Taka-Dollar Exchange Rate Dynamics in Relation to Federal Interest Rates and the Bangladesh-USA Trade Balance: A Time Series Analysis.

By

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A thesis submitted to the Department of Economics & Social Science in partial fulfillment of the

requirements for the degree of

Masters of Science in Applied Economics

Department of Economics & Social Science
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June , 2024

Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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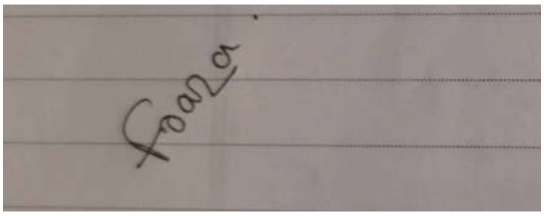

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Approval

The thesis/project titled “A Taka-Dollar Exchange Rate Dynamics in Relation to Federal Interest Rates and Bangladesh-USA Trade Balance: A Time Series Analysis.” submitted by

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of Spring, 2024 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Masters of Science in Applied Economics in May 2024.

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Abstract

This paper has studied and analyzed the impact of factors like the Federal Interest Rate and Bangladesh US trade balance on the Taka dollar exchange rate using time series analysis. Here, the co-integration relation of the Federal Interest Rate and Bangladesh US trade balance with the Taka-dollar exchange rate has been shown using the Johansen Co-integration Test. After analyzing the data, a long-term relationship has been found between the taka-dollar exchange rate and the Bangladesh-US trade balance, but it also shows that the relationship between the exchange rate and the federal interest rate is weaker, which means the Fed rate does not have any impact on the exchange rate. This paper offers strategic advice for reducing negative economic effects and informs politicians and economists regarding the fundamental factors affecting currency stability.

Keywords: exchange rate, fed rate, co-integration, trade balance, economics stability.

Acknowledgement

This thesis would not have been published without the support of my Supervisor Dr. Wasiqur Rahman Khan, who read my numerous revisions and helped make some sense of the confusion. His insights and comments motivated me to sharpen my thoughts and raise the caliber of my work.

Thanks to BRAC University for giving me the opportunity to present this thesis.

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List of Acronyms

fedrate	Federal Reserve
exch	Taka –Dollar Exchange Rate
trade	U.S. trade in goods with Bangladesh.

Chapter 1

Introduction and Motivation

1.1 Introduction

The exchange rate between the Taka and the Dollar represents significant importance within the global economic context. Bangladesh is a nation which is highly involved in International trade activities. So, here in this country it is essential for policymaker, economists and other market participants to have a solid understanding of the factors that influence the currency exchange rate. A country's trade balance and its overall economic health are affected by the exchange rate, which has a big impact on the costs of both importing and exporting goods.

The volatility in currency exchange rates has emerged as a significant issue for the economy of Bangladesh in recent times. For example, the exchange rate between the Bangladeshi taka and the US dollar experienced a notable fluctuation over the years of 2022 and after that. Specifically, in January of that year, the exchange rate stood at approximately 85 Bangladeshi takas per US dollar. However, by December of the same year, the exchange rate had risen to around 103 takas for every US dollar. Bangladesh, being a small economy, has faced significant consequences as a result of the rise in the taka-dollar exchange rate. The increase in the exchange rate has had a substantial impact on our economy. Because our country heavily relies on imported goods and services and needs to conduct trade efficiently, we have become dependent on using the dollar. The issue has been further compounded by the reliance on the US dollar to facilitate these transactions. Therefore, the growing exchange rate between the taka and the dollar poses a difficult situation for our nation. When interest rates in Bangladesh are higher than those in the USA, it can attract foreign investors who are looking for better returns on their investments. There is a possibility that the Taka's value could go up compared to the Dollar due to increased demand, which would result in a decrease in the Taka-Dollar exchange rate.

However, when interest rates in the United States are higher than those in Bangladesh, it may attract investors to invest their funds in US assets. Consequently, this can lead to a higher demand for the US Dollar. The rising demand for the Dollar may result in a decline in the value of the Taka compared to the Dollar, resulting in an increase in the Taka-Dollar exchange rate.

1.2 Motivation

The objective of this study is to conduct a comprehensive analysis and gain a thorough understanding of the factors contributing to the significant and fluctuating decline in the rate of exchange between the Bangladeshi taka and the US dollar. This paper aims to analyze the impact of two specific economic factors, namely the Federal Reserve and the dynamics of the trade balance, on the economy of Bangladesh. The purpose of this paper is to shed light on the ways in which these shifts have affected Bangladesh's economy.

Chapter 2

Literature Review

The concept of an exchange rate refers to the valuation at which the currency of one nation can be converted into the currency of another nation. The concept being discussed refers to the measurement of the worth of a particular currency in relation to another currency. This measurement is commonly denoted by the quantity of one currency that is necessary to acquire a single unit of the other currency. The determination of the exchange rate between the Bangladeshi Taka (BDT) and the US Dollar (USD) holds significant importance in the financial conditions of Bangladesh, as it has significant implications for the country's trade balance, inflation levels, and overall economic stability. Economists and policymakers have taken a keen interest in the correlation between the currency exchange rate and external variables like the Federal Reserve's interest rates and the trade surplus or deficit between Bangladesh and the United States. Determining currency rates can be a challenging task. The determinants of currency exchange rates are often ambiguous and lack clarity. Psychological and political factors contribute to the increased complexity of the foreign currency market.

2.1 Fed Interest Rate and Taka Dollar Exchange Rate

Numerous articles have examined the connection between the Taka-U.S. Dollar exchange rate and the U.S. Fed Interest Rate. One study examines the link between the Interest Rate Differential and the exchange rate using monthly interest rate data from Pakistan and the United States from January 2001 to December 2010. It employs the co-integration technique and discovers no correlation between these variables (G. Syed and Shaikh,2015). According to Sri Lankan research, interest rates and currency rates have a strong positive link. The correlation and linear regression models are used in this study to examine the links between interest rates and exchange rates. The study's findings, which indicate a high correlation between interest rates and exchange rates, are consistent with the Interest Rate Parity theory (Perera, Lalitha, and Kaushalya,2017). A different research project conducted on specific developing economies discovered a connection between fluctuations in currency exchange rates and the difference in interest rates, the level of risk premiums, and the implementation of monetary policy by the Federal Reserve (Özmen and Yılmaz, 2017).

2.2. Bangladesh USA Trade Balance and Taka Dollar Exchange Rate

One study reveals that a decline in the value of a currency first leads to a worsening in the trade balance before eventually leading to an improvement in the trade balance, providing evidence for the J-curve effect (Rabeya, Rahman, 2009). Another study examines the asymmetric impacts of fluctuations in exchange rates on the trade balance between two nations, revealing the presence of both short-term and long-term asymmetric effects across multiple industries (Bisharat, Suresh and Niaz, 2018). One study showed that Bangladesh's trade balance improved over time as a result of currency appreciation. According to this panel time-series research, currency depreciation also causes the trade balance to initially deteriorate (Rabeya, Emran, and Wahid, 2021). However, using co-integration analysis, Other studies analyze the link between Bangladesh's exchange rate and exports, concluding that there is no long-run relationship between the variables, suggesting that other macroeconomic and international trade factors may be more important (Gias, Susmita and Sayed, 2019). Another author employed error correction modeling to examine the nominal exchange rate of the Bangladeshi taka to the US dollar based on trade volumes and practices. This research study examines data from 1976 to 2015 and concludes that a balance-of-payments modeling technique is more dependable than a monetary balances approach (Tom, Dipanwita, and Adam, 2017).

Chapter 3

Methodology

3.1 Data Collection

This study utilized monthly data for Bangladesh to construct a time series regression model spanning from 2001 to 2023.

The variable 'taka-dollar exchange rate' was collected from the World Bank website, while the 'Fed Interest Rate' data was taken from the FED website, and 'trade data' was collected from census.gov.

3.2 Time series data regression Model:

In order to examine the relationship between the taka-dollar exchange rate, the fed interest rate, and U.S. trade in goods with Bangladesh, I have estimated the standard dynamic specification.

$$Y_{it} = \beta_0 + \beta_1\, fedrate_{\,t-1} + \beta_2\, trade_{\,t-1} + \epsilon_t$$

Here,

Y = Taka - Dollar exchange rate, this refers to the value at which the Bangladeshi Taka can be exchanged.

fedrate = The Federal funds rate.

trade = U.S. trade in goods with Bangladesh.

ϵ_t = Error term.

Time Series Graph:

A time series graph is a graphical representation that displays data points at succeeding time intervals. It has been used to observe fluctuations over the years 2000 to 2023 for the variable Taka dollar exchange rate, Fed rate, Trade Balance.

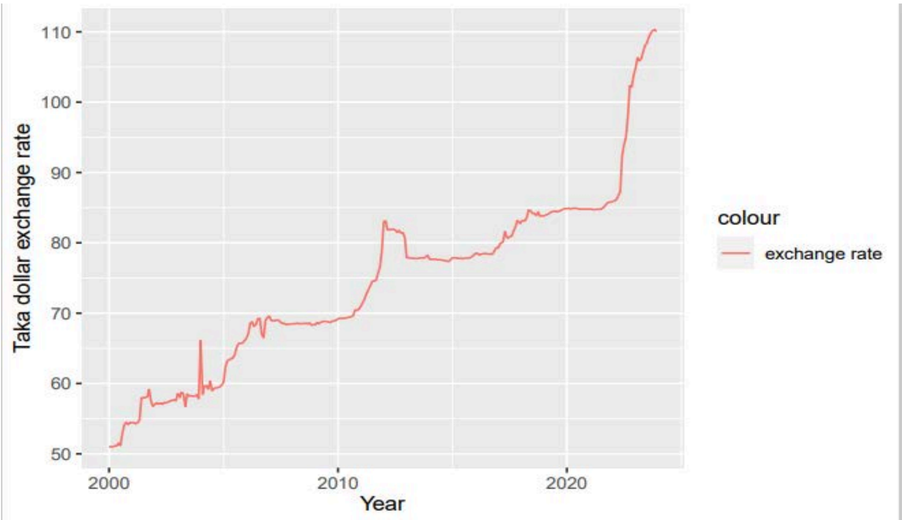

Figure 1: Time series graph for Taka - dollar exchange rate from year 2000 to 2023.

This graph likely shows the fluctuations in the exchange rate between the Bangladeshi taka and the US dollar from January 2000 to December 2023 for each month.

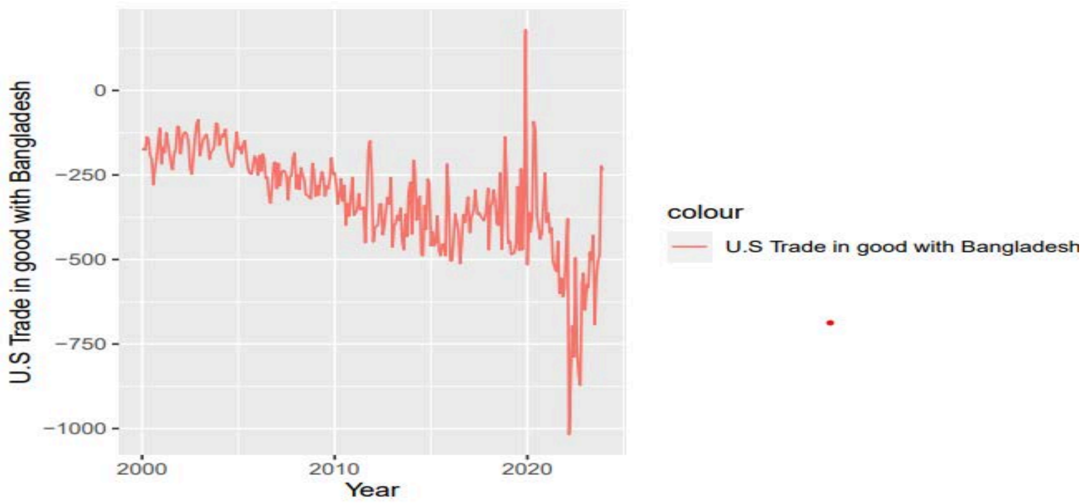

Figure 2: Time series graph for U.S Trade in goods with Bangladesh from year 2000 to 2023.

This graph represents the trade volume of goods between the U.S. and Bangladesh from January 2000 to December 2023 for each month.

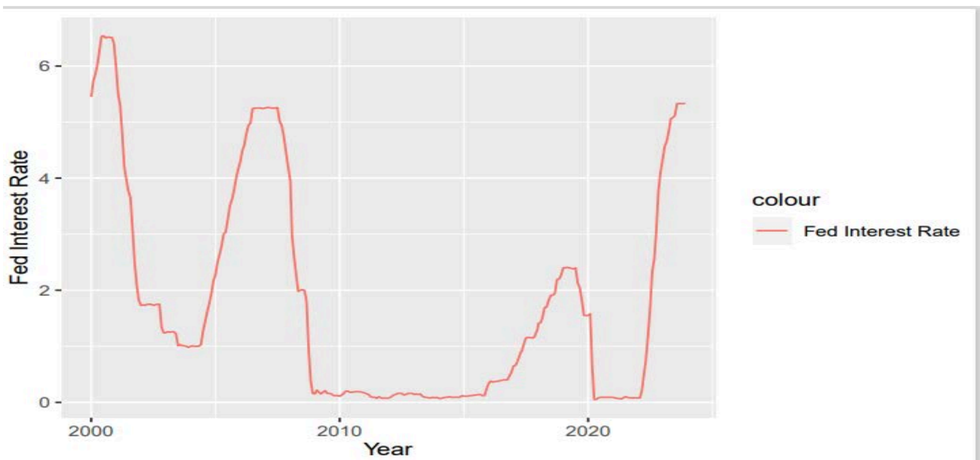

Figure 3: Time series graph for Federal Interest Rate from 2000 to 2023

This graph depicts the Federal Reserve's interest rate over time from January 2000 to December 2023 for each month.

From these three graphs, it can be interpreted that as the negative trade balance decreases and the interest rate increases, the value of the Taka weakens. Additionally, the trade balance of the USA is improving. This suggests a relationship where a reduction in the negative trade balance, making the interest rate rise, also a depreciation of the Taka's value and an improvement of the USA's trade.

3.3 ACF Plot:

The Autocorrelation Function (ACF) plot is a graph in time-series analysis that shows the correlation of observations between different time lags for a single series of data. ACF plot helps to determine how data points within a time series have relations at different time lags. Each point along the x-axis gives a specific lag, with the term 'lag' being an explanation of the time separation between observations. The y-axis will represent the correlation coefficients, which measure the level of correlation between the data points in this series at each lag. A blue line shows on the plot as the 95% confidence interval. Correlation values above this line are considered statistically significant.

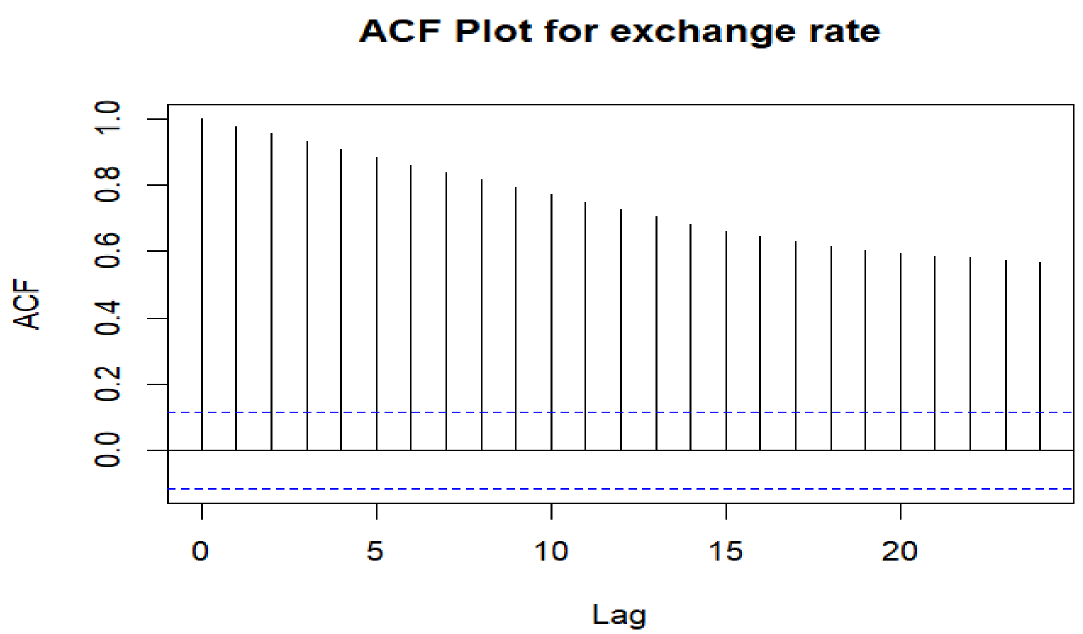

Figure 4: ACF plot for exchange rate of BDT/USD for yearly period average from 2001 to 2023

This Graph Shows that these spikes are significant, as peaks are consistently above the 95% confidence interval across various lags. This indicates strong autocorrelation, that means past values have a strong influence on future values.

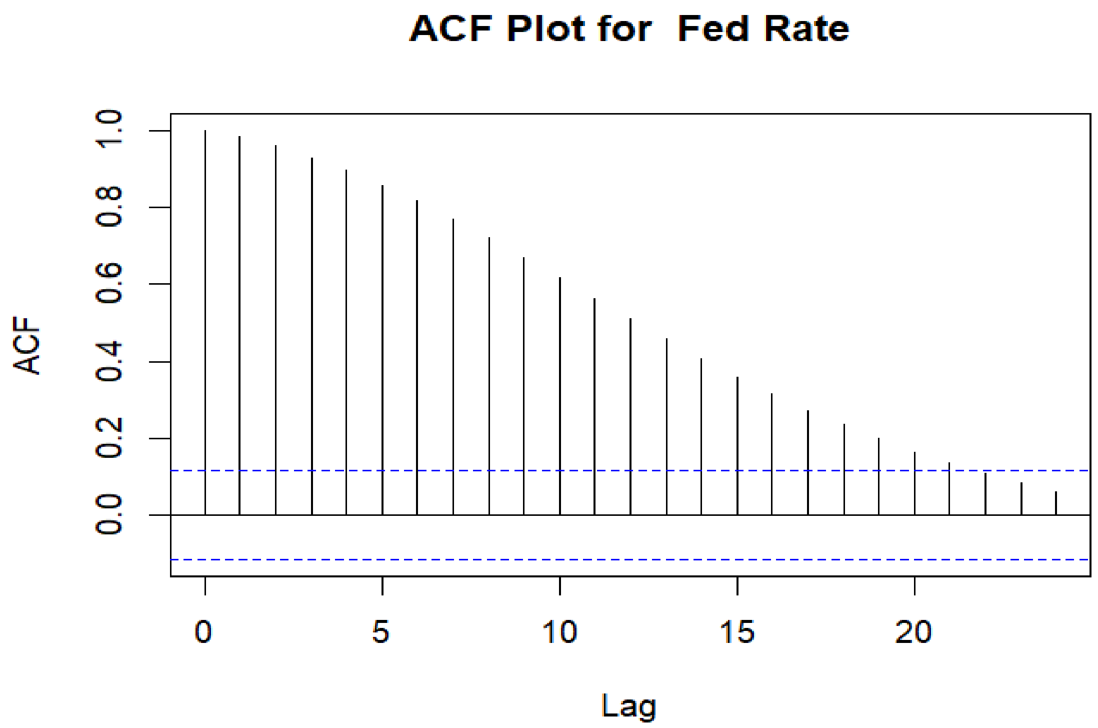

Figure 5: ACF plot for Fed Interest Rate for yearly period average from 2001 to 2023

This ACF plot for the Fed rate shows a weak relationship as the spikes are decreasing and drop off rapidly suggest that past fed rates have less influences on the future rates.

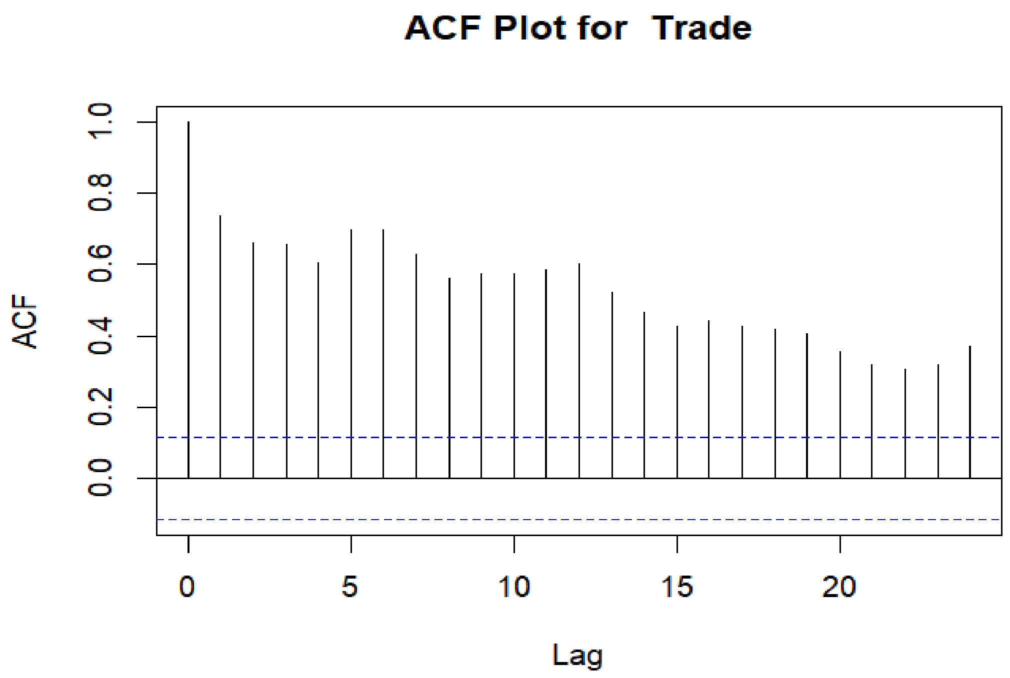

Figure 4: ACF plot for U.S. trade in goods with Bangladesh for yearly period average from 2001 to 2023

This plot tells that Trade data does not show significant peaks beyond the 95% confidence interval at any lag. So, there is no significant autocorrelation, indicating that past trade data do not reliably predict future data.

3.4 Check The stationary of Data

Augmented Dickey-Fuller Test for Stationarity

The Augmented Dickey-Fuller (ADF) test is used to determine whether the data is stationary or not in a given time series. It is important to make the time series data stationary because it indicates that the series' statistical properties, such as mean, variance, and autocorrelation, are constant over time (Enders, 2004). The first difference has been made to eliminate the non-stationary data, so we can decide about the next test that is appropriate for this kind of data.

Variable	Test Statistics	Lag Order	P-Value	Stationarity
exch	-1.9634	6	0.5916	Non-Stationary
exch_diff	-9.6413	6	0.01	Stationary
fedrate	-3.3608	6	0.06134	Non-Stationary
fedrate_diff	-8.933	6	0.01	Stationary
trade	-3.0251	6	0.1442	Non-Stationary
trade_diff	-13.28	6	0.01	Stationary

Table 1: Augmented Dickey-Fuller Test Results for Stationarity

For the original data, the test statistic for the "exch" variable is -1.9634, and it has a p-value of 0.5916. Given that the p-value is above 0.05, this indicates that the null hypothesis cannot be rejected. So the series is not stationary.

After first differencing, the variable "exch_diff" got a p-value of 0.01. Since the p-value is less than 0.05, the null hypothesis has been rejected. So, the series is stationary.

The test statistic for the "fedrate" variable is -3.3608, and p-value is 0.06134. Though the p-value is approximately 0.05, it remains higher than that. So, do not reject the null hypothesis, which suggests that there is non-stationarity.

For the last variable "fedrate_diff", the test statistic is -8.933 with a p-value of 0.01. Which P-value is less than 0.05, indicating rejection of the null hypothesis, suggesting stationarity.

The test statistic for the "trade" variable is -3.0251, and P-value is 0.1442. Once again, the p-value exceeds 0.05, failing to reject the null hypothesis and indicating the presence of non-stationarity.

For the "trade_diff" variable, the test statistic is -13.28 with a p-value of 0.01. Again, the p-value is less than 0.05, indicating the rejection of the null hypothesis, so it became stationarity.

3.5 VAR Model Selection Result:

Vector auto regression (VAR) modeling is a useful method for studying how different time series factors change over time. In this section, I present the results of the model selection process for the exchange rate (‘exch’), federal funds rate (‘fedrate’), and trade volume (‘trade’) variables, as well as a combined VAR model including all three variables (Lütkepohl, 2005).

The Akaike Information Criterion (AIC) is a widely used metric for assessing the quality of a statistical model. It addresses the trade-off between the model's goodness of fit and its complexity, which is quantified by the number of parameters used.

The Schwarz criterion is referred to as the Bayesian Information Criterion (BIC) and is similar to the AIC but imposes a more stringent penalty for the quantity of parameters.

The Hannan-Quinn Criterion (HQ) aims to find a compromise between model fit and complexity, but with a penalty that is stronger than AIC but less severe than BIC.

The Final Prediction Error (FPE), which is especially helpful in forecasting, attempts to calculate the expected prediction error for upcoming observations. Because it indicates a smaller prediction error, the model with the lowest FPE is preferred.

Variables	Model Fit AIC	Model Fit BIC	Lag Order AIC	Lag Order HQ	Lag Order SC	Lag Order FPE	Selected Lag Order
Exchange Rate	828.7104	847.0078	5	4	2	5	5
Fed Rate	-338.6027	-327.6348	6	6	6	6	6
Trade Balance	3405.085	3419.723	9	9	6	9	9

Table 2: VAR Model log selection

1. Exchange Rates (exch):

The optimal lag for the exchange rate data is 5, as determined by the lowest AIC value. A lower AIC value generally indicates a model with a better balance of fit and complexity. The BIC, also being the lowest at this lag, supports this selection, suggesting that the model with 5 lags is the most suitable for forecasting future values of the exchange rate.

0. Federal Reserve Interest Rate (fedrate):

For the Federal rate, the model with 6 lags is chosen as optimal. The negative values of AIC and BIC indicate a very strong model relative to others with different lags. This suggests that past values of the Federal rate up to six periods back are significant predictors of its future values, providing a robust model for analysis.

0. Trade Balance (trade):

The trade data suggest that the best model is of a 9-lag length because at this lag order, the AIC and BIC values are at a minimum. This would mean that the trade figures assume a more complex dynamic best captured with an increased number of lags, which might be a reflection of various underlying factors affecting trade flows for long periods of time.

3.6 ARDL Model

Pesaran et al. (2001) emphasize that the ARDL model can be used in cases where the variables are purely I (0), pure I (1), or mixed co-integrated. Here, in my data, all variables are in the same order, as it is I (1) and the raw data is non-stationary. In order to analyze the relationship between the Taka-Dollar exchange rate, and its determinants including past exchange rates, Federal interest rate, and Bangladesh-USA trade balance, an Autoregressive Distributed Lag model has been employed. Pesaran, M. H., and Shin, Y. (1999) disclosed that the use of the ARDL model is applicable for long-term relationships among variables. Also, the ARDL model is renowned for its ability to model the dynamic patterns of variables over time and to establish both short-term and long-term relationships.

Model: $Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{q} \Upsilon_k X_{1t-j} + \sum_{k=1}^{r} \delta_k X_{2t-k} + \epsilon_t$

Here,

- Y is the dependent Variable (Taka Dollar Exchange Rate)
- X_{it} is the independent variable (Federal Reserve rate)
- X_{2t} is the independent variable (U.S. trade in goods with Bangladesh)
- β_0 is the intercept
- β_1, β_2 are the coefficient of the independent variables.
- α_i, γ_j, δ_k are the coefficient of the lagged variables.
- *p, q, r* are the lag orders determined.
- $\in_t$ is the error term.

Predictor	Coefficients	Std. Error	t-Value	p-Value	Significance

Intercept	2.010e-13	1.17e-14	1.709e+01	<2e-16	Highly Significant***
lag(exch,lag_exch)	1.000	1.948e-16	5.134e+15	<2e-16	Highly Significant***
lag(fedrate,lag_fedrate)	1.559e-15	9.254e-16	1.685	0.093	Significant*
lag(trade, lag_trade)	-1.070e-17	1.685e-17	-6.350e-01	0.526	Not Significant

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Table 3: the ARDL model, including the coefficients, standard errors, t-values, p-values, and significance levels for each predictor.

The intercept coefficient (2.010e-13) indicates the estimated value of the dependent variable (Taka Dollar Exchange Rate) when all independent variables are equal to zero.

The coefficient for the lagged Taka Dollar Exchange Rate (1.000e+00) suggests a strong positive correlation between the exchange rate and its previous value. The coefficient exhibits a high level of significance ($p < 0.001$), indicating that previous exchange rate values have a large impact on the current value.

In this model, the coefficient for the lagged Federal Reserve rate (1.559e-15) is not statistically significant ($p = 0.093$). This indicates that changes in the Federal Reserve rate do not have an important impact on the Taka Dollar Exchange Rate.

Similarly, the coefficient for the lagged U.S. trade with Bangladesh (-1.070e-17) is not statistically significant ($p = 0.526$), suggesting that changes in trade do not have significant impacts on the exchange rate.

Both the R-squared and adjusted R-squared values are 1 (appendix 3), indicating a perfect fit of the model to the data. This typically suggests either an over fit or an exact fit in a small sample. So, it is crucial to ensure that this model makes theoretical sense.

3.7 OLS Test

OLS, or Ordinary Least Squares, is a statistical method used to estimate the parameters of a linear regression model. In the case of this paper,one variable (the dependent variable) is thought to be directly related to one or more other variables (the independent variables). This makes it very useful for looking at how variables are related (Wooldridge, 2015).

After the first difference, my data now meets the requirement of stationarity, specifically following an Integrated of Order 1 (I (1)) process. Therefore, Ordinary Least Squares (OLS) is now a suitable method for examining the relationships between variables in your time series data (Hamilton, 1994; Enders, 2014).

OLS Result :

```
======================================================================
                                Regression Results
----------------------------------------------------------------------
Dependent Variable:                        exch
Independent Variables     Coefficient     Std. Error    Significance
----------------------------------------------------------------------
fedrate                      -0.157           0.281        Not Sig.
trade                        -0.061           0.004           ***
Constant                     55.025           1.472           ***
----------------------------------------------------------------------
Model Statistics
Observations                    288
R²                             0.509
```

Adjusted R^2	0.505
Residual Std. Error	9.065 (df = 285)
F Statistic	147.485*** (df = 2; 285)

Note: ***p<0.01, Significance levels: Not Sig. = Not Significant

Table 3: OLS test result

From table 3, It can be said that, the coefficient for 'fedrate' is -0.157 with a standard error of 0.281, suggesting that changes in the federal rate do not significantly impact the exchange rate, as the coefficient is not statistically significant. In contrast, the trade variable has a coefficient of -0.061, which is statistically significant at the 1% level, indicating a strong inverse relationship between trade balance and the exchange rate. The model includes a constant term of 55.025, also significant at the 1% level, suggesting a strong baseline level of the exchange rate when the other variables are zero. The overall model has an R-squared of 0.509, meaning it explains about 50.9% of the variability in the exchange rate, which is relatively high, suggesting a good fit.

3.8 Bound - Test for Co-integration

The Johansen co-integration test is performed to determine if a group of non-stationary time series variables exhibit co-integration, indicating that they possess a stable and consistent relationship despite temporary fluctuations. In my data, I have non-stationary variables. So I found this test more suitable to test this highly valuable identification of multiple co-integrating relationships. This test offers a comprehensive understanding of the interplay between various economic indicators (Johansen, 1991).

3.8.1 Johansen co-integration Test Results for Exchange Rate and Fed Rate

Test Hypothesis	Test Statistic	10% Critical Value	5% Critical Value	1% Critical Value
r <=1	1.51	6.50	8.18	11.65
r=0	8.24	12.91	14,9	19.19

Eigenvalues

- 0.028406082
- 0.005276481

Eigenvectors (Co-integration Relations):

	exch.11	fedrate.11
exch.11	1.00000	1.000000
fedrate.11	-18.94492	3.247517

Loading Matrix (Weights):

	exch.11	fedrate.11
exch.11	-0.0011393549	0.0057586057
fedrate.11	0.0005007224	0.0003073396

Table 5: Johansen co-integration Test Results for Exchange Rate and Fed Rate

Interpretation:

- Eigenvalues: Eigenvalues represent the co-integration relationships between the variables. The closer to 1, the stronger the relationship. There are two eigenvalues: 0.028406082 and 0.005276481, indicating weak relationships.

- Test Statistics vs. Critical Values: Used to determine the number of co-integrating relationships. The test statistics for ‘r <= 1’ and ‘r = 0’ are 1.51 and 8.24. Compared to the critical values, this suggests there is no co-integrating relationship since the test statistics do not exceed the critical values at conventional significance levels (10%, 5%, 1%).

- Eigenvectors: Represent the co-integration equations. Here, they indicate how a change in the federal rate affects the exchange rate, and vice versa, although the weak eigenvalues suggest these relationships are not strong.

- Weights: Indicate how the deviations from the long-run equilibrium affect the change in variables in the short run. The weights for ‘exch.d’ and ‘fedrate.d’ are small, suggesting minimal short-run adjustments.

3.8.2 Johansen co-integration Test Results for Exchange Rate and Trade

Test Hypothesis	Test Statistic	10% Critical Value	5% Critical Value	1% Critical Value
r <=1	0.85	6.50	8.18	11.65
r=0	56.55	12.91	14.9	19.19

Eigenvalues

- 0.179417890
- 0.002984885

Eigenvectors (co-integration Relations):

	exch.11	trade.11
exch.11	1.00000	1.000000

trade.l1	0.1348901	0.02276474

Loading Matrix (Weights):

	exch.l1	trade.l1
exch.l1	-0.01555761	0.005040721
trade.l1	-3.29310754	-0.238332727

Table 6: Johansen co-integration Test Results for Exchange Rate and Trade

Interpretation:

- Eigenvalues: 0.1794 and 0.0029, where the first eigenvalue suggests a stronger relationship compared to the first pair.

- Test Statistics vs. Critical Values: Used to determine the number of co-integrating relationships. The test statistics for ‘r <= 1’ and ‘r = 0’ are 0.85 and 56.55. Compared to the critical values, The test statistic for ‘r = 0’ is 56.55, which exceeds the 1% critical value, indicating at least one co-integrating relationship.

- Eigenvectors: The coefficients suggest how one variable adjusts to maintain long-term equilibrium with the other. Here, I have two eigenvectors, also known as co-integrating vectors. The initial column of the eigenvectors denotes the principal co-integrating vector. This eigenvector indicates that the exchange rate and trade balance are positively related in the long run.

- Weights: Indicate how deviations from the long-term relationship influence short-term changes. I have data for two variables: exch.d and trade.d. The weights indicate the individual contribution of each variable to the co-integrating relationships. The significant negative weight for ‘trade.d’ suggests a considerable adjustment towards long-term equilibrium.

3.8.3 Johansen co-integration Test Results for Fed Rate and Trade

Test Hypothesis	Test Statistic	10% Critical Value	5% Critical Value	1% Critical Value
r <=1	6.08	6.50	8.18	11.65
r=0	34.89	12.91	14.9	19.19

Eigenvalues

- 0.1148377
- 0.0210366

Eigenvectors (co-integration Relations):

	fedrate.11	trade.11
fedrate.11	1.00000	1.000000
trade.11	-0.04873228	0.0008648246

Loading Matrix (Weights):

	fedrate.11	trade.11
fedrate.11	0.002170989	-0.009370177
trade.11	5.260513200	1.759211861

Table 7: Johansen co-integration Test Results for Fed Rate and Trade

Interpretation:

- Eigenvalues: 0.1148 and 0.0210, indicating potentially more substantial relationships than in the first pair but weaker than the second.

- Test Statistics vs. Critical Values: The test statistic for ‘r = 0’ is 34.89, exceeding the critical values at conventional levels, suggesting a co-integrating relationship.

- Eigenvectors: Provide the coefficients for the co-integration equation, indicating the long-term relationship between the federal rate and trade balance.

- Weights: Show how each variable adjusts in the short run to deviations from the long-term equilibrium. The large positive weight for ‘trade.d’ suggests significant adjustments.

Overall, Exchange Rate and Federal Rate shows weak evidence of a long-term relationship. Exchange Rate and Trade Balance shows Strong evidence of at least one long-term relationship, with significant adjustments in trade balance to maintain equilibrium and Federal Rate and Trade Balance shows long-term relationship, with notable short-term adjustments in trade balance.

Chapter 4

Future Scope

Incorporating More Variables: Researchers might add some more important variables, like FDI (foreign direct investment) rates, government stability, political instability or global economic indicators like oil prices. This could help to get a better picture of all the things that affect how the exchange rate changes.

High-Frequency Data Analysis: Look into the idea of using high-frequency data to pick up on more complex changes in the exchange rate and other factors. This can help one to understand changes that happen during the day or during the week and how they are connected to economic events and policy changes.

Policy Implications: It would be beneficial to expand the analysis and determine how well monetary and fiscal policies can handle fluctuations in exchange rates. A factor to consider is analyzing the effects of central bank interventions or government policies on exchange rate stability and trade balance.

Chapter 5

Findings

The study's findings reveal a noteworthy correlation between the Taka-Dollar exchange rate and the Bangladesh-USA trade balance. The results suggest that there is a strong relationship between the trade balances (US trade of goods with Bangladesh) and the exchange rate between the Taka and the Dollar over a long period of time.

Chapter 6

Conclusions

The Taka-Dollar exchange rate exhibited notable fluctuations over the observed period, impacting Bangladesh's economy due to its heavy reliance on imports and the use of the US dollar in trade transactions. The co-integration relationships between the variables, indicating a weak long-term relationship between exchange rates and Federal interest rates, but a strong relationship between exchange rates and trade balances. Having a deep understanding of these relationships is essential for developing effective strategies to handle fluctuations in exchange rates and uphold economic stability. By implementing strategies such as improving trade balances, diversifying export markets, and enhancing domestic production capabilities, Bangladesh can effectively mitigate the negative impact of exchange rate fluctuations on its economy.

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Appendix

Appendix 1:

ADF TEST

Augmented Dickey-Fuller Test

data: data_file$exch

Dickey-Fuller = -1.9634, Lag order = 6, p-value = 0.5916

alternative hypothesis: stationary

Augmented Dickey-Fuller Test

data: data_file$fedrate

Dickey-Fuller = -3.3608, Lag order = 6, p-value = 0.06134

alternative hypothesis: stationary

Augmented Dickey-Fuller Test

data: data_file$trade

Dickey-Fuller = -3.0251, Lag order = 6, p-value = 0.1442

alternative hypothesis: stationary

```
# Perform Augmented Dickey-Fuller Test on differenced data

        Augmented Dickey-Fuller Test

data:  exch_diff
Dickey-Fuller = -9.6413, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

        Augmented Dickey-Fuller Test

data:  fedrate_diff
Dickey-Fuller = -8.933, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary

        Augmented Dickey-Fuller Test

data:  trade_diff
Dickey-Fuller = -13.28, Lag order = 6, p-value = 0.01
alternative hypothesis: stationary
```

Appendix 2

VARselect exch

```
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     5      4      2      5


$criteria
                1          2          3          4          5          6         7          8          9
AIC(n) 0.1211167 0.09359185 0.09693289 0.07394558 0.07123619 0.07304285 0.0802205 0.08654229 0.09164872
HQ(n)  0.1315870 0.10929732 0.11787352 0.10012136 0.10264713 0.10968895 0.1221018 0.13365871 0.14400029
SC(n)  0.1472147 0.13273884 0.14912888 0.13919056 0.14953017 0.16438583 0.1846125 0.20398327 0.22213869
FPE(n) 1.1287569 1.09811238 1.10178862 1.07675238 1.07384203 1.07578809 1.0835432 1.09042217 1.09601379
               10
AIC(n) 0.0988429
HQ(n)  0.1564296
SC(n)  0.2423819
FPE(n) 1.1039385
```

VARselect fedrate)

```
$selection
AIC(n)  HQ(n)  SC(n) FPE(n)
     6      6      6      6


$criteria
                 1           2           3         4           5           6           7           8           9
AIC(n) -3.34289368 -4.02310474 -4.02148870 -4.060701 -4.05384136 -4.09143672 -4.08702252 -4.08150583 -4.08659273
HQ(n)  -3.33242336 -4.00739927 -4.00054807 -4.034525 -4.02243042 -4.05479062 -4.04514126 -4.03438942 -4.03424116
SC(n)  -3.31679568 -3.98395775 -3.96929271 -3.995456 -3.97554738 -4.00009374 -3.98263054 -3.96406486 -3.95610276
FPE(n)  0.03533457  0.01789733  0.01792629  0.017237  0.01735569  0.01671538  0.01678942  0.01688241  0.01679689
                10
AIC(n) -4.08084558
HQ(n)  -4.02325885
SC(n)  -3.93730661
FPE(n)  0.01689387
```

VARselect trade

$selection

AIC(n) HQ(n) SC(n) FPE(n)

9 6 6 9

$criteria

	1	2	3	4	5	6	7	8
AIC(n)	9.271373	9.206346	9.149679	9.152595	8.998496	8.973499	8.980467	8.965679
HQ(n)	9.281843	9.222052	9.170619	9.178770	9.029906	9.010145	9.022349	9.012796
SC(n)	9.297471	9.245493	9.201875	9.217840	9.076790	9.064842	9.084859	9.083120
FPE(n)	10629.334298	9960.147739	9411.436127	9438.934687	8090.956473	7891.247856	7946.471278	7829.876198

	9	10
AIC(n)	8.961453	8.968572
HQ(n)	9.013804	9.026158
SC(n)	9.091943	9.112110
FPE(n)	7796.917880	7852.701136

VARselect ("exch", "fedrate", "trade")

$selection

AIC(n) HQ(n) SC(n) FPE(n)

6 2 2 6

$criteria

	1	2	3	4	5	6	7	8	9
AIC(n)	5.756134	5.120435	5.100516	5.093395	5.012867	4.986820	5.031927	5.061359	5.078055
HQ(n)	5.818956	5.230374	5.257571	5.297566	5.264155	5.285224	5.377447	5.453995	5.517808
SC(n)	5.912722	5.394464	5.491986	5.602306	5.639219	5.730613	5.893160	6.040033	6.174171
FPE(n)	316.125779	167.413559	164.121826	162.975465	150.392651	146.563746	153.380452	158.035569	160.791884

	10
AIC(n)	5.134419
HQ(n)	5.621289
SC(n)	6.347976
FPE(n)	170.240670

Apendix 3

ARDL Test

Residuals:

```
      Min        1Q    Median        3Q       Max
-4.188e-14 -3.370e-15 -1.800e-16  1.150e-15  4.946e-13

Coefficients:
                             Estimate   Std. Error  t value    Pr(>|t|)
(Intercept)                 2.010e-13  1.176e-14  1.709e+01   <2e-16 ***
lag(exch, lag_exch)         1.000e+00  1.948e-16  5.134e+15   <2e-16 ***
lag(fedrate, lag_fedrate)  1.559e-15  9.254e-16  1.685e+00    0.093 .
lag(trade, lag_trade)     -1.070e-17  1.685e-17 -6.350e-01    0.526
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.981e-14 on 284 degrees of freedom
Multiple R-squared:      1, Adjusted R-squared:      1
F-statistic: 1.788e+31 on 3 and 284 DF,  p-value: < 2.2e-16
```


```
Multiple R-squared:      1, Adjusted R-squared:      1
F-statistic: 1.788e+31 on 3 and 284 DF,  p-value: < 2.2e-16
```