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An Inquiry into the Influence of Key Macroeconomic Variables on the Dhaka Stock Exchange Equity Prices

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Abstract

This study examines the performance of the Dhaka Stock Exchange (DSE) from January 2015 to December 2024 and empirically analyzes the implications for key macroeconomic variables, including interest rates, inflation, and exchange rates. The analysis uses monthly data from Bangladesh Bank and employs time-series econometric methods, including unit root tests, Johansen cointegration tests, vector error correction models (VECMs), and Granger causality tests. The results show that all variables are integrated of order one and indicate a single long-run cointegrating relationship. Interest rates have a substantial negative long-term impact on the DSE index, consistent with theoretical predictions that higher borrowing and opportunity costs depress equity prices. Conversely, inflation and exchange rates do not exhibit statistically significant long-term effects; however, short-term dynamics indicate that inflation positively influences the index, perhaps due to speculative market behavior. Granger causality tests establish bidirectional causality between interest rates and the DSE index, while inflation is found to affect exchange rates. These results underscore the DSE's inefficiency, in which macroeconomic shocks may exert delayed or exacerbated impacts on pricing. The research offers practical insights for investors, policymakers, and regulators, including the importance of monetary policy coordination and enhanced market efficiency in Bangladesh.

Keywords: *Dhaka Stock Exchange (DSE) · Macroeconomic Variables · Stock Market Volatility · Time-Series Models*

JEL Codes: *G12 · E00 · G28 · E44 · C32*

1. Introduction

There has been considerable discussion about the effectiveness of stock exchanges, given their significant role in global economies and financial

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markets. Stock markets help the economy expand by influencing how people and businesses spend and save their money. They achieve these objectives by ensuring people spend their money wisely and encouraging them to invest in assets that will pay dividends. As a result, market performance has become a key measure of economic fundamentals that affects the investment decisions of both domestic and international investors (Islam et al., 2015). Macroeconomic variables are often considered crucial factors influencing stock market trends, as they may affect future corporate cash flows and the risk-adjusted discount rates used in valuation models (Islam et al., 2015; Eldomiaty et al., 2020). Stock exchanges are also beneficial for firms because they facilitate trading and generate substantial cash flow (Adjasi & Biekpe, 2006). For this beneficial role to work, the stock market and key macroeconomic data must be closely connected. Theorists agree that macroeconomic factors are important, but their nature, size, and direction are unclear. This position is especially true in Emerging Markets (EM), where institutional and structural factors are completely unique (Islam et al., 2014; Islam et al., 2015; Current Market Valuation, 2025). This variation shows how vital it is to look at each country separately. There have been several ups and downs at the Dhaka Stock Exchange (DSE) in Bangladesh over the years (Islam et al., 2023a). Therefore, investors, regulators, and politicians need to determine which macroeconomic conditions affect its performance. The research examines the impact of macroeconomic indicators on the DSE's stock prices. From an economic standpoint, Bangladesh's leading stock market, the DSE, is classified as an emerging market (EM); however, significant efforts are required to address capacity building relative to GDP, as well as structural constraints and volatility challenges. This study analyzes several key macroeconomic variables and their impact on the DSE index's stock prices. To understand equity prices, the study analyzes three key macroeconomic variables: interest rates, inflation, and currency rates. Interest rates, inflation, and exchange rates are crucial macroeconomic factors that significantly impact investment decisions in equity markets and encourage companies to list on the DSE to finance productive endeavors.

2. Background of the Study

Stock markets are pivotal for economic growth; they function as efficient mechanisms for mobilizing capital and channeling it toward productive investment. In emerging economies, their roles are even more evident, as they intensify domestic financial systems, enhance resource allocation, and support industrialization and economic development (Islam et al., 2014; Islam et al., 2015). The increasing interconnectedness of global financial markets further accentuates the importance of understanding their complex dynamics (Islam et al., 2015). This study focuses on the DSE, Bangladesh's primary stock

exchange, within the broader context of the country's strong economic growth recently (Islam et al., 2014). National economic conditions are closely tied to the DSE's performance, serving as a barometer of fundamental factors. However, the exchange is characterized by unique characteristics and risks, including frequent regulatory changes, a relatively small market size, low liquidity, and limited depth. Historically, the DSE has been prone to manipulation and sharp crashes, most notably in 1996 and 2011 (Gwala & Mashau, 2022; Islam et al., 2023a). These features distinguish the DSE from developed markets and impact the transmission of macroeconomic shocks. Evidence indicates that the DSE is not weak-form efficient because its index follows a predictable pattern (Islam et al., 2017). Structural weaknesses, such as low market capitalization and turnover, a narrow range of financial products, and a large proportion of inexperienced investors (Islam et al., 2023a), undermine price discovery and slow the incorporation of information into stock prices. Consequently, macroeconomic announcements may exert a stronger or delayed effect than efficient markets would predict. This inefficiency highlights the relevance of analyzing macroeconomic-stock market linkages in Bangladesh. For investors, understanding these relationships provides valuable guidance for portfolio management. For policymakers, it sheds light on the interplay between financial markets and broader economic stability (Islam et al., 2015).

3. Literature Review

Research indicates that macroeconomic factors account for approximately 30–35% of the variation in stock prices (Chandra, 2004). This study focuses on economic fundamentals, offering a thorough examination of fundamental analysis and illustrating the impact of root macroeconomic variables on stock price movements. Corporate earnings, a crucial determinant of stock prices, are affected by multiple factors, including economic growth, productivity, labor quality, and capital stock (Golob & Bishop, 1997). In addition, direct and indirect factors such as interest rates, industrial output, inflation, exchange rates, and the money supply significantly affect stock market performance (Goswami & Jung, 1997). Maysami et al. (2005), in their cointegration analysis of Singapore's stock market, confirmed the importance of these macroeconomic variables. Similar findings have been reported by Aga & Kocaman (2006), Abeyratna et al. (2004), and Bilson et al. (1999), among others.

3.1 Theoretical Foundations of Macroeconomic Influences on Stock Markets

The interaction between macroeconomic conditions and stock market performance is pivotal to financial economics and is grounded in several theoretical constructs. The Efficient Market Hypothesis (EMH), articulated by Fama (1970), posits that stock prices fully reflect market expectations of a company's future performance, which is inherently tied to broader macroeconomic conditions (Eldomiaty

et al., 2020). In a truly efficient market, all available information, including macroeconomic data, is quickly and completely absorbed into prices. However, evidence indicates that the DSE does not conform to the weak form of the EMH (Islam et al., 2017), suggesting that macroeconomic variables may exert stronger, more exploitable effects due to information asymmetries and delayed adjustments. Ross's (1976) Arbitrage Pricing Theory (APT) further extends this view, proposing that asset returns are influenced by multiple macroeconomic risk factors, with investors earning risk premia in response. APT does not identify specific factors; however, it provides a comprehensive framework for the simultaneous analysis of multiple variables, in contrast to single-factor models like the Capital Asset Pricing Model (CAPM) (Eldomiaty et al., 2020). Interest rates are widely regarded as a major determinant of stock prices. They fluctuate with time, default risk, inflation, and capital productivity (Chandra, 2004). Shifts in interest rates influence investor behavior, leading to reallocations between equity markets and fixed-income instruments, as well as to speculative activity. Central banks regulate interest rates through monetary policy (Kevin, 2000), while informal financial markets remain unregulated. Theory predicts an inverse relationship between interest rates and stock prices. Smith (1990) exhibited that U.S. stock prices often rose following interest rate cuts. In Korea, Goswami & Jung (1997) found an inverse relationship between stock prices and long-term rates, but a positive correlation with short-term rates due to liquidity effects.

The cash-flow discounting model posits that elevated interest rates augment discount rates, consequently diminishing the present value of anticipated cash flows and, by extension, stock prices (Islam et al., 2017; Eldomiaty et al., 2020; Rahman et al., 2012). At the same time, higher borrowing costs reduce corporate profitability, suppressing valuations. Conversely, lower rates stimulate investment and economic activity, boosting stock returns. The opportunity cost channel reinforces this relationship: when interest rates rise, fixed-income assets become more attractive relative to equities, prompting investors to shift capital out of the stock market (Islam et al., 2017; Rahman et al., 2012). Given the inefficiency of the DSE, this channel likely has an amplified effect, as investors may quickly reallocate funds into bank deposits promising higher guaranteed returns. Inflation also plays a pivotal role. While Chandra (2004) noticed its dual impact across industries, most studies indicate an inverse relationship between inflation and stock prices. Fama & Schwert (1977) demonstrated that both expected and unexpected inflation reduce stock returns. Feldstein (1979, 1997) and Summers (1981) highlighted the distorting impact of inflation on taxation and accounting rules, including understated depreciation and the taxation of nominal gains, which depress real returns. Amadi & Odubo (2002) argued that mispricing often results from investors relying on nominal instead of real

measures. Empirical evidence strongly supports the negative effect of inflation, which arises through purchasing power erosion, reduced profitability, tax distortions, and negative real returns (Eldomiaty et al., 2020; Gopinath, 2025). The exchange rate–stock price relationship is more intricate. Fluctuations directly affect import-dependent industries and corporate earnings. Maku & Atanda (2010) found a positive correlation between stock prices and a depreciating Naira in Nigeria. Exchange rates influence competitiveness, trade balances, and reserves, creating risks and opportunities (Osamwonyi, 2003). Channels include (i) international competitiveness and trade balance, where depreciation boosts exports (Eldomiaty et al., 2020; Phylaktis & Ravazzolo, 2005); (ii) transaction and translation exposure in trade and financial statements; and (iii) the economic activity channel, where depreciation can increase aggregate demand. Empirical findings are mixed—negative (Mfugale & Olomi, 2023), positive (Golder et al., 2020), or even reverse causality (Ullah et al., 2017). This variability underscores the need for country-specific analysis.

3.2 Empirical Evidence in Emerging Economies

A substantial body of literature highlights the impact of macroeconomic factors on emerging markets (EM) (Islam et al., 2014; 2015; Eldomiaty et al., 2020). Garza-Garcia & Yue (2010) demonstrated U.S. influence on Chinese markets, while Sharma & Mahendru (2010) found similar dynamics in India. Asmy et al. (2010) noted differences in the pre- and post-crisis relationships among inflation, the money supply, and exchange rates. Humpe & Macmillan (2009) found strong macro-market linkages in the U.S. and Japan. Qayyum & Anwar (2011) showed that monetary policy drives volatility in Pakistan. More recent studies confirm that GDP, interest rates, inflation, exchange rates, money supply, and capital flows are key factors, though results often conflict in direction and significance (Mfugale & Olomi, 2023). This inconsistency demonstrates the importance of localized analysis, as causality and magnitude vary across contexts (Adrian et al., 2024; Gopinath, 2025).

3.3 Literature on the Dhaka Stock Exchange

For the DSE, multiple studies confirm a long-run cointegrating relationship between stock prices and macroeconomic variables (Islam et al., 2018). Inflation consistently negatively affects DSE returns (Gwala & Mashau, 2022; Golder et al., 2020; Mfugale & Olomi, 2023). Similarly, interest rates negatively affect prices, aligning with opportunity cost and profitability theories (Islam et al., 2017; Mfugale & Olomi, 2023). Exchange rate effects, however, are mixed: some studies demonstrate a positive link, others a negative one, and some indicate reverse causality, where stock prices Granger-cause exchange rates (Ullah et al., 2018). These contradictions highlight the DSE's inefficiency, low liquidity, and heightened sensitivity to macro shocks.

3.4 Identification of the Research Gap

While theory and empirical evidence suggest that macroeconomic factors influence stock markets, findings for emerging markets (EM) are inconsistent and context-dependent. In Bangladesh, the DSE's inefficiency, volatility, and structural limitations suggest that macroeconomic shocks may have stronger, delayed effects than in developed markets. Empirical evidence on the impacts of inflation and exchange rates is particularly contradictory, underscoring the need for context-specific verification. This study addresses these gaps by examining the effects of *interest rates, inflation, and exchange rates* on the DSE using updated monthly data (2015–2024) and advanced econometric methods. It tests the applicability of established theories in Bangladesh's unique market environment, characterized by import dependency and the opportunity cost of bank deposits. The findings aim to provide nuanced insights for investors, policymakers, and regulators.

3.5 Research Questions

This study aims to address the following research questions:

3.5.1 Time-Series Properties

What are the stationarity characteristics and descriptive statistics of the DSE index, interest rate, inflation rate, and exchange rate of Bangladesh during 2015–2024?

3.5.2 Long-Run Relationships

Are the DSE index, interest rate, inflation rate, and exchange rate cointegrated in the long run over the study period?

3.5.3 Short-Run and Long-Run Effects

How do interest rates, inflation, and exchange rates influence the DSE index in both the short run and the long run?

3.5.4 Causality Dynamics

Does Granger causality exist between the DSE index and the selected macroeconomic variables? If so, what is the direction of causality?

3.6 Research Hypotheses

3.6.1 H1: Time-Series Properties

H1a: The DSE index, interest rate, inflation rate, and exchange rate are non-stationary at their levels.

H1b: These variables become stationary after first differencing, indicating integration of order one, I (1).

3.6.2 H2: Long-Run Relationships

H2a: The DSE index, interest rate, inflation rate, and exchange rate share at least one cointegrating relationship in the long run.

H2b: Interest rates exert a significant negative long-run effect on the DSE index.

H2c: Inflation and exchange rates exert significant long-run effects on the DSE index.

3.6.3 H3: Short-Run Dynamics

H3a: Interest rates have a significant short-run effect on the DSE index.

H3b: Inflation has a significant short-run effect on the DSE index.

H3c: Exchange rate fluctuations have a significant short-run effect on the DSE index.

3.6.4 H4: Granger Causality

H4a: There exists bidirectional Granger causality between interest rates and the DSE index.

H4b: Inflation Granger-causes the DSE index and/or the exchange rate.

H4c: Exchange rate fluctuations Granger-cause the DSE index.

4. Data and Research Methods

4.1 Data Availability

This study uses monthly time-series data for the DSE Index (as the dependent variable) and three key macroeconomic variables: the interest rate, inflation rate, and exchange rate (as independent variables). The primary data source for all variables is the Bangladesh Bank website, ensuring consistency and direct applicability to the research query. The dataset covers a continuous 10-year period from January 2015 to December 2024, yielding a total of 120 monthly observations per variable. This length of data is generally considered sufficient for robust time-series econometric analysis.

Among the four variables, the first, i.e., the DSE Index datasets collected from the Dhaka Stock Exchange depository, refer to datasets that track the performance of the Dhaka Stock Exchange, Bangladesh's main stock exchange (https://www.dsebd.org/). The other three variables recognized were collected from the Bangladesh Bank's (BB) repository system (https://www.bb.org.bd/en/index.php). Both repositories are publicly available. The two data sources' names and repositories:

4.1.1 Name of Data Source: Dhaka Stock Exchange (DSE) and

Repository: https://www.dsebd.org/

4.1.2 Name of Data Source: Bangladesh Bank (BB) and

Repository: https://www.bb.org.bd/en/index.php

The variables are defined as follows:

4.1.1 DSE Index
Represents the overall performance of the Dhaka Stock Exchange, serving as a proxy for the aggregate stock market return.

4.1.2 Interest Rate
Reflects the general cost of borrowing in the economy and the opportunity cost of holding equity investments.

4.1.3 Inflation Rate
Measured by the Consumer Price Index (CPI), indicating the rate of change in the general price level of goods and services.

4.1.4 Exchange Rate
Represents the value of the Bangladeshi Taka against USD.

4.2 Model Specification (General)
INDEX =A*INTEREST_RATE + B*INFLATION_RATE +C*EXCHANGE_RATE + D + E

Where A, B, and C are coefficients, D and E consist of a parameter and a disturbance term, respectively, and INDEX means DSE Index.

4.2.1 The Static Model (Baseline Specification)
Based on the model specification you provided and the dataset details (monthly time-series data from 2015 to 2024), the study has reformulated the equation into a proper time-series econometric model. To do so, the given static model is redefined as:

If we write the equation exactly as given, but with a time subscript (t) to denote the monthly observations, it is:

$$(\text{INDEX})_t = \beta_0 + \beta_1 \cdot (\text{INTEREST\_RATE})_t + \beta_2 \cdot (\text{INFLATION\_RATE})_t + \beta_3$$

Where:

t = 1, 2, …, 120 (representing January 2015 to December 2024).

β_0 = The constant term (D in your specification, containing the parameter).

$\beta_1, \beta_2, \beta_3$ = The coefficients (A, B, C).

ϵ_t = The disturbance term (E), assumed to be white noise.

4.2.2 The Dynamic Time Series Model

The use of monthly data over a decade requires accounting for dynamics (lags) and the error structure in a proper time-series equation. Because you are using the DSE Index (a financial variable) with monthly data, the static model above is likely to suffer from autocorrelation and non-stationarity. In time-series econometrics, it is standard to include a lagged dependent variable to capture market momentum (investors often look at last month's performance) and to ensure that the residuals are uncorrelated. A more appropriate time series equation for your specification is an Autoregressive Distributed Lag (ARDL) model:

$$\text{INDEX}_t = \alpha + \phi \cdot \text{INDEX}_{t-1} + \beta_1 \cdot \text{INTEREST\_RATE}_t + \beta_2 \cdot \text{INFLATION\_RATE}_t + \beta_3 \cdot \text{EXCHANGE\_RATE}_t + \epsilon_t$$

Where:

INDEX_{t-1}: The DSE Index value from the previous month (lag 1). This accounts for the fact that stock indices are path-dependent.

ϕ: The coefficient of the lagged dependent variable. If ϕ is close to 1, the index follows a random walk. α: The constant parameter (D), ϵ_t: The disturbance term (E)

4.2.3 Considering Stationarity (Unit Root Context)

Since your data spans 10 years (120 months), the DSE Index, Interest Rate, and Exchange Rate are likely non-stationary (they contain unit roots). If that is the case, a simple regression may be "spurious" (showing relationships that are not real). To correct for this, the time series equation should be estimated in first differences (γ,δ, and λ) or using a cointegration framework[1].

4.3 General Tendency of Data

The study seeks to empirically investigate the short- and long-term effects of three principal macroeconomic variables—interest rate, inflation rate, and exchange rate—on the influence of the Dhaka Stock Exchange (DSE) through time-series analysis. To do so, the data of each variable are depicted individually in Fig. 1. In the figure, the study plotted each variable and obtained each frequency curve, which presents the general trend line of the study. Among the four quartiles in

[1] If the variables are cointegrated (they move together in the long run), the equation becomes an Error Correction Model (ECM): $\mathbf{\Delta INDEX}_t = \gamma \cdot \mathbf{ECT}_{t-1} + i=1 \sum p \delta i \Delta \mathbf{INDEX}_{t-i} + j=0 \sum q \lambda j \Delta X_{t-j} + \epsilon_t$

the figure, inflation and exchange rates showed an upward trend over time (the 3rd and 4th quartiles). With little fluctuation, the interest rate also showed an upward trend (2nd quartile), but the dependent variable of the research, the DSE index, did not show a trend line (1st quartile). In fact, the DSE index did not respond equally to the progress of the three independent variables.

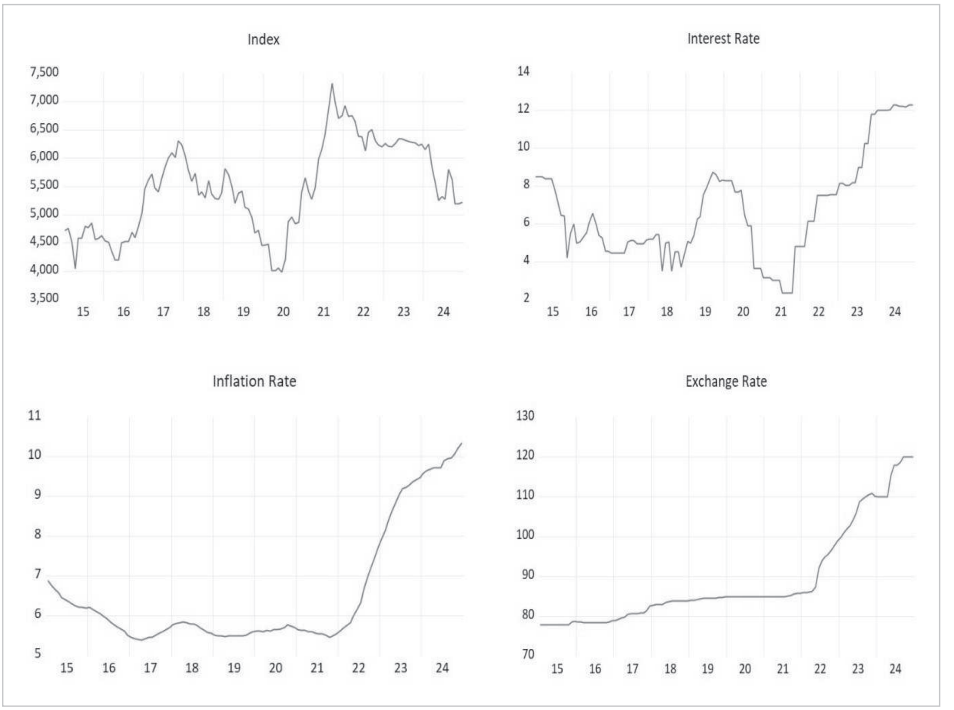

Fig .1 Time series plots of the variables, Bangladesh Bank (January 2015 to December 2024).

4.4 Time Series Properties

a) Stationarity Tests: A fundamental prerequisite for many time-series econometric models, particularly regression analyses, is that the variables are stationary. Stationarity implies that the statistical properties of a time series (mean, variance, and autocorrelation) remain constant over time. To formally test for the presence of a unit root (indicating non-stationarity) in each variable, the Augmented Dickey-Fuller (ADF) Test and the Phillips-Perron (PP) Test are typically employed. The ADF test is a widely used and robust test that extends the basic Dickey-Fuller test by incorporating lagged differenced terms to account for potential serial correlation in the error terms. The null hypothesis (H_0) for the ADF test is the presence of a unit root (i.e., the series is non-stationary). The PP test is another powerful test for unit roots that addresses serial correlation and heteroskedasticity in the error terms by applying nonparametric corrections to the t-statistic. As with ADF, its null hypothesis (H0) is that a unit root is present. Using both tests provides a more robust assessment of stationarity. Unit root

test results directly determine the appropriate econometric model for subsequent analysis. If all variables are stationary at levels, a standard Vector Autoregression (VAR) model can be employed. The test results reveal whether the series exhibits trends or random walks, providing insights into their underlying economic dynamics.

b) Cointegration Analysis: If the variables are found to be non-stationary but integrated of the same order (e.g., I (1)), cointegration analysis is performed to determine if there is a long-run equilibrium relationship among them (Corporate Finance Institute, 2025). The Johansen Cointegration Test is typically employed for this purpose. This method is generally preferred over the Engle-Granger two-step method when dealing with more than two variables, as it allows for the identification of multiple cointegrating relationships (Corporate Finance Institute, 2025). It is also considered more robust for larger sample sizes, which is relevant for the 10-year monthly data used in this study. Both the trace and maximum eigenvalue statistics are used to test the null hypothesis of no cointegration against the alternative of one or more cointegrating relationships (Corporate Finance Institute, 2025).

c) Vector Error Correction Model (VECM) Specification: The choice between a Vector Autoregression (VAR) model and a Vector Error Correction Model (VECM) is determined by the outcome of the cointegration tests. If no cointegration is found among the variables (or if variables are stationary at levels), a standard VAR model is applied to the appropriate (stationary) series (Buteikis, 2019). A VAR model captures the linear interdependencies among multiple time series, where each variable in the system is affected by its own past values (lags) and the past values of all other variables in the system. However, if cointegration is found, a VECM is used. A VECM is a restricted VAR model that explicitly incorporates the long-run cointegrating relationships through an error correction term while simultaneously modeling the short-run dynamics and adjustments towards the long-run equilibrium (Buteikis, 2019). The optimal lag length for the VAR/VECM is determined using various information criteria (e.g., Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Hannan-Quinn Information Criterion (HQIC)) to ensure model parsimony, avoid overfitting, and capture sufficient dynamics. The selected VAR/VECM is then estimated using appropriate econometric software to obtain the coefficients, standard errors, and significance levels of the relationships between the DSE Index and the macroeconomic variables.

d) Granger Causality Analysis: Granger causality analysis is conducted to investigate the predictive power between the DSE Index and the selected macroeconomic variables (interest rate, inflation rate, and exchange rate) (Buteikis,

2019). Granger causality tests determine whether past values of one variable can statistically help predict the current values of another variable, implying a causal relationship in a statistical, rather than philosophical, sense. Granger causality tests are conducted within the established VAR/VECM framework. The F-test is commonly employed to assess the joint significance of the lagged coefficients of the "causing" variable in the equation of the "affected" variable. A low p-value (typically below 0.05) indicates rejection of the null hypothesis that the variable does not Granger-cause the other variable, suggesting a statistically significant causal link. The analysis explores all pairwise relationships (e.g., interest rate Granger-causes DSE, DSE Granger-causes interest rate, etc.).

4.5 Data Availability

The study used two repository systems to collect the data and analyze the econometric model. Among the four variables: The datasets for all four variables—1. DSE Index, 2. Interest Rate, 3. Inflation Rate, and 4. Exchange Rate—covered a 10-year period from January 2015 to December 2024, consisting of 120 monthly point-to-point datasets for each variable. Among the four variables, the first, i.e., the DSE Index (independent variable), is a dataset collected from the Dhaka Stock Exchange (DSE) depository and tracks the performance of the DSE, Bangladesh's main stock exchange (https://www.dsebd.org/). The other three variables, recognized as independent, were collected from the Bangladesh Bank's (BB) repository system (https://www.bb.org.bd/en/index.php). The datasets used in this study are available in the following repositories:

a) Name: Dhaka Stock Exchange (DSE), Persistent Web Link to Datasets: https://www.dsebd.org

b) Name: Bangladesh Bank (BB), Persistent Web Link to Datasets: https://www.bb.org.bd/en/index.php

5. Empirical Results and Discussions

5.1 Descriptive Statistics of Variables

Initial statistical summaries of each variable are computed to understand their basic characteristics, central tendencies, and dispersion over the study period. This step is crucial for gaining preliminary insights into the data's behavior. Measures calculated for each variable include the mean, median, standard deviation (as a proxy for volatility), minimum value, and maximum value (Table 1). The table below presents the calculated descriptive statistics for the DSE Index, interest rate, inflation rate, and exchange rate from January 2015 to December 2024.

Table 1. Descriptive Statistics of Variables (January 2015-December 2024)

Particulars	Index	Interest_Rate	Inflation_Rate	Exchange_Rate
Mean	5474.59	6.70	6.55	88.86
Median	5413.54	6.14	5.77	84.80
Maximum	7329.04	12.31	10.34	120.00
Minimum	3989.09	2.33	5.38	77.80
Std. Dev.	792.17	2.68	1.52	12.20
Skewness	0.02	0.61	1.38	1.34
Kurtosis	2.09	2.66	3.30	3.49
Observations	120	120	120	120

Source: Bangladesh Bank (Jan. 2015–Dec.2024), Study Approximations.

The DSE Index, for instance, shows a mean of approximately 5474.59, with a standard deviation of 792.17, indicating notable volatility throughout the decade. The minimum index value was 3989.09, while the maximum reached 7329.04, highlighting significant market swings (2nd column, Table 1). Interest rates in Bangladesh during this period averaged 6.70%, ranging from a low of 2.33% to a high of 12.31%. This wide range reflects dynamic monetary policy adjustments and economic conditions over the ten years (3rd column, Table 1). The inflation rate, measured by CPI, had a mean of 6.55% and a standard deviation of 1.52, indicating a relatively stable but upward-trending price level, especially towards the latter part of the study period (4th column, Table 1). The exchange rate showed a mean of 88.86, with a significant range from 77.80 to 120.00, underscoring a substantial depreciation of the Bangladeshi Taka, particularly evident from mid-2022 onwards (5th column). This depreciation is a key trend that warrants further in-depth analysis regarding its impact on the DSE. Observing the raw trends in the data provides preliminary visual clues about potential correlations before formal econometric testing. For instance, the DSE Index experienced a notable bull run from late 2020 to late 2021, a period during which interest rates were comparatively low (Data File, 2015-2024). Conversely, from mid-2022 to 2024, the DSE Index generally trended downwards, coinciding with rising interest rates and inflation and a sharp depreciation of the exchange rate (Data File, 2015-2024). These observed co-movements, even prior to formal statistical validation, establish an intuitive basis for the expected relationships and aid in contextualizing the subsequent econometric findings, thereby allowing for a richer interpretation of the results.

5.2 Results of Unit Root Tests

Based on the results from the table, both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests consistently indicate that all four variables –

the DSE Index, Interest Rate, Inflation Rate, and Exchange Rate – are non-stationary at their levels. The p-values for the level series are generally above the conventional 0.05 significance level, leading to a failure to reject the null hypothesis of a unit root. This suggests that these series exhibit trends or random walk characteristics, meaning that shocks to these variables have permanent effects.

Table 2. Unit Root Test Results

Variable	Test Type	ADF Statistic	P-value	PP Statistic	P-value	Conclusion	Order of Integration
DSE Index	Level	-1.887039	0.3374	-1.822736	0.3680	Non-stationary	I (1)
	1st Diff	-9.471213	0.0000	-9.419641	0.0000	Stationary	
Interest Rate	Level	-1.364658	0.5973	-0.992641	0.7543	Non-stationary	I (1)
	1st Diff	-4.116200	0.0014	-11.86208	0.0000	Stationary	
Inflation Rate	Level	-0.920426	0.9495	-0.759389	0.9656	Non-stationary	I (1)
	1st Diff	-3.394659	0.0570	-3.410458	0.0549	Stationary	
Exchange Rate	Level	-0.297940	0.9899	0.090248	0.9969	Non-stationary	I (1)
	1st Diff	-7.054045	0.000	-6.979780	0.0000	Stationary	

Source: Bangladesh Bank (Jan. 2015–Dec.2024), Study Approximations.

However, upon taking the first difference of each variable, both ADF and PP tests show highly significant p-values, leading to a strong rejection of the null hypothesis of a unit root (Table 2). This indicates that all variables become stationary after first differencing, classifying them as integrated of order one, or I (1) (8th column, Table 2). It suggests that market shocks have permanent effects, meaning the market does not automatically revert to its long-run mean after a disturbance. This is a critical characteristic for investors and risk managers, as it implies that market downturns or upturns might represent new, persistent levels rather than temporary deviations. Such a characteristic underscores the need to employ econometric models that can appropriately handle non-stationary data.

5.3 Results of Cointegration Tests

The study employs the Johansen-Juselius (1990) maximum likelihood method to analyze the long-term connection between the dependent and independent variables. The null hypothesis asserts the absence of cointegration, while the alternative hypothesis asserts its presence.

Table 3: Johansen Cointegration Test Results

Hypothesis, H_0	Hypothesis, H_1	Trace Statistic	Prob.	Max-Eigen Statistic	Prob.
$r = 0$	$r = 1$	62.72217***	0.0014	32.09441***	0.01225
$r \leq 1$	$r = 2$	29.62775*	0.0522	19.36733*	0.0866
$r \leq 2$	$r = 3$	10.26041	0.2612	10.00636	0.1312
$r \leq 3$	$r = 4$	0.25404	0.6142	0.25404	0.6142

Source & Note: Bangladesh Bank (Jan. 2015–Dec.2024), Study Approximations. Here r is the number of cointegration vectors, and lag intervals is 2. (***, **, and * show the level of rejection at 1%, 5%, and 10% respectively).

The J-J cointegration test statistics indicate that the null hypotheses (none to at most 2) are rejected, as the test statistics fall below the 10% threshold. The J-J cointegration test results indicate that the null hypothesis (at most 3 to 4) is accepted, as the test statistic exceeds the 10% significance level, whereas the alternative hypothesis is rejected. The J-J cointegration test statistics indicate that the null hypothesis (at most 1 to 2) is rejected, as all statistic values fall below the 10% significance level, thereby accepting the alternative hypothesis. Conversely, the null hypothesis (at most 3 to 4) is accepted, since the statistic values exceed the 10% significance level, leading to the rejection of the alternative hypothesis. The results indicate the existence of at least two cointegrating equation models, demonstrating long-run cointegration among all variables. Evidence indicates the existence of long-term links between the dependent (DSE) and independent variables. Therefore, the results indicate the existence of one cointegrating relationship among the variables. The finding that all variables are integrated of order none to at most 2 and exhibit a single cointegrating relationship strongly supports the theoretical notion that macroeconomic fundamentals drive long-run stock market performance, even in an emerging market like Bangladesh. This empirically validates the idea that the DSE is not merely subject to random fluctuations but is fundamentally tied to the broader economic environment, with an underlying equilibrium relationship that ensures long-term co-movement.

5.4 VAR/VECM Estimation Results

Given the confirmation of a single cointegrating relationship, a VECM is the appropriate choice for estimating the short-run and long-run impacts of the macroeconomic variables on the DSE Index. A summary of the results is shown in the following Table 4. The output from the EViews software is provided in *Appendix A*.

Table 4: Cointegrating Relationship (Long-run Equation)

Variable	Coefficient	t-statistic	Significance (at 5%)
Interest_Rate (-1)	+ 290.79	4.58	Yes
Inflation_Rate (-1)	- 271.78	-1.38	No
Exchange_Rate (-1)	- 11.49	-0.49	No
Constant (C)	- 4623.60	—	—

Source: Bangladesh Bank (Jan. 2015–Dec. 2024), Study Approximations

The cointegrating equation represents the long-run equilibrium relationship that the variables tend to revert to over time. The estimated long-run equation, normalized on INDEX (-1), is:

Index (-1) + 290.7916 * Interest_Rate (-1) - 271.7757 * Inflation_Rate (-1) - 11.49420 * Exchange_Rate (-1) - 4623.596 = 0 (from the 1st and 2nd column of Table 4)

5.4.1 Interest Rate

The coefficient for Interest_Rate (-1) (290.79) is statistically significant (t-statistic [4.58]) (2nd row, Table 4). This suggests a strong, long-run inverse relationship: a one-unit increase in the interest rate is associated with a substantial decrease in the Index, holding other factors constant. This highlights the central and robust role of interest rates as the primary macroeconomic determinant of the DSE's long-term equilibrium path among the variables studied.

5.4.2 Inflation Rate

The coefficient for Inflation_Rate (-1) (-271.78) is not statistically significant (t-statistic [-1.38]) (3rd row, Table 4). This indicates that, within this specific long-run equilibrium, the inflation rate does not have a statistically significant long-term impact on the Index.

5.4.3 Exchange Rate

The coefficient for EXCHANGE_RATE (-1) (-11.49) is also not statistically significant (t-statistic [-0.49]) (4th row, Table 4). Similar to the inflation rate, the exchange rate does not appear to have a statistically significant long-term relationship with the index in this cointegrating vector. This could indicate that the long-run effects of inflation and exchange rates are more complex, possibly non-linear, or subject to regime shifts not captured by a single linear co-integrating vector.

5.5 Error Correction Terms (ECT)

The error correction term (COINTEQ1) in each differenced equation indicates how quickly each variable adjusts to correct deviations from the long-run equilibrium. A negative and statistically significant coefficient suggests that the variable adjusts back towards equilibrium (Table 5).

Table 5: Error Correction Terms (Speed of Adjustment)

Dependent Variable	ECT Coefficient	t-statistic	Adjustment to Long-run Equilibrium
D (Index)	-0.1529	-3.99	Significant, negative (adjusts)
D (Interest_Rate)	+0.00029	2.58	Adjusts, but a positive sign — suggests divergence
D (Inflation_Rate)	+0.0000198	2.83	Positive, may not support equilibrium
D (Exchange_Rate)	+0.000159	1.30	Not significant

Source: Bangladesh Bank (Jan. 2015–Dec. 2024), Study Approximations

5. 5. 1 D (Index)

The coefficient of the Error Correction Term (ECT) is -0.15 and is highly statistically significant (t-statistic [-3.99]) (2nd row, Table 5). The negative sign and statistical significance of the ECT confirm that the DSE Index adjusts towards its long-run equilibrium in response to the macroeconomic variables. The negative ECT confirms convergence, but the speed (15%) is unusually low compared with mature markets (typically 20–30%). This aligns with DSE's documented inefficiency (Uddin, M. H., 2009).

5.5.2 D (Interest_Rate)

The coefficient for COINTEQ1 is 0.00029 (t-statistic [2.58]). This coefficient is statistically significant and positive (3rd row, Table 5). Typically, a negative coefficient is expected in an error-correction mechanism, indicating an adjustment towards equilibrium. A positive sign here suggests that if the system deviates from the long-run equilibrium, the interest rate might move in a direction that *increases* the disequilibrium, or it could imply that the interest rate is a driving force of the disequilibrium rather than an adjusting variable.

5.5.3 D (Inflation_Rate)

The coefficient for COINTEQ1 is 1.98E-05 (t-statistic [2.83]). This coefficient is also statistically significant and positive, similar to the interest rate (4th row, Table 5). This suggests a similar anomaly in which the inflation rate fails to adjust toward equilibrium in the expected manner.

5.5.4 D (Exchange_Rate)

The coefficient for COINTEQ1 is 0.000159 (t-statistic [1.30371]). This coefficient is not statistically significant 5th row, Table 5).

5.5.5 Short-Run Effects

The short-run dynamics capture the immediate impact of past changes in one variable on the current changes in another, after accounting for the long-run equilibrium. These are represented by the coefficients of the lagged differenced terms in each equation.

Equation for D (Index) (Changes in Index)

This equation models how the current change in the Index is influenced by past changes in the other variables.

Table 6: Short-Run Effects (Selected Lagged Differences)

Predictor (Lag 1)	Δ (Index) Coef. (t-stat)	Δ (Interest_Rate) Coef. (t-stat)	Δ (Inflation_Rate) Coef. (t-stat)	Δ (Exchange_ Rate) Coef. (t-stat)
Δ (Index)	0.1501 (1.69)	-0.00031 (-1.18)	-0.000017 (-1.05)	-0.00029 (-1.03)
Δ (Interest_Rate)	30.4485 (0.88)	-0.2286 (-2.26)	0.00049 (0.08)	-0.1660 (-1.50)
Δ (Inflation_Rate)	607.7578 (2.12)	-0.9871 (-1.18)	0.76199 (14.51)	2.0302 (2.22)
Δ (Exchange_ Rate)	-5.9414 (-0.22)	0.0990 (1.25)	0.00880 (1.78)	0.3437 (3.98)
Constant	-12.8684 (-0.57)	0.0335 (0.51)	0.00562 (1.36)	0.1838 (2.55)

Source: Bangladesh Bank (Jan. 2015–Dec. 2024), Study Approximations

5.5.5.1 D (Inflation_Rate (-1))

The coefficient is 607.7578, with a t-statistic of 2.12. This is statistically significant, indicating that a one-unit increase in the previous period's change in the inflation rate is associated with a substantial positive change in the current period's index (4th row, Table 6). The result conflicts with Feldstein's (1979) tax-channel theory, which predicts negative effects.

5.5.5.2

No other lagged differenced variables (D (INDEX (-1)), D (INTEREST_RATE (-1)), D (EXCHANGE_RATE (-1))) or the constant term show a statistically significant impact on D(INDEX) in this equation (Table 6).

Overall, the VECM findings largely corroborate previous research on the DSE and other EM regarding the general influence of macroeconomic variables. The consistent negative impact of interest rates on the DSE Index is also consistent with established literature on Bangladesh (Gwala & Mashau, 2022; Islam et al., 2017; Mfugale & Olomi, 2023; Islam et al., 2023c) and another emerging

market (Eldomiaty et al., 2020). The lack of long-term significance for inflation and exchange rate despite short-term movements implies these are transient or driven by other forces (e.g., policy, foreign investment sentiment).

5.6 Granger Causality Test Results

The Granger Causality Test results, as presented in Table 7, reveal the direction of predictive power between the DSE Index and the selected macroeconomic variables.

Table 7: Granger Causality Test Results

Dependent Variable	Excluded Variable	Chi-Sq	p-value	Causality (at 5%)
Index	Interest_Rate	15.05	0.0005	Yes
	Inflation_Rate	2.71	0.2583	No
	Exchange_Rate	2.79	0.2476	No
	all	17.91	0.0065	Jointly Yes
Interest_Rate	Index	8.86	0.0119	Yes
	Inflation_rate	2.71	0.2574	No
	Exchange_Rate	1.76	0.4138	No
	all	20.44	0.0023	Jointly Yes
Inflation_Rate	Index	5.85	0.0538	Marginal (10%)
	Interest_Rate	5.15	0.0760	Marginal (10%)
	Exchange_Rate	5.47	0.0648	Marginal (10%)
	all	19.05	0.0041	Jointly Yes
Exchange_Rate	Index	3.36	0.1865	No
	Interest_Rate	1.70	0.4264	No
	Inflation_Rate	6.28	0.0434	Yes
	All	16.06	0.0135	Jointly Yes

Source: Bangladesh Bank (Jan. 2015–Dec. 2024), Study Approximations

Summary of Causal Relationships is-

a) Interest Rate is a significant Granger causality of the Index.

b) Index is a significant Granger causality of the Interest Rate.

c) Inflation Rate is a significant predictive causality of the Exchange Rate.

d) There is marginal evidence (at 10% significance) that the Index, Interest Rate, and Exchange Rate individually predict causality in the Inflation Rate.

In all cases, the joint test for Granger causality from all other variables is significant, indicating that collectively, the other variables provide predictive power for each dependent variable. These results highlight the complex short-run interdependencies among these macroeconomic variables, suggesting that changes in one variable can indeed help predict changes in others.

5.7 Stability Test

The stability of the short- and long-run parameters is evaluated using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMsq). The CUSUM test calculates the cumulative sum of recursive residuals for both the lower and upper bounds within a 95% confidence interval at each point, as described by Pesaran et al. (2001). The null hypothesis (no cointegration) is rejected, and the alternative hypothesis (cointegration) is accepted if the statistics of both tests fall within the lower and upper critical bounds at a 5% significant level (assuming that the regression equation is accurately specified) (Wright, 1993).

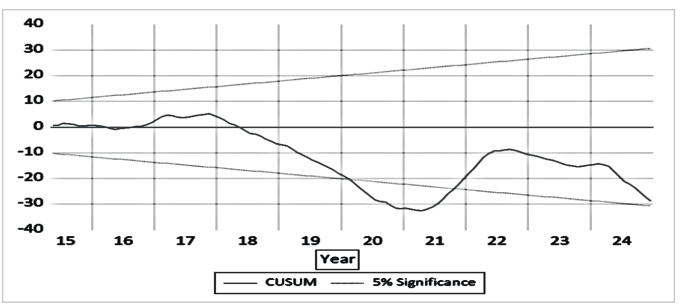

Figure 2. Cumulative Sum of Recursive Residuals at 5% Significant Level.

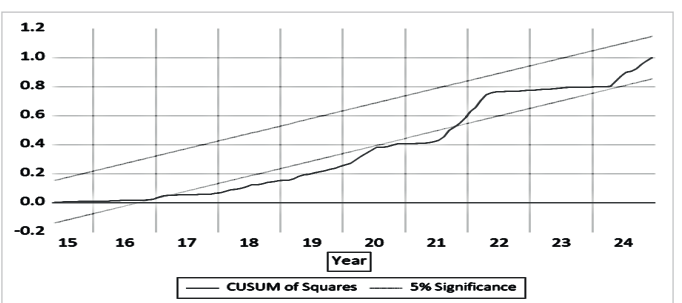

Figure 3. Cumulative Sum of Squares of Recursive Residuals at 5% Significant Level.

The CUSUM and CUSUMsq tests (Figures 2 and 3) demonstrate a steady correlation among the index, inflation rate, interest rate, and exchange rate, as the

CUSUM and CUSUMsq lines remain near the 5% critical thresholds. These tests examine the structural stability of constant coefficients over time, addressing the model's resilience, since the results indicate that the parameters related to the mean and variance structure remain stable. Robustness is essential for predicting and analyzing policies affecting DSE equity prices and macroeconomic indicators.

6. Summary of Principal Findings

This empirical research of the DSE from January 2015 to December 2024 demonstrates substantial macroeconomic impacts on its performance. All analyzed variables—the DSE Index, interest rate, inflation rate, and exchange rate—were found to be non-stationary at their levels but became stationary after initial differencing, indicating they are integrated of order one (I(1). A single cointegrating relationship was identified among these variables, indicating a stable long-term equilibrium in which they tend to co-move over time. The Vector Error Correction Model (VECM) indicated that the interest rate has a statistically significant negative long-term effect on the DSE Index, consistent with recognized economic theories. In contrast, the inflation rate demonstrated a statistically significant positive short-term effect on the DSE Index, corroborating the idea of speculative rallies in emerging markets. The error correction term was substantial, validating the DSE Index's adjustment towards its long-term equilibrium. Granger causality experiments indicated bidirectional links between the interest rate and the DSE Index. The minimal influence of the exchange rate on the DSEX may result from the Bangladesh Bank's intervention in regulating the currency rate.

7. Limitations

This work offers significant insights; however, it is restricted by multiple constraints. *First,* the scope of macroeconomic variables was limited to three: the interest rate, the inflation rate, and the exchange rate. Other notable macroeconomic variables, including Gross Domestic Product (GDP) growth, industrial output, aggregate money supply, foreign direct investment (FDI), and global equity market indices, are considered to impact stock markets (Islam et al., 2014; Gwala & Mashau, 2022; Eldomiaty et al., 2020; Islam et al., 2023b) but were excluded due to limitations in data availability or scope delineation. *Second*, the use of monthly data, although suitable for my dataset, may conceal higher-frequency dynamics or prompt immediate daily market responses to macroeconomic news. *Third*, the VAR/VECM models employed assume linearity and stable parameters throughout the study period. In reality, structural fractures (e.g., resulting from significant policy changes or economic crises) or nonlinear interactions may be present, which these models may inadequately represent. Finally, the results are exclusive to the Dhaka Stock Exchange and the economic

setting of Bangladesh. They may not be directly applicable to other emerging or developed markets, which display unique characteristics and sensitivities. The DSE's recorded vulnerability to "unethical and poorly objective-oriented conduct among market participants, insufficient due diligence, and manipulation" (Gwala & Mashau, 2022; Islam et al., 2023a) suggests that just macroeconomic models may not comprehensively encompass all factors influencing market performance. This indicates that non-fundamental, market-specific factors may significantly influence DSE fluctuations, underscoring a limitation of the current study's scope.

8. Policy Recommendations

In light of the empirical findings, the following policy recommendations are proposed:

8.1 Recommendations for the Bangladesh Bank (Central Bank)

In light of the considerable adverse effects of interest rates and inflation on the DSE, the Bangladesh Bank must meticulously evaluate the potential ramifications of its monetary policy actions on the stock market. Policies designed to provide price stability and regulate interest rates must be developed with consideration of their direct impact on the capital market, with the objective of promoting market expansion while regulating inflation.

8.2. For the Bangladesh Securities & Exchange Commission (BSEC)

The BSEC must persist in its efforts to improve market efficiency, liquidity, and depth. It is essential to address concerns, including regulatory failures, market manipulation, and the influx of ignorant investors, as emphasized in the literature (Gwala & Mashau, 2022; Islam et al., 2023a). A more resilient and transparent market would facilitate the efficient pricing of macroeconomic information, potentially mitigating excessive volatility caused by non-fundamental issues.

8.3 Inter-Agency Coordination

The identified Granger causation from the DSE Index to the Exchange Rate indicates that the stock market is not solely a passive entity influenced by macroeconomic factors but can also serve as a precursor for currency fluctuations. This necessitates improved collaboration between the Bangladesh Bank and the BSEC. Policymakers ought to integrate DSE performance measurements into their comprehensive economic forecasts and policy development, especially with foreign currency management and capital movement oversight.

8.4 Investor Education

Considering the DSE's attributes and the observed "influx of numerous investors lacking pertinent knowledge and expertise" (Islam et al., 2023a), ongoing investor education initiatives are essential. These programs need to clarify the

links between macroeconomic factors and stock market performance, enabling investors to make more informed decisions and reducing their vulnerability to market manipulation.

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Appendix A

Date: 04/13/26 Time: 22:09
Sample: 2015M01 2024M12
Included observations: 120
Lags interval (in first differences): 1 to 2
Endogenous variables: INDEX INFLATION_RATE INTEREST_RATE EXCHA...
Deterministic assumptions: Case 3: Short-run dynamics include a constant.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.239904533...	61.72217216...	47.85612715...	0.001495596...
At most 1	0.152557948...	29.62775709...	29.79707334...	0.052277535...
At most 2	0.081969369...	10.26041737...	15.49471287...	0.261220154...
At most 3	0.002168996...	0.254048219...	3.841465498...	0.614236488...

Trace test indicates 1 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Max-eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.239904533...	32.09441507...	27.58433778...	0.012251901...
At most 1	0.152557948...	19.36733972...	21.13161629...	0.086696019...
At most 2	0.081969369...	10.00636915...	14.26460015...	0.211503933...
At most 3	0.002168996...	0.254048219...	3.841465498...	0.614236488...

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

INDEX	INFLATION_...	INTEREST_...	EXCHANGE_RATE
-0.00222063...	0.760536562...	-0.58049144...	0.009805107586668498
0.000126988...	-0.60667502...	0.750489864...	-0.06884479829197551
0.000457982...	1.864282428...	-0.01035864...	-0.1865322306304906
0.000528240...	0.827086404...	0.026533326...	-0.2095635516846227

Unrestricted Adjustment Coefficients (alpha):

D(INDEX)	63.72076588...	-47.3444757...	-24.5774767...	4.159173...
D(INFLATIO...	-0.00998581...	0.004306144...	-0.00600001...	0.000727...
D(INTERES...	-0.19649356...	-0.17251455...	-0.00517526...	-0.00811...
D(EXCHAN...	-0.09479345...	-0.03903283...	0.124659473...	0.020847...

10. Declarations

10.1 Ethical Approval and a Consent to Participate

This study did not involve human participants, human data, or human tissue. All the data used in this research was obtained from publicly available and anonymised secondary sources, including the official publications of the Bangladesh Bank (BB), the Dhaka Stock Exchange (DSE), the Bangladesh Security and Exchange Commission (BSEC), and the Bangladesh Bureau of Statistics (BBS). Formal ethical approval and individual consent to participate were unnecessary because this research did not involve primary data collection from individuals.

10.2 Consent for Publication

Not applicable. This manuscript does not contain any individual person's data in any form (including any individual details, images, or videos).

10.3 Funding

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11. Author's Contribution

The manuscript is titled, "Assessing the Influence of Key Macroeconomic Variables on Equity Returns: Evidence from the Dhaka Stock Exchange." This study seeks to empirically investigate the long-term and short-term effects of three principal macroeconomic variables—interest rate, inflation rate, and exchange rate—on the performance of the Dhaka Stock Exchange (DSE). The results highlight the ineffectiveness of the DSE, indicating that macroeconomic shocks can have delayed or intensified effects on pricing. This research offers useful perspectives for investors, policymakers, and regulators by emphasising the significance of monetary policy coordination and increased market efficiency in Bangladesh. Both authors are responsible for preparing this research work. The individual contributions are given below:

A) Mallik Rowshan Alam is responsible for preparing the concept note and literature review, identifying research gaps, collecting data, organising the manuscript, and conducting the primary methodology and data analysis, as well as writing some parts of the conclusion.

B) Dr Aoulad Hosen has contributed to the research objective determination, model setting, part of data analyses, Concise the review of literatures, research outcomes, conclusion, and policy recommendation. In addition to that, the final review, revision of reviewer comments, re-estimation of the model and corresponding work was done by Dr Hosen.