

**IMPACT OF MACROECONOMIC INDICATORS ON STOCK
MARKET CAPITALIZATION OF BANGLADESH:
EMPIRICAL EVIDENCE FROM DHAKA STOCK
EXCHANGE**

Sk. Alamgir Hossain¹ and Md. Zubaeer Ahmed²

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Abstract


The purpose of this study is to investigate the impact of economic factors, such as foreign exchange reserves, interest rates, and inflation, on the magnitude of Bangladesh's stock market capitalization from 2001 to 2023. The data came from the annual economic trends of the Central Bank of Bangladesh. To ensure homogeneity and prevent possible conflicts, the study used 23 observations per variable and transformed the information into a natural logarithmic format. For the goal of projecting the influence that these independent variables- foreign exchange reserves (FOREXR), interest rates (INT), and inflation (INF)-had on the stock market capitalization (SMC), a comparison was done between them and the dependent variable, the capitalization of the DSE. FOREXR and INF show significant positive coefficients in the short and long run, according to the ARDL model and ARDL limits test. On the other hand, it has been demonstrated that INT at level data has a minimal negative coefficient over the short and long terms. Again, INT at one period lag data was shown to have a negative and insignificant coefficient in the near term. Furthermore, the Wald test demonstrated that FOREXR, INF, and INT all influence the movement of OCF. According to the error correction model (ECM), resolving historical dynamic disequilibrium requires substantially less time. The paired Granger causality test for this study does not rule out the possibility that the explained and explanatory variables are causally connected.

Keywords: Foreign Exchange Reserve, Interest Rate, Inflation Rate, ARDL Model, Stock Market Capitalization, Bangladesh.

1. Introduction

A country's financial market performance can serve as an indicator of its capital level. The Dhaka Stock Exchange (DSE) is Bangladesh's principal financial market, promoting the trading of assets such as stocks, bonds, and derivatives and also providing a platform for capital mobilization and investment. DSE plays an important

¹ Assistant Professor, Department of Finance, Jagannath University, Dhaka.
 <https://orcid.org/0000-0002-2756-0329>, Email: alamgir@fin.jnu.ac.bd

² Graduate Student, MBA Program, Department of Finance, Jagannath University, Dhaka.
 <https://orcid.org/0009-0000-4502-3562>, Email: a.zubaeer1998@gmail.com

role in the country's economic growth. Bangladesh's financial industry has undergone significant reforms to increase market efficiency, transparency, and investor confidence. The Bangladesh Securities and Exchange Commission (BSEC), the capital market's regulatory authority, has implemented several steps to ensure market stability, safeguard investors, and promote long-term financial growth. These include changes to listing legislation, the digitalization of trading systems, and the establishment of global financial reporting standards. Given the interconnectivity of foreign currency reserves and capital markets, institutional assistance from organizations such as the BSEC, BB, and government officials is becoming increasingly vital. These institutions jointly shape the dynamics of stock market capitalization through policies impacting interest rates, inflation control, currency stability, and investor mood. Their coordinated activities are critical in creating an atmosphere that promotes stock market growth and attracts both domestic and international investors.

This study is conducted within this institutional framework, exploring how macroeconomic variables, notably foreign exchange reserves, interact with stock market capitalization in Bangladesh. To succeed in the mentioned goal, this research will utilize quantitative research methodologies, applying statistical methods including time series analysis, regression analysis, and correlation analysis. This study will utilize secondary information gathered from credible sources like the World Bank, Bangladesh Securities Exchange and Commission (BSEC) annual report, Dhaka Stock Exchange (DSE) annual report, and Bangladesh Bank (BB). This article aims to demonstrate the enduring influence of the foreign exchange reserves on the stock market valuation of Bangladesh, utilizing empirical evidence from the Dhaka Stock Exchange, and historical data from a specific period, 2001-2023.

According to Kaleeshwari and Jegadeeshwaran (2023), foreign exchange reserves contribute contributions that are essential to the growth of the stock market by encouraging domestic investors to participate. Long-term investments are impacted by foreign exchange reserves, which also draw investors with alluring returns. Well-established and efficient stock markets attract both the market's capitalization and foreign exchange reserves. This points to the importance of foreign exchange reserves in promoting economic growth and stock market progress Khan & Khan, (2018). However, studies Akinlo & Awolowo, (2015); Tripathi & Seth, (2014) have shown that the market's growth cannot be exclusively attributed to the existence of foreign exchange reserves. Additionally, the capitalization of the stock market is affected by macroeconomic factors like the inflation rate and interest rate. According to Khalid (2017) and Subrata (2020), the stock market's capitalization is impacted by a favorable investment atmosphere, investor sentiment, and decision-making.

Most research suggests that macroeconomic indicators like GDP, currency rate, interest rate, current account, and money supply significantly influence stock market capitalization Khan & Khan, (2018). Maintaining macroeconomic stability has been a major focus for developing nations (Phuong, 2020). The goal of this study is to offer valuable information about the elements that are anticipated to affect the evolution of stock market capitalization and to contribute to the advancement of current understanding in this field. This research has undertaken an analysis of the interrelationships and dynamics among these parameters to accomplish this.

The results of this investigation shed light on the connection between foreign exchange reserves and the capitalization of individual stock markets, particularly on whether foreign reserves promote or facilitate stock market growth. Ray, (2012) emphasizes the significant policy implications, illustrating the connection between capitalization of the stock market and the reserve of foreign exchange, indicating whether the stock market may be impacted by a reduction in foreign reserves. Ray, (2012) added that market capitalization is investment capital, which is the entire amount of money that is put into the stock market, and that foreign exchange reserves are among the most important factors in maintaining the native currency's worth to other currencies, which makes both of the above variables that are being investigated extremely important.

Figure 1 shows how Bangladesh's foreign exchange reserves and stock market valuation have grown dramatically over time. Total stock market capitalization increased from BDT 63769 million in 2001 to BDT 97442.26 million in 2003. From 2004 to 2006, the stock market capitalization dropped to BDT 21542.19 million. In 2007, the figure increased again to BDT 47585.54 million. Although stock market capitalizations increased until 2011, it dropped in 2012 due to stock market manipulation. Through the implementation of various reforms proposed by the Bangladesh Securities Exchange Commission, the stock market was able to overcome this problem very quickly, and the stock market capitalization reached BDT 399816 million in 2019. At the end of the year 2023, stock market capitalization reached BDT 772078.04 million.

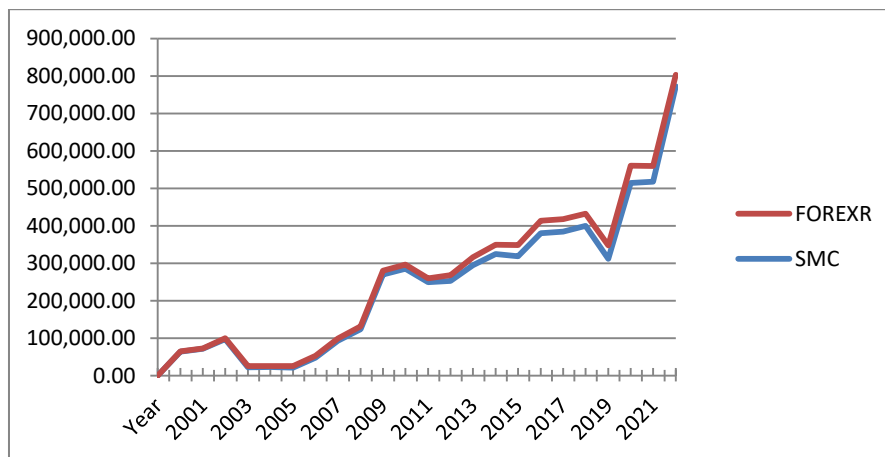


Figure 1: Plots of FOREXR and SMC

Similarly, FOREXR has grown dramatically over time. It has gone up from \$1306.7 million in 2001 to \$10911.55 million in 2011. It collapsed in 2012 due to the global economic downturn that took place at the close of the last decade. The figure dropped to \$10364.4 million in 2012. The many actions taken by the Bangladesh Bank were successful in stopping the currency's depreciation. There was a sharp increase from \$15315.2 million in 2013 to \$33406.6 million in 2017. After the pandemic, Bangladesh has overcome the crisis, and the foreign exchange reserve reached \$46391.4 million in 2021. But due to the global price hike, it dropped to \$31203 million at the end of 2023.

Interestingly, the government has recently taken various steps to enhance the stock market capitalization and increase foreign exchange reserves. To completely grasp the consequences of these actions, we must first understand the connection between FOREXR and the evolution of the stock market capitalization. That, of course, is the main objective of this study. Even so, the research desires to accomplish a few specific goals. These are

- a) To investigate how the FOREXR, INT, and INF affect Bangladesh's stock market capitalization in the near term.
- b) To determine the Granger causal link and long-term effects of the FOREXR and INT on Bangladesh's SMC.

The structure of the article is as follows: A brief assessment of existing literature is given in Section 2. In Section 3, Data and Methodology are discussed. The results of the experiments are presented in Section 4. Sections 5 and 6 present the findings and conclusion, respectively.

2. Literature Review

Financial researchers have examined the link between stock market capitalization and macroeconomic variables such as foreign currency reserves, interest rates, and inflation rates. However, few of these studies expressly address the connection between stock market capitalization and foreign currency reserves. Investors, lawmakers, and economic visionaries can benefit greatly from this comprehension. There are a plethora of hypotheses and empirical investigations that aim to understand this complex dynamic, providing crucial insights for investors and policymakers.

2.1 Evidence from the Global Context

To identify the connection amidst stock market performance, currency rates, foreign exchange reserves, and trade balance *Bhattacharya, (2012)* embraced *Toda and Yamamoto's (1995)* Granger non-causality approach. Their findings revealed no correlation amidst stock prices, exchange rates that are effective, foreign currency reserves, and trade balance. But *Nishat et al., (2004)* discovered a reversal relationship amidst industrial production and stock prices, with macroeconomic factors influencing fluctuation of the stock price. They discovered large lag times between actual economic changes and stock market volatility. *Ray (2012)* discovered that there was a unidirectional association between FOREXR and SMC, proving that India's FOREXR favorably affected the BSE stock market capitalization.

Kaleeshwari & Jegadeeshwaran (2023) examine the volatility of foreign exchange reserves and selected indexes of the National Stock Exchange that are crucial for price fluctuations and growth. The analysis draws on secondary data from the World Bank, Reserve Bank of India, and the National Stock Exchange's data bank. Stationarity, the ARCH effect, least squares, volatility clustering, heteroskedasticity tests, and volatility tests are used to evaluate the effect of foreign currency reserves on these indices.

In accordance with *Phuong et al., (2023)* uses data from 2008 to 2019 is used to examine the effect of macroeconomic conditions on global stock market capitalization. It uses inflation, interest rates, currency rates, GDP growth, and

foreign reserves as stand-in variables. The generalized method of moments (GMM) results show that inflation, interest rates, and foreign currency reserves have a considerable influence on stock market value. Higher net foreign exchange reserves promote market growth; however, higher inflation and interest rates impede it. The analysis further shows that developed stock markets possess much greater capitalization values than others. Using the general moment method (GMM) Phuong (2020) it looks into how institutions and macroeconomic elements influence capitalization of the securities in East Asian and Pacific countries (EAP). A well-rounded panel of information was collected in 11 EAP nations between 2008 and 2018. According to the study, institutions and macroeconomic elements have a substantial effect on stock market capitalization. Institutional variables such as savings and economic expansion had a positive influence; however, Macroeconomic problems including rising interest rates and inflation, had a negative impact. Additionally, the research discovered that established markets had stronger institutions and improved command and control over inflation and interest rates; undeveloped nations, on the other hand, saw greater rates of economic growth and domestic savings.

E. Abakah & M. Abakah (2016) conducted a variety of tests to investigate the correlation amidst the foreign currency reserves and stock market valuation. They discovered that foreign currency reserves greatly boost stock market growth, with a one-way effect evident. According to the study, interest rates have a considerable effect on the relationship between the foreign currency reserves and stock market growth. Employing the Box-Jenkins ARIMA model, Gay (2016) investigated the time-series relationship between stock market index prices and macroeconomic indicators such as oil prices and currency rates for Brazil, Russia, India, and China (BRIC). However, no meaningful correlation was shown amidst the corresponding exchange rate and oil price impact on stock market index values of any BRICS nation or between the historical and current returns of the stock market.

Akinlo & Awolowo (2015) examined a positive association amidst the foreign reserves and stock market growth. The research employed *Engle-Granger's two-step method* and *Johansen- Juselius's* cointegration technique to evaluate links amidst interest rates and foreign reserves, illustrating a bidirectional relationship.

Khrawish et al., (2010) found a strong positive connection between interest rates and stock market capitalization using the ordinary least squares (OLS) regression technique. Interest rates, inflation, exchange rates, gross domestic savings, and two Indian capital markets were all analyzed in *Pal & Mittal (2011)*. It was shown that interest rates and foreign exchange reserves affect one market, while inflation affects the other, and gross domestic savings has no effect on either market. *Ologunde et al., (2007)* defines the relationship amidst the stock market capitalization rates in Nigeria and the interest rates. While current interest rates had a positive impact, they discovered that government development stock rates harmed the stock market capitalization.

Liu & Shrestha (2008) utilized secondary data from 1992 to 2001 to examine the link among the money supply, inflation, interest rates, industrial production, and the Chinese stock market. They invent that these factors had positive correlation, but inflation, interest rates, and currency rates had a negative impact on share prices.

Conversely, research by *Sohail & Hussain (2009)* on the stock markets of India and Kenya showed that industrial output, currency values, and money supply positively influenced stock returns, while inflation had an opposing effect.

Ultimately, taking into account autocorrelation and cross-autocorrelation patterns, *Doong et al., (2005)* studied organization amidst the stocks and exchange rates in six Asian nations from 1989 to 2003. They found no cointegration; however, there is bidirectional causality in Indonesia, Korea, Malaysia, and Thailand.

2.2 Evidence from the Context of Bangladesh

While global studies provide strong theoretical and empirical foundations, research focused on Bangladesh remains limited—particularly regarding the influence of foreign exchange reserves on stock market capitalization. Recent works have begun addressing this gap, but they vary in scope, methods, and variable selection.

Al Hasan (2024) analyzed the effects of foreign exchange reserves, inflation, and call money rates on DSE market capitalization using data from 2010 to 2023. The findings suggest that stable reserves and controlled inflation support market growth, while rising call money rates indicate a liquidity crunch that may hinder market expansion.

Hasan (2018) also found a significant and positive relationship between foreign exchange reserves and stock market capitalization. The study emphasized the importance of interest rates as a monetary policy tool influencing investor behavior. *Khalid (2017)* analyzing Bangladesh's monetary environment, reported an inverse relationship between interest rates and market volatility, while favorable exchange rate conditions supported market growth. Using Granger causality testing, the study identified unidirectional effects from interest rates and exchange rates to market performance.

Islam & Rahman (2021) extended the analysis to include variables such as inflation, exchange rate, and broad money supply. Their regression results indicated that foreign exchange reserves and exchange rate stability were significant predictors of DSE performance. Inflation, however, showed a negative impact. Similarly, *Hossain et al., (2022)* investigated the effect of GDP, interest rate, and money supply on stock market development in Bangladesh and concluded that monetary factors exert substantial influence on market dynamics.

Based on the review of existing literature, the following gaps are identified: Limited country-specific studies for Bangladesh that focus explicitly on the link between foreign exchange reserves and stock market capitalization. A lack of comprehensive models that incorporate both monetary variables (interest rate, inflation, and exchange rate) alongside foreign exchange reserves. Many studies fail to use updated datasets that reflect the post-pandemic economic context or recent global financial trends. Few studies employ advanced econometric methods that capture both short-run fluctuations and long-run relationships (e.g., ARDL, ECM, Granger causality).

To address these gaps, this study selects the following independent variables: Foreign Exchange Reserves (FOREXR)—to assess the direct influence of reserves on investor confidence and market growth. Inflation Rate (INF)—to examine the impact of purchasing power and macroeconomic stability on investment decisions. Interest Rate (IR)—as a key determinant of opportunity cost and borrowing for investment.

These variables are chosen based on their theoretical significance, empirical validation in prior studies, and relevance in the Bangladeshi economic context. By using annual data from 2001 to 2023 and applying techniques such as ADF, ARDL, Bounds Cointegration, ECM, and Granger Causality, this study seeks to offer a holistic and updated analysis of the intricate linkage between foreign currency reserves and stock market capitalization in Bangladesh.

3. Data and methodology

Methodology means the steps of collecting, sorting, processing, and analyzing relevant information for a study. The reliability and validity of a study can be judged based on the methodology section of a report. Two significant questions are addressed by the methodology: How was the information compiled? How were they analyzed? This chapter's remaining sections go into detail on the study's methodology.

3.1 Data and variables

This report examines how the SMC of Bangladesh is influenced by FOREXR, utilizing secondary data from 2001 to 2023. The research employs 23 annual observations, focusing on stock market capitalization (SMC) as the dependent variable, while foreign exchange reserves (FOREXR), inflation rates (INF), and interest rates (INT) serve as independent variables. Data on these variables is obtained from various sources, including Bangladesh's economic data, the Handbook of Statistics concerning the Bangladesh Securities Market (BSEC, BB), and several published reports.

Table 1 shows the data's summary statistics. The mean of stock market capitalization is 244805.37 crore and the observations are much clustered around mean value. The value of foreign exchange reserve is average of 17874.41 million having observations much more clustered around the same. Inflation has an average value of 6.64% and observations are heavily concentrated around the mean value. Observations of interest rate having a mean value of 5.65% are also much more clustered around the mean value. The standard deviation of both data variable is positive. And also, the data of each variable are positively skewed.

Dataset of each variable other than foreign exchange reserve is leptokurtic because both variables' the value of kurtosis is higher than 3. The data sets of foreign exchange reserve are platykurtic because foreign exchange reserve kurtosis value is less than 3. The Jarque-Bera statistic of SMC, FOREXR, INF, and INT are, 1.4809, 2.2745, 0.4269, and 25.2813*** respectively, and all of these except the INT reveal the insignificant results, that is, the hypothesis of normal distribution is rejected.

Table 1: Summary statistics

Variables	Obs.	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
SMC	23	244805.37	270074.00	202488.25	0.62	3.07	1.4809
FOREXR	23	17874.41	10911.55	14795.78	0.42	1.71	2.2745
INF	23	6.64	6.22	1.99	0.07	3.65	0.4269
INT	23	5.65	5.51	2.37	1.66	6.91	25.2813***

Significant at the 5% and 1% respectively

The entire estimation approach includes the ordinary least squares estimate, Johansen Cointegration, Granger Casualty test, Unit Root Test, the ordinary least square estimate, and ECM model. This report was prepared using a variety of software applications. Microsoft Word was utilized for word processing, and Microsoft Excel was used to create graphs and charts. "Stata 14.2 and EViews 12 SV" are two statistical programs that were utilized for the analysis.

3.2 Methodology

What is meant by “model specification” is the procedure through which variables are chosen for inclusion in a model (MacCallum, 1995). Since using the incorrect methodology or the inaccurate model specification results in biased and erroneous estimates, selecting the appropriate approach to utilize the most important component of time series analysis is the time series data.

First, the data's stationarity was assessed using unit root techniques. Time series data is not steady, regression findings are invalid. Data stationarity may be tested in a number of methods, and modern econometrics regularly employs each one. Nonetheless, the research utilized Augmented Dickey-Fuller (ADF) unit root technique (Dickey & Fuller, 1979) to confirm stationarity of the data and validate the results. Subsequently, ideal number of lags was chosen for the Autoregressive Distributed Lag (ARDL) along with Johansen's Cointegration tests, which assess if long-term collaboration exists amidst the stock market capitalization and foreign currency reserves, inflation rates, and interest rates. Finally, the study conducted Granger Causality test to determine the pairwise informal connection amidst stock market capitalization and foreign currency reserves, inflation rates, and interest rates.

Stationarity refers to the condition in which the statistical features of the process creating a time series remain constant. That doesn't mean nothing happens in the series, merely that the series' method of change stays the same. The “unit root test” is a statistical method in order to ascertain whether a given series is stationary. Augmented Dickey Fuller is one of several methods of unit root testing (Shrestha & Bhatta, 2018). The method is described below.

The most widely used strategy for determining whether or not a unit root exists is the ADF test. Suppose, y_t is a unit root-checking series and how the ADF model checks for unit root is shown below.

$$\Delta y_t = \mu + \delta y_{t-1} + \sum_{i=1}^k \beta \Delta y_{t-1} + e_t$$

Where,

$$\delta = \alpha - 1; \alpha = \text{coefficient of } y_{t-1}; \Delta y_t = \text{First difference of } y_t, \text{ i.e., } y_t - y_{t-1}$$

ADF null hypothesis state that $\delta = 0$ while alternative hypothesis posits that $\delta < 0$. Diminishing null hypothesis suggest the series is stationary; the lack of support appears not to be stationary.

An ARDL model that is based on ordinary least squares (OLS) may be employed regarding time series with differing integration order and non-stationarity. This model includes enough delays to characterize data generation process by utilizing

board to refine the modelling technique Shrestha & Bhatta, (2018). The autoregressive distributed lag model outperforms alternative models, whether the sample size is larger or smaller Ghatak & Siddiki, (2001). When right lags are used in ARDL modeling, this is accurate on the issue of serial correlation. The ARDL model may identify cointegration linkages across both long and short durations while providing unbiased estimates for the analysis Pesaran *et al.*, (2001). This model is usually used to *ARDL* (p, q_1, \dots, q_k), where p represents the number of lags of dependent variable, and q_k denotes k^{th} regressors.

The subsequent representation pertains to the ARDL model

$$\Delta y_t = \alpha + \sum_{i=1}^p y_i y_{t-1} + \sum_{j=1}^k \sum_{i=0}^{q_j} X_{j,t-1} \beta_{i,j} + \epsilon_t$$

Regressors without lag terms are termed fixed regressors, whereas those containing lag terms are referred to as dynamic regressors. The suitable delays for each variable have to be identified to define the ARDL model (i.e., specifying p, q_1, \dots, q_k). The lag durations may be readily ascertained by conventional model selection methodologies. Standard Hannan-Quinn, Akaike, and Schwarz information criteria may be employed to ascertain the appropriate lag order.

ARDL model may exhibit a long-term connection amidst dependent and explanatory variables, as outlined by Pesaran *et al.*, (2001). (Pesaran *et al.*, 2001) Bounds test approach may be articulated by the accompanying equation-

$$\Delta y_t = - \sum_{i=1}^{p-1} y_i^* \Delta y_{t-1} + \sum_{j=1}^k \sum_{i=0}^{q_j-1} \Delta X_{j,t-1} \beta_{i,j,i^*} - \rho y_{t-1} - \alpha - \sum_{j=1}^k X_{j,t-1} \delta_j + \epsilon_t$$

Consequently, following simple test may be utilized to evaluate the existence of long-term connections. $\rho=0, \delta_1=\delta_2=\dots=\delta_k=0$. (Pesaran *et al.*, 2001) given limits, including critical values, for most common situations when the explanatory variables comprise both I(0) and I(1) kinds. They have also set boundaries for scenarios in which all the regressors are I(0) or I(1).

Cointegration test just evaluates correlation between variables, offering no insights into the direction of causality (Hossain *et al.*, 2013). The Granger causality test determines whether one variable's history values have a major impact on another variable's future value. The Granger, (1988) technique is employed to determine the causal link among variables in this study. Estimating equations below is necessary for conducting the Granger tests.

$$X_t = \alpha_0 + \sum_{j=1}^k \alpha_{1s} X_{t-s} + \sum_{j=1}^m \alpha_{2i} Y_{t-m} + \epsilon_t$$

$$X_t = \beta_0 + \sum_{j=1}^n \beta_{1j} Y_{t-1} + \sum_{h=1}^p \beta_{2h} Y_{t-h} + \epsilon_{2t}$$

Where, ϵ_{1t} and ϵ_{2t} are thought to have no correlation and $E(\epsilon_{1t} \text{ and } \epsilon_{2t}) = 0 = E(\epsilon_{2t} \text{ and } \epsilon_{2s})$ for all $s \neq t$.

These equations demonstrate X-Y unidirectional causality. Y Granger causes X if the coefficient estimates α_{2i} is statistically significant, i.e., $\alpha_{2i} \neq 0$. Similarly, Y Granger-causes X, if the coefficient estimates β_{2h} is statistically significant. If both α_{2i} and β_{2h} are significant, X and Y are mutually dependent.

Finally, X and Y are independent if α_{2i} & β_{2h} are statistically equal to zero. Mathematically $\alpha_{2i} \neq 0$, and $\beta_{2h} \neq 0$. If there is causality direction from the lag X value to the current Y value, i.e., $\alpha_{2i} = 0$, and $\beta_{2h} \neq 0$, then the relationship amidst the lag X value and the present worth of Y suggests that X has a forward-looking tendency, such that changes in the Y are accurately predicted.

4. Data Analysis and Interpretation

Table 2 presents that stock market capitalization (SMC) has very strong significant positive correlation with foreign exchange reserve (FOREXR). Foreign exchange reserve has significant strongly negative association considering the interest rate. Inflation has strongly positive and significant association with stock market capitalization. All other variables are not found to have any significant association among each other. From now and onwards, for further analysis, all the variables are converted to their natural logarithm value.

Table 2: Pearson's Pairwise Correlations

Variable	SMC	FOREXR	INF	INT
SMC	1			
FOREXR	0.8560	1		
INF	0.1790	-0.0268	1	
INT	-0.4109	-0.3364	-0.4225	1

Note: Author's calculation *P<0.05

4.1 Unit Root Test

Table 3 displays the outcome of unit root test, which measures degree of stationarity variables. The outcomes of the unit root test determine which approach should be used for additional study. Using the ordinary least squares (OLS) approach to take the difference of non-stationary time series and make the variables stationary is not advised. The Johansen co-integration test is appropriate for the same levels of stationarity, i.e., either I(0) or I(1), since it examines both the short-run and long-run. If the time series have a mixed degree of integration, the ARDL model can be applied (Shrestha & Bhatta, 2018). The degree of stationarity of the variables has been estimated using the Augmented Dickey-Fuller (ADF) Test.

Table 3: Test of Stationarity

Variables	I(0)	I(1)
Ln SMC	0.3161	0.006
Ln FOREXR	0.1172	0.0176
Ln INF	0.0033	
Ln INT	0.0827	0.0027

Note: Author's calculation

ADF test result demonstrate that the dependent variable SMC, and two independent variables FOREXR and INT are stationary at 1st order of integration while another independent variable, INF, is stationary at level. Unit root test outcome show that every variable can be included in the ARDL test. To conduct additional research using the ARDL model, the ideal lag length must be determined. For this reason, various estimation of lag has been employed. The variables' optimal lag length is 1 according to the VAR lag order selection criteria presented in appendix table 1. By using the optimum lag, the ARDL model has been applied.

4.2 ARDL (Short-run Association)

Table 4 shows the outcomes of ARDL test, indicating short-run relationship amidst dependent and independent variables. This model demonstrates statistical reliability with an F-statistic p-value of 0.0000. The test result changes 97.44% in dependent variables among the independent variable. According to the results, INT at level data has an insignificantly negative impact on the changes of the dependent variable SMC, whereas the coefficients of FOREXR and INF have a large and favorable impact.

Evidence suggests that FOREXR at level data plays significant role in explaining variations in SMC over the short-run. As well, both INF, and INT can affect the variations in SMC in the short-run, with an impact seen at lag 1.

Table 4: Short-run ARDL Test Estimates of SMC and Explanatory Variables

Dependent Variable: LN_SMC				
Method: ARDL				
Dynamic regressors (1 lag, automatic): LN_FOREXR LN_INF LN_INT				
Fixed regressors: C				
Model: ARDL(1, 0, 0, 0)				
<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.*</i>
<i>LN_SMC(-1)</i>	0.6376	0.1255	5.0821	0.0001
<i>LN_FOREXR</i>	0.3805	0.1787	2.1290	0.0482
<i>LN_INF</i>	0.6799	0.2414	2.8164	0.0119
<i>LN_INT</i>	-0.0122	0.1687	-0.0724	0.9431
<i>C</i>	-0.4027	0.9481	-0.4247	0.6764
F-statistic	161.6323		Prob(F-statistic)	0.0000
LN_SMC = 0.6376*LN_SMC(-1) + 0.3805*LN_FOREXR + 0.6799*LN_INF - 0.0122*LN_INT - 0.4027				

Note: Author's calculation; * p<0.05

To make sure the ARDL model is feasible, a number of econometric studies have been conducted. Table 5 below is a summary of the results from the Wald test. The Wald test posits a null hypothesis asserting that the explanatory factors, in aggregate, lack statistical significance. The P-value for F-statistic (0.0091) and Chi-square (0.0007) in the calculated ARDL model indicate that Wald test rejects null hypothesis. It signifies that regressors are collectively statistically significant and hence contribute to the dependent variables.

Table 5: Wald Test for ARDL Model

Null Hypothesis: $C(2)=0, C(3)=0, C(4)=0, C(5)=0$			
Test Statistic	Value	df	Probability
F-statistic	4.7765	(4, 17)	0.0091*
Chi-square	19.1060	4	0.0007*

Note: Author's calculation; * $p < 0.05$

A heteroscedasticity test was subsequently conducted to ascertain if dataset is homoscedastic, with null hypothesis positing that dataset is homoscedastic. The examination findings are displayed in *Appendix Table 3*; both F-statistic (0.5976) and Obs*R-squared (0.6693) have p-values greater than 0.05, indicating that null hypothesis cannot be rejected.

Breusch-Godfrey serial correlation test, LM test has been employed to ascertain if residuals display serial correlation. Accepting null hypothesis, the outcome in *Appendix Table 4* suggest that residuals exhibit no serial correlation.

To find whether the developed model has any significant non-linear relationship, Ramsey RESET test has been carried out. Rejecting the null hypothesis, the results, shown in *Appendix Table 5*, advocate that regression model is free from any kind of specification error thus no significant non-linear relationship exists.

To find whether the developed model has any significant multicollinearity, Variance Inflation Factors test has been carried out. Rejecting the null hypothesis, the results shows in *Appendix table 6*, both independent variables centered VIF value is less than 10. This result said that each dependent data variable has no multicollinearity relationship.

Appendix Figure 1 shows how the residuals are evaluated for normality. Normality test findings indicate that residuals follow a normal distribution, since Jarque-Bera p-value (0.8980) above 0.05 at the 5% significance level.

As a final fitness test metric, the CUSUM test has been used to graphically illustrate the model's statistical stability. The results of CUSUM and CUSUMSQ are shown in *Appendix Figure 2* and *Appendix Figure 3*, respectively. The graphs for CUSUM and CUSUMSQ tests remain inside confines of 5% significance threshold. The CUSUM and CUSUMSQ tests both show that the ARDL model is statistically stable.

4.3 ARDL Bounds Test

The results of an ARDL bounds test are presented in *Table 6* below. The null hypothesis of ARDL Bounds test asserts that no long-term link exists between dependent and independent variables. At 5% significance level, null hypothesis has been rejected since F-statistic (6.6928) above the $I(1)$ threshold (3.67). This discovery signifies a prolonged correlation between SMC and explanatory factors.

Table 6: Bounds Test Estimates between SMC and Independent Variables

Null Hypothesis: No levels (Long-term) relationship exists		
Test Statistic	Value	K
F-statistic	6.6928	3
Critical Value Bounds		
Significance	$I(0)$ Bound	$I(1)$ Bound
5%	2.79	3.67

Note: Author's calculation; * $p < 0.05$

4.4 Cointegrating (Long-run) Test

Table 7 displays long-run cointegrating Pesaran *et al.*, (2001) connections amidst dependent and independent variables. Considering the information in the tables, independent variable FOREXR has significant relationship with SMC in long-run but other two independent variables have insignificant relationship on SMC in short-run. The coefficient of FOREXR is positive. The coefficient of INF is also positive in this study. In contrast, coefficient of INT has negative but statistically significant impact on SMC in the long run. As per the study by (Ray, 2012), null hypothesis indicating the lack of co-integrating vectors can be rejected at 1% level of significance, demonstrating the presence of a single co-integration equation and thereby a linear relationship among variables. However, results from (E. J. A. Abakah & M. K. Abakah, 2016) suggest that null hypothesis of no integration can be rejected at 5% significance level.

Table 7: Long-run Cointegrating Test Estimates between SMC and Explanatory Variables

Dependent Variable: D(LAG_SMC)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FOREXR	1.0499	0.1864	5.6312	0.0000
INF	1.8761	0.7255	2.5859	0.0192
INT	-0.0337	0.4680	-0.0720	0.9434
C	-1.1111	2.4913	-0.4460	0.6612
EC = LAG_SMC - (1.0499*LAG_FOREXR + 1.8761*LAG_INF - 0.0337*LAG_INT - 1.1111)				

Note: Author's calculation; * p<0.05

SMC's Error Correction Model (ECM) with the regressors is shown in Table 8. Error correction coefficient, CointEq(-1), is -0.3624, accompanied with P-value of 0.00001. The error correction coefficient signifies that annually, 36.24 percent of the previous dynamic imbalance is corrected to attain equilibrium.

Table 8: ECM between SMC and Regressors

Variable	Coefficient	Standard Error	t-Statistic	Prob*
CointEq(-1)*	-0.3624	0.0564	-6.4295	0.00001

Note: Author's calculation; * p<0.05

4.5 Granger Causality Test

Finding a causal relationship between the overall stock market capitalization and its primary long-term factors is the last stage of empirical study. For this purpose, we use the well-known Granger-causality test to examine if the projected variables in the suggested model are causally associated with a single lag length in at least one direction. The Granger causality test results, which show a relationship between SMC and explanatory factors, are shown in Table 9. The absence of causation serves as null hypothesis in Granger causality test. According to findings, the regressand is not related to any of the regressors in any way.

Table 9: VAR Granger Causality Wald Tests

Dependent variable	Excluded	Chi-sq	df	Prob.
LAG_SMC	LAG_FOREXR	5.8173	2	0.0545
	LAG_INF	1.4294	2	0.4893
	LAG_INT	2.6418	2	0.2669
	All	6.6788	6	0.3516
LAG_FOREXR	LAG_SMC	3.9474	2	0.1389
	LAG_INF	7.2437	2	0.0267
	LAG_INT	0.3822	2	0.8260
	All	21.4660	6	0.0015
LAG_INF	LAG_SMC	0.9765	2	0.6137
	LAG_FOREXR	3.6192	2	0.1637
	LAG_INT	6.0106	2	0.0495
	All	8.5226	6	0.2023
LAG_INT	LAG_SMC	0.9723	2	0.6150
	LAG_FOREXR	1.2163	2	0.5444
	LAG_INF	0.2563	2	0.8797
	All	3.6216	6	0.7277

Note: Author's calculation

After performing the co-integration test, determine if one variable "Granger causes another" (Granger, 1969). Variables under consideration are displayed in the following table along with their respective Prob>chi2.

The outcomes of the three assessments for the first equation are now examined. In this test, the null hypothesis posits that foreign currency reserves do not Granger-cause stock market capitalization. In such scenario, the null hypothesis is retained as the probability exceeds 0.05, signifying lack of a causal connection between foreign exchange reserves and market capitalization in Bangladesh. According to (Hasan, 2018) there exists a causal connection amidst foreign exchange reserves and market capitalization in Bangladesh. A similar conclusion can be reached for inflation and market capitalization, interest rates, and stock market capitalization. The concluding examination pertains to null hypothesis for all variables. In that circumstance, null hypothesis remains unrefuted. Conclusion drawn from the market capitalization formula is that each component contributes to the determination of Bangladesh's market capitalization.

In foreign exchange reserve equation, the null hypothesis posits that stock market capitalization and interest rates lack a causal relationship since probability value for both variables exceed 5%. But null hypothesis of inflation is not rejected because the value of probability is less than 5% level of significance and there is no greater causality, but inflation is linked to foreign exchange reserve. But all the variables jointly cause the foreign exchange reserve.

Null hypothesis state that there is no causal link among interest rates, foreign currency reserves, and stock market capitalization is not rejected in case of the

inflation equation, indicating that market capitalization was not the source of inflation. And also, all the variables do not jointly cause the inflation rate. Regarding interest rates, the same conclusion may be made. In the event, *Akinlo and Awolowo (2015)* show that a bidirectional connection existed amidst interest rates and stock market capitalization.

5. Findings of the Study

The present study confirms a strong and statistically significant long-run relationship between foreign exchange reserves (FOREXR) and stock market capitalization (SMC), aligning with the findings of *Ray, (2012)*, who observed a unidirectional impact of FOREXR on stock market performance in India. Similarly, *E. Abakah & M. Abakah, (2016)* and *Akinlo & Awolowo, (2015)* also reported a positive association between foreign reserves and stock market growth. However, in contrast to *Bhattacharya, (2012)* who found no significant correlation in the Indian context using the Toda-Yamamoto method, this study demonstrates clear short- and long-term effects in Bangladesh, possibly due to differences in data span and methodology (ARDL vs. VAR).

This study finds a positive short- and long-run relationship between inflation and stock market capitalization, which contrasts with the findings of *Sohail & Hussain, (2009)* and *Liu & Shrestha, (2008)*, who documented a negative relationship in emerging markets like Pakistan and China. This difference could be due to Bangladesh's relatively stable inflationary trends over the study period (2001–2023), or structural characteristics of its capital market.

The result for interest rate (INT) shows a statistically insignificant impact on stock market capitalization in both the short and long run. This diverges from the findings of *Khalid, (2017)* and *Khravish et al., (2010)*, who identified a negative and significant effect of interest rates on stock market capitalization. The absence of a significant relationship in this study may reflect effective monetary policy coordination in Bangladesh post-2011 or the dominance of other capital market determinants during this period.

The Granger Causality test reveals no direct causal relationship between foreign exchange reserves and market capitalization in Bangladesh. This finding challenges prior research such as *Hasan, (2018)*, which asserted a unidirectional causality from reserves to capitalization. It suggests that while FOREXR influences SMC in terms of correlation and cointegration, it does not necessarily precede or “Granger-cause” it in the short run.

This study offers several important contributions to the existing body of research: Updated and Extended Dataset; While most previous studies examined shorter periods (e.g., 1990–2010 or 2001–2018), this research utilizes 23 years of annual data from 2001–2023, providing a more comprehensive and recent analysis—particularly capturing post-crisis and post-pandemic impacts. Bangladesh-Specific Empirical Evidence: Very few studies have empirically tested the linkage between FOREXR and SMC in the Bangladeshi context using robust econometric tools. This study bridges that gap by applying ADF, ARDL, Bounds Test, ECM, and Granger Causality approaches. Methodological Rigor; Unlike earlier studies that relied solely

on OLS or bivariate causality, this research incorporates both short-run and long-run dynamics using the ARDL framework, capturing cointegrating relationships among macroeconomic indicators. Inclusion of Critical Macroeconomic Variables: The study includes foreign exchange reserves, inflation, interest rates, and exchange rates, offering a multivariate perspective rather than a bivariate one, which enhances analytical depth. Policy Implications: The findings contribute to policy-level understanding by identifying FOREXR and inflation as significant drivers of market capitalization in Bangladesh. This can inform monetary authorities, investors, and regulatory bodies when formulating capital market development strategies.

6. Conclusion

This study explored the influence of macroeconomic indicators—specifically foreign exchange reserves (FOREXR), interest rates (INT), and inflation (INF) on stock market capitalization (SMC) in Bangladesh using time series data spanning from 2001 to 2023. Employing robust econometric techniques including the Augmented Dickey-Fuller (ADF) unit root test, the ARDL model, bounds testing, cointegration, error correction modeling (ECM), and Granger causality testing, the research provides both short-run and long-run insights into the dynamic relationships between these variables and market capitalization.

The findings confirm that foreign exchange reserves exert a significant and positive impact on stock market capitalization in both the short and long run, underscoring the role of FOREXR as a stabilizing force and a signal of investor confidence in the financial system. Similarly, inflation demonstrates a significant and positive effect on SMC in both the short-run (lagged) and long-run analyses an outcome that may reflect a controlled inflationary environment and capital market resilience in Bangladesh. On the contrary, interest rates exhibit an insignificant negative relationship with stock market capitalization, suggesting that interest rate movements may not be the primary determinant of investor behavior or market growth in the context of Bangladesh.

Although the correlation and cointegration analyses support the importance of FOREXR and INF, the Granger causality test found no strong evidence of predictive causality between the independent variables and SMC. This suggests that while these variables are related, their movements do not necessarily forecast changes in market capitalization within a short temporal lag.

Importantly, the study fills a gap in existing literature by offering up-to-date empirical evidence over a 23-year period, capturing key events such as the 2011 market manipulation crisis, the COVID-19 pandemic, and the post-pandemic recovery. Moreover, it enriches the academic discourse by applying a multivariate ARDL approach, in contrast to many prior studies which were bivariate or used outdated methodologies.

6.1 Policy Implications and Future Research

The results offer meaningful implications for policymakers, investors, and regulatory bodies. The significant influence of foreign reserves and inflation on stock market performance suggests that maintaining macroeconomic stability particularly adequate

reserves and inflation control can enhance market capitalization and attract investor confidence. Monetary authorities may consider coordinating interest rate policies with reserve accumulation strategies to foster a stable investment climate.

However, this study is not without limitations. It focuses on only three macroeconomic variables and excludes others such as exchange rate volatility, GDP growth, or political risk factors. Future studies could benefit from incorporating broader economic and institutional variables, using higher-frequency data (e.g., quarterly or monthly), or conducting cross-country comparisons to generalize findings further.

In conclusion, this research contributes to a deeper understanding of the macro-financial linkages in Bangladesh and provides a reliable foundation for more targeted economic and financial policymaking aimed at strengthening the Dhaka Stock Exchange and enhancing national capital market development.

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Appendices

Appendix Table 1: Optimum Lag Selection for ARDL Model

VAR Lag Order Selection Criteria						
Endogenous variables: LAG_SMC LAG_FOREXR LAG_INF LAG_INT						
LAG	LogL	LR	FPE	AIC	SC	HQ
0	-39.283024	NA	0.000725	4.122193	4.321149	4.165371
1	22.175549	93.65116*	9.92e-06*	-0.207195*	0.787588*	0.008698*
2	32.790513	12.131390	0.000020	0.305665	2.096275	0.694274

Appendix Table 2: Coefficient Labels for ARDL Model

Variable	Coefficient
LN_SMC(-1)	C(1)
LN_FOREXR	C(2)
LN_INF	C(3)
LN_INT	C(4)
C	C(5)

Appendix Table 3: Test of Heteroskedasticity

<i>Heteroskedasticity Test: Breusch-Pagan-Godfrey</i>			
<i>Null hypothesis: Homoskedasticity</i>			
F-statistic	0.5976	Prob. F(4,17)	0.6693
Obs*R-squared	2.7122	Prob. Chi-Square(4)	0.6071
Scaled explained SS	1.4067	Prob. Chi-Square(4)	0.8430

Appendix Table 4: Serial Correlation LM Test

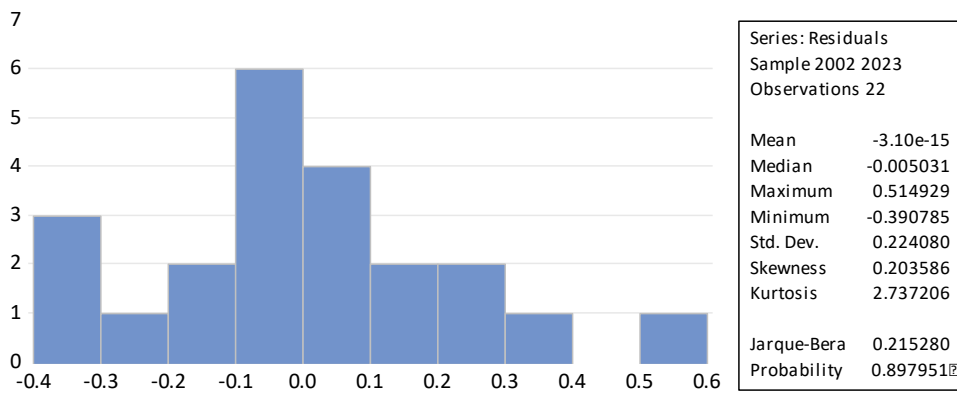
Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.2755	Prob. F(2,15)	0.7630
Obs*R-squared	0.7794	Prob. Chi-Square(2)	0.6773

Appendix Table 5: Test of Ramsey RESET

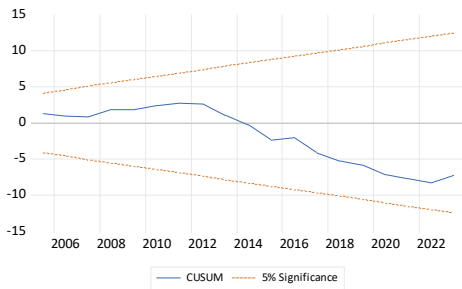
	Value	df	Probability
t-statistic	1.0064	16	0.3292
F-statistic	1.0129	(1, 16)	0.3292
Likelihood ratio	1.3504	1	0.2452

Appendix Table 6: Multicollinearity Test (Variance Inflation Factors)

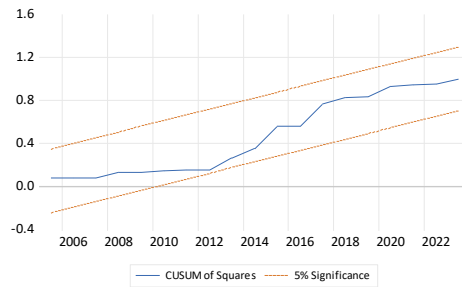
<i>Variable</i>	<i>Coefficient Variance</i>	<i>Uncentered VIF</i>	<i>Centered VIF</i>
LAG_FOREXR	0.007399	92.901799	1.330646
LAG_INF	0.072734	36.569415	1.259687
LAG_INT	0.069552	28.858243	1.481719
C	1.411963	202.172659	NA



Appendix Figure 1: Residuals' Normality Test of ARDL Model



Appendix Figure 2: CUSUM Test



Appendix Figure 3: CUSUM of Square (CUSUMSQ) Test