without understanding the fundamental capacity of the companies and extensively depend on the rumours generated by so-called syndicates in this market. In addition to that, their investment decision is mostly based on the rule of thumbs or either the earning capacity or the size of the firms. It is observed from

different studies that the degree of risk depends on the sensitivity of different factors in an economy, neither on the earnings capacity nor the size of the firm (Girard & Sinha, 2008). Stephen Ross instrumented the Arbitrage Pricing Theory (APT) model in 1976. According to this model, the return of an underlying asset can be estimated by analyzing the relationship between that asset and various common risk factors. Alexander et al., in 2001 mentioned that APT assumes unknown number of variables influence security returns. On the other hand, Roll and Ross (1976) specified four major factors viz., industrial production, inflation rate, interest rates and risk premium influence the return. Chen et al., 1986 found the applicability of APT in the US securities market using macroeconomic factors as underlying risk factors to estimate stock returns. In their study, they found several factors remarkably explain expected stock return such as nature of industrial production, variations in risk premium and movement of return curve. This study aims to check the applicability of Arbitrage Pricing Theory (APT) in the Chittagong Stock Exchange (CSE). It also aims to identify the factors that influence the stock return in the same bourse. Here, six macroeconomic variables will be tested to estimate the stock prices listed on CSE. The variables include exchange rate, interest rate, unanticipated inflation, unemployment rate, risk premium, and the money supply. In order to test the application of the model, historical values of macro variables and the return of different stocks from January 2005 to December 2014 are collected. Here, the sensitivity of the factors on the portfolio return is to be determined.

2. LITERATURE REVIEW

Many studies have been conducted to understand the nature of risk and return in developed, emerging and frontier markets. Measuring the relationship between risk and return in the stock market is a highly-studied research topic in financial economics. Although many researchers found positive relation between risk and return in many stock markets, it is not always true and there are a lot of controversies over this issue. Whitelaw (2000) conducted a study on the government-switching consumption process at a general equilibrium exchange economy. Although he found a positive linear relationship between additional returns and its change in a single-regime model, he found a non-linear relationship in a two-regime model. Furthermore, a negative correlation was found at market level in the long-run. Brandt and Kang (2004) observed a negative trade-off at conditional correlation and a positive trade-off at unconditional correlation. Guo and Whitelaw (2006) found a positive relation between risk and return where they allowed a hedge component. Guedhami and Sy (2005) found a negative risk-return trade-off by applying an instrumental variable method where they considered long-term government bonds. They observed that the negative trade-off of risk and return was not the consequence of omission of the hedge component related to the ICAPM. Li, Yang, Chan and Hasiao (2005) found positive but insignificant relationship between risk and return in 12 major international markets. Oludoyi (2003) studied the nature of risks associated with listed companies of Nigerian stock market. He observed positive co-variance of market portfolio and most of the listed companies in Nigeria. The positive portfolio beta indicates that there is limited opportunity to diversify the risk of investment in stock market.

The risk factor analysis was conducted by Goriaev in the Russian stock market in 2004. He observed that the difference of return premium between the companies with stable profit in any macroeconomic environment and the companies which are sensitive to the country risk is about

60%. Similarly, the risk premium of corporate governance was 25% and that of traditional size and dollar issue was between 33% to 39% per annum in the Russian market.

Yamaguchi (2005) observed the expected equity return in Japan considering the supply-side of the estimation. It was found in Japanese economy that in the last three decades since 1970s, the equity risk premium of supply side was near about zero. The reasons behind this low risk premium were marked as the reducing rate of return on equity (ROE) throughout the period and excessive rate of income tax on the earnings of shareholders imposed by the Japanese government. However, he suggested corporate houses to pay more attention to increase the return on equity. He also recommended the government to adopt a shareholders' interest friendly tax policy so that their tax liability can be kept within a tolerable limit.

Battilosi & Houpt (2006) studied three factors viz., risk, return and volume in Bilbao Stock Exchange of Spain which is considered as one of the emerging stock markets in the world. They observed strong existence of auto correlation and GARCH effects, but found no evidence of risk-return relationship. At the same time a weak evidence of a contemporaneous effect of trading volumes on stock returns was also found. The outcome of Battilosi & Houpt is very similar to the results obtained by various authors on emerging markets.

In the Asian emerging market, the relation between risk and return found to be highly positive. Harvey (1995) observed different risk-return relation in emerging stock markets and established stock markets. In the emerging stock market the expectation is very high and so does the risk. Michelfelder and Pandya (2005), Arora, Das, and Jain (2009) found emerging markets more volatile than those of developed markets. Various other previous studies on developing markets got the same result. Interestingly Theodossiou and Lee (1995) found no risk-return trade-off in several Asian stock markets. On the other hand, De Santis and Imrohoruglu (1997) used a GARCH (1,1) model and found no evidence of positive trade-off in different Asian stock markets. Chiang and Doong (2001) studied the relationship between stock returns and time-varying volatility by reviewing an asymmetric GARCH (1,1)-M model where they used the data from Singapore, Korea, Hong Kong, Malaysia, the Philippines, Taiwan and Thailand. Although they observed a significant positive relationship in daily data, the impact of volatility on market returns was insignificant in monthly data and weak in weekly data. Shin (2005) used weekly data from January 1989 to May 2003 and applied both parametric and semi parametric GARCH-in mean models to examine the risk-return trade-off in European, Asian, American and Latin emerging stock markets. Author considered India, Thailand, Taiwan, Korea, Malaysia, and the Philippines to study Asian markets and found a positive but insignificant trade-off in most of the cases, including the issue of Thailand. No relationship between return and risk was found by Karmakar (2007) who estimated EGARCH model using the data from the Indian stock market from 1990 to 2004. Guo and Neely (2008) also observed several proof of a significant positive relation in Hong Kong, but found different result in Singapore. In Chinese stock markets, Kong, Liu, and Wang (2008) measured the risk-return trade-off and found no evidence of relation in the second sub-sample but found positive trade-off in the first sub-sample. They observed that the risk is priced properly when the stock markets are more mature.

In Bangladesh, Masuduzzaman (2012) applied various time series techniques to find the impact of macroeconomic variables in Bangladesh stock market. He applied Johansen co-

integration, Engle-Granger co-integration, Error Correction Model (ECM), Granger- Causality, Variance Decomposition (VDC), Impulse Response Function (IRF) incorporating the macroeconomic variables such as Interest rate, Consumer Price Index, Industrial Production, Exchange rate of BDT against USD, and Broad money supply (M2) as explanatory variables and DSE General Index (DGEN) of Dhaka Stock Exchange as dependent variable. He found no relationships between stock price movements and macroeconomic variables in Bangladesh stock markets.

3. STATEMENT OF THE PROBLEM

Number of investors in stock market is increasing day by day in Bangladesh. Market capitalization is also increasing at a faster rate. Capital market of Bangladesh is inconsistent and inefficient in nature. People invest in this market to make money in short period. They do not keep their investment for long period. Most of the investors lack necessary knowledge on stock market. This market is mostly syndicate driven and investors take their investment decisions based on rumors. Apart from investors' nature, the return on stocks is influenced by different macroeconomic factors.

4. OBJECTIVE OF THE STUDY

The main objective of this study is to examine the impact of macroeconomic factors on the stock return in Chittagong Stock Exchange.

5. METHODOLOGY

5.1 Data source

In CSE, there are 295 stocks listed under twenty different sectors. Table:1 shows the number of companies under each sector. Table 2 shows the macroeconomic factors that are employed in this study. The factors include risk premium, interest rate, inflation rate, money supply, exchange rate, and unemployment rate in Bangladesh from 2005 to 2014. In order to test the APT application in CSE, we have constructed six portfolios taking best performing from the total stocks listed in the CSE. Each portfolio combines stocks of various category and sectors to ensure the representation of all the sectors.

Table: 1 General Portfolio

SL	Symbol	Industry Name	No. of Companies
1	BANK	BANK	29
2	CEMENT	CEMENT	7
3	CERAMIC	CERAMIC	5
4	CORPBOND	CORPORATE BOND	2
5	DEBENTURE	DEBENTURE	0
6	ENERGY	ENERGY	16
7	ENGELECT	ENG. & ELECTRICAL	26
8	FOOD	FOODS & ALLIED	12
9	GENINSU	GENERAL INSURANCE	29
10	ICT	ICT	6
11	LEASING	LEASING & FINANCE	22
12	LEATHER	LEATHER & FOOTWEAR	5
13	LIFEINSU	LIFE INSURANCE	12

14	MISC	MISCELLANEOUS	12
15	MF	MUTUAL FUNDS	41
16	PAPERS	PAPERS & PRINTING	4
17	PHARMA	PHARMA & CHEMICALS	22
18	SERVICES	SERVICES & PROPERTY	7
19	TELECOM	TELECOMMUNICATION	2
20	TEXTILE	TEXTILES & CLOTHING	36
		Total	295

Source: CSE website

Table: 2 Economic variables

Variable	**Symbol**	**Factors**
F_1	INTEREST	Interest rate
F_2	INFLATION	Inflation rate
F_3	RISKPREM	Risk premium
F_4	XCHAGNE	Exchange rate
F_5	MONEYSUP	Money supply
F_6	UNEMPLY	Unemployment

Rjoub et al (2009) applied APT model in Istanbul Stock Market to test the effect of macroeconomic factors on stock return. In this study, the same approach is followed to find the same effect on CSE.

In this study interest rate, inflation rate, risk premium, exchange rate, money supply, and the unemployment rate are examined as independent variables and stock returns of different portfolios are used as dependent variables. Following model is used to test the effect of those macroeconomic variables on the stock return. The factors tested are.

$$R_i = b_{i0} + b_{i1}F_1 + b_{i2}F_2 + b_{i3}F_3 + b_{i4}F_4 + b_{i5}F_5 + b_{i6}F_6 + e_i$$

where, Ri, actual return on the portfolio I;
bi, is the reaction coefficient measuring the change in portfolio return for change in risk factors,
F_1, the term structure of interest rate;
F_2, the unanticipated inflation;
F_3, the risk premium;
F_4, the real exchange rate;
F_5, the money supply;
F_6, the unemployment rate;
ei, a residual error for portfolio I.

In the theory of pricing, future cash flows are discounted. Variables which are supposed to influence the future cash flows or risk adjusted discount rate of a company are considered. The aim of explaining the variables is to measure the macroeconomic forces that influence the stock

returns. The aim of explaining the variables is to measure the macroeconomic forces that influence the stock returns.

5.2 Interest rates

Discount rate has direct impact on the value of stocks. It is considered as very important factor of asset pricing model. Since interest rate is highly correlated to other macroeconomic factors, sometimes it may cause problem.

5.3 Inflation rate

Sales revenue and borrowing of a firm is affected by inflation as discount rates and nominal cash flows change over the period of time. It affects the market value of stocks.

5.4 The risk premium

It is important to determine the discount rate of required risk premium of investors. Due to the changes in discount rate, the risk premium changes and therefore the value of the asset also changes. The change in risk premium results in the change of aggregated risk for the economy. Risk premium and stock price move in the same direction. Yield difference of low-grade bond and long-term government bond is used to determine the risk premium.

5.5 Exchange rate

Most of the Bangladeshi companies are operating in the global field. Their operations are directly or indirectly influenced by international activities. Frequent and mass scale exports and imports are common phenomena in today's global business era. Increased globalization and liberalization of the economy, enhances capital mobility. The value of cash sales also changes for this capital mobility. This change is regarded as an important risk factor from investor's view point.

5.6 Money supply

The impact of money supply on stock returns was observed by Fama (1981). Uncertainty in inflation and portfolio rebalancing are the consequence of nominal increase in money supply. This uncertainty adversely affects the stock return. Real interest rate decreases as money supply increases. Future cash flows are required to discount with low rate. To maintain constant earnings or to increase the earnings, investments need to be adjusted. It ultimately results in higher sales, profits, cash flows and stock price.

5.7 Unemployment rate

To test the effect of unemployment rate on the stock return, actual unemployment rates of stated period in Bangladesh is considered.

6 FINDINGS AND POLICY MEASURES

Table 3: Correlation matrix of economic variables

	INTEREST	INFLATION	RISKPREM	XCHAGNE	MONEYSUP	UNEMPLY
INTEREST	1	0.194	0.194	-0.513	-0.108	-0.285
INFLATION	0.194	1	1.000**	-0.138	-0.353	-0.381
RISKPREM	0.194	1.000**	1	-0.138	-0.353	-0.381

XCHAGNE	-0.513	-0.138	-0.138	1	-0.216	0.105
MONEYSUP	-0.108	-0.353	-0.353	-0.216	1	0.435
UNEMPLY	-0.285	-0.381	-0.381	0.105	0.435	1

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation matrix of economic variables in the above table shows that, the correlation is very low and ranging from -0.513 to +0.194.

Table 4: Correlation matrix of portfolios

	PORT_1	PORT_2	PORT_3	PORT_4	PORT_5	PORT_6
PORT_1	1	0.362	.977**	0.622	0.15	-0.086
PORT_2	0.362	1	0.429	.865**	.869**	-0.559
PORT_3	.977**	0.429	1	.691*	0.194	-0.187
PORT_4	0.622	.865**	.691*	1	0.585	-0.406
PORT_5	0.15	.869**	0.194	0.585	1	-.656*
PORT_6	-0.086	-0.559	-0.187	-0.406	-.656*	1
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Table 4 shows positive correlations between 5 portfolios except one. This relation indicates that the problem of happening multicollinearity can be reduced if dependent variables are used separately. This multicollinearity between the variables occurs only when the correlation between the variables is usually high.

Table 5: APT Regression Results

	Portfolio					
	PORT_1	PORT_2	PORT_3	PORT_4	PORT_5	PORT_6
Intercept	23.1270	5.0280	16.8100	6.1920	4.3800	6.2330
INTEREST	0.1170	0.0540	0.2060	0.0070	0,026	-0.0020
INFLATION	-0.3500	0.0290	0.0110	0.0000	0.0660	0.0000
RISKPREM	-0.0284	0.0400	-0.1900	0.0000	0.0890	0.0000
XCHAGNE	-0.8200	-0.0150	-0.0590	-0.0020	-0.1000	0.0004
MONEYSUP	-0.5200	0.3100	-0.3300	0.0010	0.0330	0.0000
UNEMPLY	-2.8000	0.1980	-2.1130	0.0120	0.2740	-0.0070
R^2	0.7800	0.7890	0.9430	0.9600	0.6040	0.3090
F-Stat	2.8430	2.9950	6.4330	9.3950	1.2210	0.3580
D-W	2.5910	2.4140	2.5540	2.5620	1.6490	1.4460

In order to test the null hypothesis (H_0: the residuals from an ordinary least-squares regression are not auto-correlated), The Durbin-Watson test statistic is used. Here the alternative hypothesis is (H_a) residuals follow AR1 process. Value of the D-W test statistic ranges from 0 to 4.

The guideline of D-W test statistics is, if the value is near about 2, it implies non-autocorrelation; if the value tends to be zero, it indicates positive auto-correlation; when the value tends to go towards 4, it indicates negative auto-correlation.

It is observed that, most of the values are higher than 2. Out of six portfolios, four portfolios viz., Portfolio 1, Portfolio 2, Portfolio 3, and Portfolio 4 have negative autocorrelation whereas two portfolios (Portfolio 5 and Portfolio 6) have non-autocorrelation.

The R^2 results of different portfolios indicate that there is a positive correlation between portfolio return and the macroeconomic variables. Portfolio 3 and 4 have strong correlation, Portfolio 1, 2 and 5 have good correlation whereas only portfolio 6 has very poor relation. Inflation is positively related with five portfolios and it has negative relation with only one portfolio. Risk premium is also positively correlated with four portfolios but negatively related with only two portfolios. Surprisingly exchange rate is negatively related with all the portfolios. Money supply has positive relation with four portfolios and negative relation with two portfolios. Unemployment has positive relation with three portfolios. Performance of stock market and the economic growth are correlated. Bullish trend of stock market indicates positive economic growth. Stock market helps to raise capital for a company and company uses this fund to increase its profit through appropriate and efficient utilization of the same. In this study, positive relation between inflation and risk premium indicates additional flow of fund decrease the supply of stocks and keep the demand side of the same unchanged. Positive link between interest rate and risk premium indicates that investors prefer stock market to earn more return by taking loan from banks. Additional demand for loan increases the interest rates and the premium on risk also goes up as the demand side of the stocks also move in the same direction. Negative relation between exchange rates and stock return indicates, growth in economy increases the purchasing power of local currency as exports increase and imports decrease. Additional earnings are channelized to the stock markets. Uddin and Alam (2007) found same positive relation between stock return and interest rate in Dhaka Stock Exchange although Mohammad (2011) found negative relation between the variables. Gjerdr et al (1999) found insignificant relation between stock return and the macroeconomic variables in China, Brazil, India and Russia. He also observed weak form market efficiency in these countries.

7 CONCLUSION

This study attempted to test the impact of macroeconomic variables on the stock returns in CSE from January 2005 to December 2014. It is evident that, there is both positive and negative pricing relationship between stock return and selected macroeconomic variables. Stock market can contribute to the economic development of a country to a greater extent. An efficient stock market ensures the safeguard of investment by reducing the risk and making it more profitable. Selected macroeconomic variables of this study are true indicators of socio-economic progress of a country. Here, Interest rate, inflation rate, risk premium, money supply and unemployment rate are positively correlated whereas only exchange rate is negatively correlated. Since the correlation values among the variables are insignificant, it indicates that other macroeconomic factors have influence on stock market returns in CSE apart from these selective variables. In order to keeps the growth of a country's economy moving forward, necessary initiatives are required to be taken. Government should formulate business friendly policies like providing hassle free loan, encouraging new entrepreneurs to start their business by providing smooth

cooperation in all respects, privatizing the losing state owned enterprises, encouraging promising companies to be listed on the stock markets etc. Since Chittagong Stock Exchange is still an inefficient market, Bangladesh Securities and Exchange Commission (BSEC) can take robust initiatives to make this market efficient and a reliable place for investment. It is true and also found in many studies that the relation between macroeconomic variables and stock return cannot be compared strictly as the methodology of each study is unique. However, studies found relationship between these variables both in the short and long-run. Stock return is the outcome of many interdependent macro variables; therefore, firmly it cannot be concluded that this result represents the actual scenario.

GUIDELINE FOR FUTURE RESEARCH

In this research, few selective macroeconomic variables and stock return of Chittagong Stock Exchange have been considered. In future, researchers can consider other important macroeconomic variables to check the impact on stock return of both Chittagong and Dhaka Stock Exchange in Bangladesh. It is also recommended to check the impact of stock return on macroeconomic variables in different perspectives.

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