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UNDERSTANDING THE RELATIONSHIP BETWEEN MACROECONOMIC VARIABLES AND EXCHANGE RATES

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Abstract: This study examines the impact of macroeconomic variables on exchange rates in Bangladesh. Using secondary data collected from the World Bank and Bangladesh Bank over a period of 20 years, the study identifies the key factors that influence exchange rates in the country. The results show that current account balance, GDP growth rate, interest rate, remittances, foreign direct investment, and foreign exchange reserves are the most important macroeconomic factors affecting exchange rates. The study also highlights the positive impact of remittance on the Bangladeshi economy. The findings of this study are expected to provide valuable insights into the development of effective exchange rate policies in Bangladesh.

Keywords: exchange rates, macroeconomic variables, Bangladesh, current account balance, GDP growth rate, interest rate, remittances, foreign direct investment, foreign exchange reserves.

INTRODUCTION

Amongst all the variables, the exchange rate is the most vital determinant for an import-dependent nation like Bangladesh. The moment the exchange rate increases, people, especially, importers have to spend more for having the same goods or services. So, to keep the exchange rate stable and create an appreciation of the local currency, policymakers need to take proper and effective steps considering influential macroeconomic factors. The exchange rate is the price of one currency in relation to another currency. The demand and supply pressure of foreign currency determine what the exchange rate will be in the market. It represents the amount of a unit of foreign currency relative to the local currency (Bashir & Luqman, 2014). Therefore, it is an essential factor for any economy.

Numerous other macroeconomic variables also change the level of the exchange rate. As a result, the government is required to maintain confidence in the currency by securing strength and ensuring full convertibility (Islam & Biswas, 2009). Since the abolishment of the gold standard, countries have used different mechanisms in order to establish the foundation of modern exchange rates, like fixed exchange rates, currency pegs, and floating exchange rate systems. Today, mostly floating exchange rate mechanism is used.

However, in the last few decades, huge development has taken place in the foreign exchange market. After the elimination of the General Agreement of Tariff and Trade (GATT) and the enactment of the World Trade Organization (WTO), the international business became very easier. As a result, all the countries started

exporting more and more of their surplus and importing more to fulfill the deficit. With this increment of international business, countries must hold a universally accepted currency. As the dollar is the strongest currency, all the countries give more consent to increase the dollar reserve. Furthermore, the exchange rate of the dollar with the home currency became very important. Countries with poor economic decisions face deprecation of home currency against the dollar, which required more money to afford
imports. Therefore, all the countries started to find out which macroeconomic variable influences the exchange rate more and which movement of the variable will create appreciation in the home currency.

In determining influential factors on the exchange rate, the most important factors are interest rate, inflation rate, GDP growth rate, foreign exchange reserve, foreign remittance, and current account balance. Considering that Bangladesh is now one of the world's highest rates of economic growth, it helps largely to the determine exchange rate. Foreign remittance is the game changer for the economy of Bangladesh. It strengthens the country's foreign exchange reserve and fulfills the current account balance deficit. Although the readymade garments sector exports large volumes of products in the international market and earns dollars, that does not influence significantly as most of the raw materials are imported. At the same time, many foreign residents, who are working in the top-level and mid-level of the industry, send earnings to their home country. However, the sector still is contributing to the economy by stabilizing the exchange rate through the marginal dollar income.

On the other hand, GDP size is increasing with the increment of both export and import. A strong and appreciated currency will bring enormous benefits to the country. Therefore, understanding and controlling the factors that influence exchange rates help to develop sound exchange policies that lead to anticipated economic growth. Investors might be invested in an economy with stable exchange rates because the risk is greater in an economy with volatile exchange rates. So, for that, exchange rate management requires decisive emphasis to strengthen the economy. Considering these, the study aims to identify influential factors of the exchange rate along with their influence on the exchange rate.

The study collects data from secondary sources for 20 years from World Bank and Bangladesh Bank. The dependent variable exchange rate is collected from Bangladesh Bank and independent variables are collected from World Bank. So for the analysis here the multiple linear regression model for BDT and USD is used to find out the impact of influential factors on the exchange rate.

There is a negligible number of research on Bangladesh to know the influential factors of the exchange rate. On the other hand, many studies on the exchange rates are based on other economies. For example, Maurya (2017) studied India, Rajakarun (2017) investigated Sri Lanka, Carissa and Khoirudin (2020) studied Indonesia, Bashir & Luqman (2014), and Saeed et al. (2012) studied Pakistan. However, the impacts of inflation and exchange rate on foreign direct investment in Bangladesh are studied by Mostafa (2020) and the determination of the exchange rate in Bangladesh is investigated by Bristy (2017). In addition, the authors did not specify the level of influence of the different factors on the exchange rate. Therefore, this study takes a fresh attempt to identify the effect of various factors on the exchange rate using a wide span of data; the period of the study is 2002-2021 to fill-up up the research gap.

This research consists of five Sections. Section 1 is the introduction which consists of the objectives and motivation of the article and also describes the importance and purpose. Section 2 is the literature review describing different literature on exchange rates those are previously been published. Section 3 is the materials and methods which consist of variables description, material selection and hypothesis, research methods, and methodology. Section 4 discusses results, consisting of descriptive statistics, correlation matrix, and regression analysis. And finally, Section 5 is the conclusion which shows the findings, implications and recommendations, research limitations, and suggestions for future research.

LITERATURE REVIEW

In this globalisation era, the exchange rate is a curtail factor for the social, economic, and political fields. Adverse movement in exchange rate influences all three factors quickly. Regarding international trade, a lower exchange rate makes the exports less expensive while a higher rate makes them more expensive and vice versa. Sometimes appreciation of the local currency has a greater impact on foreign trade.

The system of exchange rates in Bangladesh was not stable with the change in world standards. Therefore, Bangladesh also changes the exchange rate system. From January 1972 to May 2003, Bangladesh had a fixed exchange rate. As of June 2003, it has been a floating exchange rate (Priyo, 2007). An exchange rate can also be distinguished as a nominal rate and a real rate (Drine & Rault, 2001). The importance of exchange rate stability cannot be neglected. It affects the other macroeconomic variable, international trade and investment (Nwude, 2012; Insah & Chiaraah, 2013). The fluctuation of the exchange rate is a contributing factor to a number of other economic issues that affect how local and foreign goods are produced and purchased, as well as how domestic and international markets for goods, services, and assets are connected (Oriavwote & Oyovwi, 2012).

The exchange rate has a favourable effect on export and imports both, and an increase in the exchange rate does not indicate a considerable gain in GDP. The depreciation of the Rupee causes exports to rise and imports to fall will lead to an increase of GDP significantly (Maurya, 2017). Exchange rates are, therefore, the most closely scrutinised, studied, and governmentally controlled economic indicators (Mkenda, 2001). However, macroeconomists are still unable to come to any definite conclusions regarding the long-term factors that determine the exchange rate (Parveen et al., 2012). Forecasting and modelling the exchange rate has become a crucial topic in economic studies (Raja & Ullah, 2014).

Exchange rate influencers may vary from economic, political, psychological, and short or long-term factors (Saeed et al., 2012). The current account balance, interest rate, GDP growth rate, and inflation rate are reliable indicators for determining exchange rates (Chowdhury & Hossain, 2014). In a study involving Pakistan, Bashir and Luqman (2014) used an econometric analysis to determine the influential long-term factor on real exchange rates. They collected time series data and used the Johansen co-integration test and error correction model to find long and short-term elasticity. The study concluded that in long run, the real exchange rate is depreciated by terms of trade and price level, and appreciated or negatively affected by trade and workers' remittances.

The importance of remittance in developing countries is huge. If remittance is consumed or invested, both positively affect the economy (Stahl & Amold, 1986). Adelman and Tailor (1990) discovered that for every dollar Mexico gained from migrants working abroad, it's GNP rose by $2.69 to $3.17 depending on whether the home was rural or urban. The remittance is the sum of three components: current transfer, capital transfer, and local staff of embassies (Ratha, 2003). The capital flow, price level, and nominal effective exchange rate are significant factors of the real effective exchange rate in Nigeria, but the ratio of government expenditure to gross domestic product, terms of trade, and technological advancement are not significant determinants (Oriavwote & Oyovwi, 2012). Due to globalisation, various macroeconomic factors change it's very frequently. To condense imports and promote FDI, a better exchange rate is required (Khera & Singh, 2015).

Insah and Chiaraah (2013) covered the period from 1980 to 2012. The analysis indicated a positive association between government expenditures and real exchange rate volatility in Ghana and a negative relationship between domestic and external indebtedness. Four nations' relative interest rates, trade balance, terms of trade, and net capital inflow were considered in a panel data study done by Raja and Ullah (2014). According to the results, a rise in interest rates and adverse trade balance has a large negative impact, whereas terms of trade and an increase in net capital inflow result in a positive exchange rate for the home nation. However, Patel,

Patel and Patel (2014) aimed to identify the most influential factors affecting currency rates to facilitate investment in currency futures. They concentrated on economics theory to assess the currency's health along with effective prediction models for currency rates. Ogun (2012) identified the drivers of nominal exchange rate fluctuations in less developed nations with a flexible exchange rate system by analysing the weather, the exchange rate on the parallel market, the related premium, and corruption. The study indicated that corruption has long-term effects whereas other factors have short-term effects.

Atif, Sauytbekova, and Macdonald (2012) compared quarterly and annual data over the period of 1975 to 2012, applied Engle-Granger co-integration test and found that Australia's trade components and macroeconomic indicators such as output and liquidity play a significant role while interest rate and inflation play an insignificant role in the determination of exchange rates. Clostermann (2000) built a synthetic Euro-Dollar exchange rate from 1975 to 1998 and used cointegration techniques to find four main variables of the actual euro-dollar exchange rate. These factors are the international real interest rate difference, relative pricing in the traded and non-traded products sectors, the real oil price, and the fiscal condition relative to other nations. Haque and Brumm (2008) study attempt to determine the exchange of the US Dollar and major currencies. For the study, four major currencies were Euro, Yen, SDR, and Canadian Dollar. The findings of the study show that export affects exchange rate negatively Euro and SDR but positively Yen and Canadian Dollar. Import is positively affecting Euro, SDR and Yen but Canadian dollar negatively. Finally, personal income affects all four currencies negatively. The findings of analysis suggest that every macroeconomic determiner will not affect exchange rate in the same direction rather, the economic condition of the country will determine it.

Nuhu (2020) find out impact of change in exchange rate on inflation rate of Nigeria. In the study, they used time series data from 1986 to 2019. The research objectives were fulfilled by useing the generalised autoregressive conditional heteroskedasticity (GARCH) and vector error correction model (VECM). They use money supply, export, import, and exchange rate as independent variables, whereas inflation rate is used as dependent variable. The consumer price index or inflation in Nigeria is shown to be positively and significantly impacted by the money supply and nominal exchange rate. Both the currency rate and the current account are major elements that adversely influence small economies, as they have a direct and positive relationship with inflation (Hughes Hallett, & Wren-Lewis, 1997). Pakistan's exchange rate is mostly impacted by inflation because it carries the highest beta in the multiple regression model. Exports, economic growth rates, and inflation all have a favourable and strong relationship with the exchange rate.

However, imports have a negative and significant impact on the currency exchange rate (Parveen et al., 2012). In Bangladesh, the broad money supply, the gross domestic product, the gross capital formation, the primary income payments, the external debt stock, and the gross national income are also crucial in determining the exchange rate. However, current account balance, foreign currency reserve, and deposit rate have moderate importance. At the same time, inflation, lending rate, net financial account, foreign direct investment, net capital account and primary income receipts are the least key factors (Bristy, 2017).

MATERIALS AND METHODS

Variable Description

Previous authors identified various macroeconomic factors that influence the exchange rate. Therefore, multiple linear regression is used to analyse this study. After testing the multiple linear regression assumptions, only six independent variables (i.e, inflation rate, interest rate, GDP growth rate, current account balance, foreign direct investment (FDI), foreign exchange reserve, trade deficit, and remittances) have been selected to conduct this study. A brief description of the variables used is given below:

Exchange Rate

A currency exchange rate is the rate at which one currency is traded for another. The exchange rate is simply the price of one currency in relation to another currency, determined by the demand and supply in foreign exchange markets (Chowdhury & Hossain, 2014; Maurya, 2017; Carissa & Khoirudin, 2020; Mayowa & Olushola, 2013; Bristy, 2017; Priyo, 2009; Mirchandani, 2013).

Interest Rate

It is the rate at which people and institutions pay for the amount borrowed from banks and other financial institutions. For the study real interest rate which is the portion of the interest rate that remains after the deduction of inflation, is used. As the inflation rate itself is an independent variable, considering the nominal interest rate will create biasness (Chowdhury & Hossain, 2014; Maurya, 2017; Carissa & Khoirudin, 2020; Mayowa & Olushola, 2013).

Current Account Balance

This is the total of exports minus imports of goods and services, net foreign income, and net current transfers (Bristy, 2017; Chowdhury & Hossain, 2014).

Foreign Exchange Reserve

Foreign exchange reserves are the deposits of foreign currency and bonds held by a country's central bank and monetary authority, including gold holdings, special drawing rights (SDR), and exchange reserve balances with the international monetary fund (IMF) (Bristy, 2017; Priyo, 2009; Maurya, 2017).

Remittances

Remittance is the amount of foreign currency migrant workers sent into the country (Rajakaruna, 2017).

GDP Growth Rate

The increase in the amount of gross value contributed by all resident producers in the economy, plus any product taxes and minus any subsidies not included in the previous year's product value. This is calculated as percentage form (Bristy, 2017; Priyo, 2009; Chowdhury & Hossain, 2014; Mostafa, 2020; Maurya, 2017).

Foreign Direct Investment (FDI)

This is the net inflow of investment in an economy. In particular, it is the total of reinvestment of earnings, equity capital, other long-term capital, and short-term capital which is reflected in the balance of payments (Bristy, 2017; Priyo, 2009; Mirchandani, 2013).

Hypotheses Development

In research conducted in Nigeria (Oriavwote & Oyovwi, 2012) demonstrates that government expenditure on GDP, trade, and technology are not significant predictors of the actual effective exchange rate (Oriavwote & Oyovwi, 2012). Mostafa (2020) demonstrates that in the short run, the inflation rate has no substantial impact on FDI in Bangladesh (Mostafa, 2020). Osinubi and Amaghionyeodiwe (2009) analyse the effect of exchange rate on Nigeria's gross domestic product using time series data from 1970 to 2004. The author found no evidence of a direct correlation between exchange rates and GDP.

Atif et al. (2012) used Engle-Granger co-integration test over the period of 1975 to 2012 and found that interest rate and inflation play insignificant roles in determination of exchange rates in Australia. Haque & Brumm (2008) show their analysis that every macroeconomic factor will not influence the exchange rate at the same way because it will be determined by the economic state of a nation (Haque & Brumm, 2008).

Based on the above discussion, the null hypothesis is made:

H_0 = The macroeconomic variables do not influence the exchange rate of Bangladesh

Chowdhury and Hossain (2014) shows that the GDP growth rate, current account balance, inflation rate, and interest rate is the good determinant of exchange rate (Chowdhury & Hossain, 2014). Maurya (2017) indicates that the exchange rate has a significant positive influence on both imports and export (Maurya, 2017).

Exchange rate affects the macroeconomic variable, international trade, and investment (Nwede, 2012; Insah & Chiaraah, 2013). The exchange rate is influenced by economic, political, and psychological variables, as well as long- and short-term considerations (Saeed et al., 2012). The inflation rate, which differs from the world average, is an influential factor in determining the exchange rate (Heller, 1978). This study also asserts that the central bank must accumulate foreign currency reserves to fix the exchange rates in the equilibrium point (Antwi et al., 2014).

Haque and Brumm (2008) try to determine the exchange of the US Dollar and four major currencies, which were the Euro, Yen, SDR, and Canadian Dollar. In that study, authors found that export negatively affects the exchange rate in terms of Euro and SDR but positively affects in case of Yen and Canadian Dollar. Import affects the exchange rate positively in terms of the Euro, SDR, and Yen but negatively in Canadian Dollar (Haque & Brumm, 2008). Furthermore, Hughes Hallett, and Wren-Lewis (1997) discovered that the exchange rate and current account have a direct and positive relationship with inflation, and these two factors have a negative impact on small economies (Hughes Hallett, & Wren-Lewis, 1997).

H_{1a} = Current account balance influences the exchange rate of Bangladesh

A study on Nigeria expresses that the exchange rate has minimal impact on the determination of inflation but it influences inflation positively (Akinbobola, 2012). According to Prasad and Raju (2010), there is a positive link between GDP and export volatility, i.e., the foreign exchange reserves grow as GDP and export volatility rise. Consequently, the connection between foreign exchange reserves and exchange rate is inverse. Kasman and Ayhan (2008) found that in Tukey exchange rates and foreign exchange reserves have a long run relationship. Flood and Marion (2002) found that the fluctuation of the nominal effective exchange rate reduces international reserves. A study on Pakistan using Granger causality analysis found that the foreign exchange reserves of Pakistan have an effect on the nominal and real exchange rate (Khan, 2013).

H_{1b} = GDP growth influences the exchange rate of Bangladesh

Hacker et al. (2014) state that the nominal interest rate has a negative short-term effect on exchange rate but has a favourable long-term effect (Hacker et al., 2014). Hnatkovska et al. (2013) demonstrate that an increase in the nominal interest rate causes the currency to appreciate before depreciating. According to Engel et al. (2019), the nominal interest rate between the United States and any other nation considerably impacts exchange rates. If an economy has a fixed exchange rate system, then an increase in foreign interest rates has a beneficial effect on that economy, according to Di Giovanni & Shambaugh (2008). According to Mehrotra (2007), the exchange rate affects inflation in Japan and Hong Kong, but not in China, where neither interest nor foreign currency rates affect inflation.

H_{1c} = Interest rate influences the exchange rate of Bangladesh

Aggarwal et al. (2006), Giuliano & Ruiz-Arranz (2009), and Gupta et al. (2009) opined that remittances increase the improvement of the financial sector of an economy by easing credit restrictions on investments. Pezo (2004) made a study from 1979-1998 based on panel data from 13 Caribbean and Latin American countries and found that an increase in remittances appreciated the real exchange rate. Lartey et al. (2012) recently showed in a study by analysing a sample of 109 countries from 1992 to 2003 that the flow of remittances appreciates the real currency exchange rate.

H_{1d} = Remittance influences the exchange rate of Bangladesh

Froot and Stein (1991) analysed data from 1974 to 1987 on the 13th industrialised nations to determine the influence of real exchange rates on foreign direct investment (FDI). They discovered that the exchange rate has negative indications, indicating that depreciation leads to an increase in FDI. According to Khan, Sattar and Rehman (2012), there are two explanations, the first being that currency exchange rates have a direct correlation with the volatility of FDI; second, a negative association exists between exchange rates and FDI.

Kogut and Chang (1996) found that for Japanese electronics firms to invest in the United States, Foreign direct investment is predicated mostly on exchange rate fluctuations. Gottschalk and Hall (2008) reported that the Japanese exchange rate is positively correlated with foreign direct investment among South Asian nations.

H_{1e} = FDI has influences on the exchange rate of Bangladesh.

According to Rodrik (2008), the link between exchange rates and gross domestic product growth is positive (Rodrik, 2008). Ito, Isard and Symasnsky (2007) identify that adequate export growth indicates that there is high growth in the economy as a result, there is an increased value of exchange rates. According to Joseph et al. (2011), GDP and exchange rates have a significant impact on foreign exchange reserves, although the impact of exchange rates on GDP is smaller than the foreign exchange reserves.

H_{1f} = Foreign exchange reserve influences the exchange rate of Bangladesh.

Methodology

Data is collected from secondary sources, i.e., World Bank and Bangladesh Bank. The dependent variable exchange rate is collected from Bangladesh Bank and independent variables are collected from World Bank. For the study data from both dependent and independent variables have been used. Based on the availability of data for the last 20 years, the study period is 2002-2021. Annual data is used for the study.

Data Analysis Methods

The multivariate data analysis method is applied to reach the answer to the research question. Therefore, multiple linear regression is used to identify the impact of the independent variables on the dependent variable. Moreover, Pearson's correlation analysis measures the relationship between examined variables. To develop multiple regression, the general equation is given below:

$$Y= \beta 0 + \beta 1*X1+ \beta 2*X2+\ldots\ldots\ldots+ \beta n*Xn+\epsilon$$

Here Y stands for the dependent variable, the β represents the constant value of subsequent variables and X represents the value of the independent variables. By considering the general equation for multiple regression of this study, the two regression models are used, which are shown below –

$$EXR = \beta_0 + \beta_1 INT + \beta_2 REM + \beta_3 FXR + \beta_4 GDP + \beta_5 CAB + \beta_6 FDI + \epsilon \ldots\ldots (1)$$

The EXR represents exchange rate, β_0 represents beta the constant, the INT represents interest rate, REM represents remittance, FXR represents foreign exchange reserve, GDP represents GDP growth rate, CAB represents current account balance and FDI represents foreign direct investment. At the same time, subsequent beta represents beta coefficient of independent variables.

$$EXR = \beta_0 + \beta_1 INT + \beta_2 REM + \beta_3 FXR + \beta_4 GDP + \epsilon \ldots\ldots (2)$$

The EXR represents dependent variable exchange rate, β_0 represents beta of constant, the INT represents interest rate, REM represents remittance, FXR represents foreign exchange reserve, GDP represents GDP growth rate. At the same time, subsequent beta represents beta coefficient of independent variables.

RESULTS AND DISCUSSIONS

The data analysis section is most important because findings will help fulfil research objectives based on the analysis. Therefore, section 4.1 will present descriptive statistics, which will describe the characteristics of the data, 4.2 will present a correlation matrix to identify the correlation among variables and 4.3 will present regression analysis to find out the impact of the independent variables on the dependent variable.

Descriptive Statistics

The descriptive statistics show different aspects of the variables used in the study (Table 1). In this study, the exchange rate is used as a dependent variable and inflation rate, interest rate, GDP growth rate, current account balance, foreign direct investment (FDI), foreign exchange reserve, trade deficit, and remittances are used as independent variables.

It will be better to understand the characteristics of data through statistics. The descriptive table shows that from the independent variable maximum interest rate is 8.39% and the minimum is 3.08%. The standard deviation of interest rate is 1.21, which represents that changes in interest rate are slower. The maximum current account balance is 3.56 billion, the minimum -15.56 billion, the average or mean balance is -0.63 billion, and the standard deviation is 4.45 billion. This represents that most of the time Bangladeshi economy faces a negative current account balance.

The maximum foreign exchange reserve is 46.17 billion, the minimum is 1.72 billion, average or mean foreign exchange reserve is 17.8 billion and standard deviation is 14.62 billion in the 20-year period. This represents that on average, Bangladesh holds a 17.8-billion-dollar reserve. The maximum remittance in 20-year period is 24.76 billion, minimum 2.86 billion, average remittance is 11.71 billion and the standard deviation is 6.15 billion. As remittance is one of the most important factors in determining the exchange rate, a higher remittance is beneficial for the country. The GDP (Gross Domestic Product) growth rate is another influential factor. With the growth of GDP other macroeconomic indicators also changes.

The average GDP growth rate is 6.08% which represents a positive sign for the economy. Maximum exchange rate is 84.81 taka per dollar and the minimum is 57.43. The standard deviation of 9.13 shows that the exchange rate is fluctuating more and more. The average foreign direct investment is 1.35 billion per year.

Table 1. Shows the descriptive statistics of all variables used in the study for the period of 2002 to 2021

Variables	**N**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
Exchange Rate	20	72.87	9.13	57.43	84.81
Interest Rate	20	5.3	1.21	3.08	8.39
Current Account Balance	20	-.63	4.42	-15.56	3.56
Foreign Exchange Reserve	20	17.82	14.62	1.72	46.17
Remittances	20	11.71	6.15	2.86	24.76
GDP Growth Rate	20	6.08	1.14	3.45	7.88
Exchange Rate	20	72.87	9.13	57.43	84.81
FDI	20	1.35	.89	.05	2.83

Correlation Matrix

As the main concern of the study is the exchange rate that's why close attention will be given to the correlation between the exchange rate and other independent variables (Table 2). There is a statistically significant positive correlation found for exchange rate with foreign exchange reserve, remittance, and foreign direct investment. On the other hand, a statistically significant negative correlation exists between the exchange rate and interest rate. Moreover, there is no statistically significant correlation identified for exchange rate with current account balance and GDP growth rate.

Table 2. Shows correlation matrix of all the variables

Variables	**INR**	**CAB**	**FXR**	**RMT**	**FDI**	**GDP**	**EXR**
INR	1						
CAB	.552*	1					

FXR	-.621**	-.575**	1				
RMT	-.573**	-.484*	.919**	1			
FDI	-.373	-.166	.798**	.752**	1		
GDP	-.406	-.371	.243	.262	.408	1	
EXR	-.563**	-.391	.887**	.943**	.829**	.423	1

The Pearson correlation matrix shows correlation between all the variables. Single star-mark (*) is used to show correlation coefficient that is significant at 0.05 level and double star-marks (**) is used to show correlation coefficient that is significant at 0.01 level. At the same time the EXR represents dependent variable exchange rate, the INT represents interest rate, REM represents remittance, FXR represents foreign exchange reserve, GDP represents GDP growth rate, CAB represents current account balance and FDI represents foreign direct investment.

Regression Analysis

Multiple linear regression is conducted to find out the influence of macroeconomic variables on the exchange rate of Bangladesh. Two regression models are used based on equations 1 and 2; details of the equations are shown in the previous section.

The assumptions of linear regression have been tested for the plausibility of regression results. The assumption of the linear relationship between the exchange rate with other examined variables has been identified through scatter plots. Both models do not suffer from multicollinearity problems as VIF is less than 10. Moreover, the homoscedasticity assumption for both models has been satisfied as the amount of error in the residuals is almost similar at each point of the linear models. Durbin-Watson test is performed to see the independence of the observation where model-1 and model-2 show values of 1.5 and 2.5, respectively. These results signal that there is little chance of an autocorrelation problem for both models. Table 3 shows the regression output.

Table 3. Shows regression Analysis, adjusted R-squared and F-statistics

Variables	**Model-1 (T-value)**	**Model-2 (T-value)**
GDP Growth Rate	2.306 **	1.953
	(2.774)	***
		(4.004)
Remittances	1.023 ***	1.040
	(4.435)	***
		(4.845)
Foreign Exchange Reserve	.271	.192 *
	(1.502)	(1.998)
Current Account Balance	.540 *	.445 **
	(2.044)	(2.967)
Interest Rate	.300	
	(.434)	
FDI	-.981	
	(-.502)	
Constant	42.109 ***	45.66
	(5.656)	***

		(14.945)
Adjusted R Square	.933***	.940***
F-statistics	45.06***	76.06***
Number of Observations (N)	20	20

Table 3 shows regression Analysis, adjusted R-squared and F-statistics for model-1($EXR = \beta_0 + \beta_1 INT + \beta_2 REM + \beta_3 FXR + \beta_4 GDP + \beta_5 CAB + \beta_6 FDI + \epsilon$ --- 1) and model-2 ($EXR = \beta_0 + \beta_1 INT + \beta_2 REM + \beta_3 FXR + \beta_4 GDP + \epsilon$..... 2).. The table summarises the beta coefficient, t-value and significant level of the independent variables. The beta coefficient indicates, a change in the independent variable will change the dependent variable at which degree. The significant level will explain, the change explained by the independent variable on dependent variable is significant or not. Single star-mark (*) is used to show beta coefficient that is significant at 0.05 level, double star-marks (**) is used to show beta coefficient that is significant at 0.01 level and triple starmarks (***) is used to show a beta coefficient that is significant at 0.001 level.

For model 1, the coefficients of GDP growth rate, remittances, and current account balance exist a statistically significant positive relationship with the exchange rate. This indicates that when the GDP growth rate, remittances, and current account balance increase, an exchange rate also increase. However, there is no statistically significant relationship exit for exchange rate with foreign exchange reserve, interest rate, and FDI. For model 2, the coefficients of GDP growth rate, remittances, foreign exchange reserve, and current account

balance exist statistically significant positive relationships with the exchange rate. This indicates that when the GDP growth rate, remittances, foreign exchange reserve, and current account balance increase then the exchange rate also increase.

From the above discussion, it is said that the GDP growth rate, remittances, foreign exchange reserve, and current account balance exist a positive relationship with the exchange rate. Therefore, current account balance, foreign exchange reserve, remittances, and GDP growth rate are the significant determinants of the exchange rate of Bangladesh. These findings are consistent with the results of Bristy (2017); Chowdhury and Hossain (2014) and Maurya (2017).

CONCLUSIONS

The exchange rate is a big concern for the government of developing countries like Bangladesh. An adverse exchange rate movement creates adverse implications for any country's economy. Considering the importance of the exchange rate and its effect on Bangladesh's economy, the study has been conducted very carefully. Throughout the study, it's found that foreign exchange reserves, remittance, GDP growth rates, and current account balances are the most crucial determiner of the exchange rate. The policymakers can change these influential factors to get the best exchange rate for the benefit, and stability of Bangladesh's economy.

Future Research Opportunities

Over time macroeconomic environment changes. As a result, influential factors for the determination of the exchange rate also will change. At the same time due to the unavailability of data, 2022 can't be included in the research. Suddenly in 2022 exchange rate fluctuated a lot. Thus, future researchers can include the data of 2022 to observe which factors are responsible for the huge increase in the exchange rate in 2022.

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