# Analyzing the Effects of Macroeconomic Factors on the Financial Performance of Bangladeshi Commercial Banks

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**ABSTRACT**

Since banks mobilize financial resources across the economy, they are expected to be critical in bringing about financial stability and economic progress. The purpose of this research was to determine the impact of macroeconomic variables on the financial performance of commercial banks in Bangladesh. From the World Bank website, secondary data were gathered for the fiscal years 2010 through 2021. Correlation, multiple linear regression, factor analysis, and model selection criteria were utilized for this study. From the correlation analysis, it was observed that the inflation rate was significantly and positively correlated with the financial performance of commercial banks in Bangladesh. From the multiple linear regression analysis, it was seen that import, exchange rate, and inflation rates have a substantial impact on Bangladesh's commercial banks' financial performance. From the factor analysis, it was observed that GDP and imports are highly correlated with Bangladesh's commercial banks' financial performance. Based on the model selection criteria, it was discovered that the model including all variables is the best. The government, other researchers, bank managers, possible investors, financial experts, and anybody else involved in Bangladesh's banking sector should all take note of the findings.

**Keywords:** Commercial banks, Financial stability, Economic progress, and Macroeconomic variables.

## INTRODUCTION:

### Preamble of the investigation

Worldwide financial organizations enable the reassignment of money from an economy's superfluous supply units to its insufficient supply units (Eakins & Mishkin, 2012). Commercial banks are among these financial companies. Commercial banks are the primary participants in Bangladesh's financial system (CBK, 2016). To increase returns through greater financial performance, banks engage in financial intermediation. They, therefore, acquire resources and put

them to use to realize the preferred financial performance. The Bangladesh Bank Order, 1972, and the Bank Company Act, of 1991 allow Bangladesh Bank to supervise and oversee all 61 scheduled banks in Bangladesh to the fullest extent possible (BB, 2022). In Bangladesh, there are 35 nonbank financial institutions and 5 non-scheduled banks operating. The banking sector is essential to a growing economy. Banks actively support the growth and development of the economy (Horobet *et al.*, 2021). The main essential parts of the economy, like the GDP, inflation,

staterun income, exchange rates, perhead income, unemployment rate, rates of interest, and the severity of the financial crisis, are all considered macroeconomic factors (Ozatac *et al.*, 2018). A larger part of the population is backwashed by macroeconomic belongings, exposing clues about the economy (Lynn, 2013). Macroeconomic variables are less under the control of companies because they are a part of the broader environment (Dioha *et al.*, 2018). To address challenges and capture opportunities brought on by environmental factors, managerial effectiveness is, hence, increasingly essential (Lawa *et al.*, 2021).

In particular, the efficiency of financial institutions is essential for fostering economic growth, luring in foreign and domestic investment, alleviating poverty, and generating jobs (Kyalo, 2020). There has been debate over the link between financial performance and macroeconomic conditions ever since Tobin's seminal work in 1960. The conditions of the macroeconomic factors that impact the banks' financial performance have shown mixed results. The exchange rate had a significant positive impact, but macroeconomic indicators like the rate of inflation and GDP had no appreciable outgrowth on the prediction of financial success (Sopan, 2021). Rates of interest have a big and positive outcome on how well commercial banks perform (Alpera & Anbar, 2011). On the other hand, there was no apparent conflict between the inflation rate and GDP and bank performance (Ngweshemi & Isiksal, 2021; Lawa *et al.*, 2021). To fill a void in the body of knowledge, this research uses actual data to show how macroeconomic factors like GDP, rates of interest, inflation, imports, and currency rates affect commercial banks' financial performance in Bangladesh.

### Statement of the problem

Banks that deal with commerce are essential for a country's economic resource allocation (Ongore & Kusa, 2013). By making money available for investors to borrow from and by strengthening the country's financial system, they help the nation's economy grow (Otuori, 2013). Commercial banks constantly experience the effects of the economy on their operations and play a significant part in it (Ouma & Muriu, 2014). Both external and internal factors, including macroeconomic indicators and the performance of commercial banks, are impacted by internal bank difficulties (Ongore and Kusa, 2013). The aspects that characterize the country's economy and business climate are known as macroeconomic variables (Brueggeman & Fisher, 2011; Hoque *et al.*, 2020). According to various academics, the specific macroeconomic variables have varying effects on financial performance indicators. As a result, little is known about how macroeconomic issues change Bangladesh's commercial banks' the financial performance. To fill the gap, this research has been conducted.

### Significance of the study

Banks that deal with commerce have had a substantial impact on Bangladesh's economic growth. Banks that deal with commerce are thought to be the lifeblood of the banking system. After the monetary predicament of 2008 and the Basel III framework that showed the bank's performance had been implemented. Bangladesh needs some academic research to identify the key factors influencing profitability because the banking industry's competitiveness has significantly intensified.

### Objectives of the study

The main goal of this study was to determine how macroeconomic factors affect Bangladesh's commercial banks' financial performance. The study's additional goals included:

1) To compute the potency of the alliance between Bangladesh's commercial banks' financial performance and macroeconomic factors.
2) To appraise the outgrowth of all macroeconomic factors on the Bangladeshi commercial banks' financial performance.
3) To narrow down the list of important factors influencing the Bangladeshi commercial banks' financial performance.
4) To choose the most accurate model of Bangladeshi commercial banks' financial performance.

### Review of Literature

Macroeconomic factors, also referred to as economic conditions, have aforce on banks' financial performance (Petria *et al.*, 2015; Brahmaiah & Ranajee, 2018; Kirimi *et al.*, 2020). Gross domestic product, interest rates, currency rates, and inflation rates all have a noteworthy impact on how well banks are performing financially (Neupane, 2020; Bhattarai, 2015;

Saeed, 2014). Otuori, (2013) explored the influence of the determinants of currency rate on the operations of Kenya's commercial banks to uncover the link between the profitability of banks and the country's inflation rate. The inflation rate had a considerable, unfavorable impact on banks' profitability. Macroeconomic factors had a noteworthy influence on the prosperity of banks in Africa (Flamini *et al.*, 2009). Bank profitability increased dramatically due to output growth, whereas inflation had an encouraging upshot. Interest rates have a considerable beneficial impression on the financial performance of commercial banks, while GDP growth has a negative effect (Staikouras & Wood, 2004). Inflation and interest rates have a substantial outcome on the profitability of Greek banks (Athanasoglou, 2005). In general, the risk necessities, operational revenue, and the conducting performance of Austrian banks throughout the 1990s can be explained by some macroeconomic variables, such as rates of interest and consumer prices, but not by GDP (Arpa *et al.*, 2010). A considerable downbeat connection between bank size and bank profitability, as well as an upbeat but not statistically noteworthy liaison between bank profitability and the rate of inflation, were found in their investigation (Hasan, 2013). Kaguri, (2013) observed that bank size, liquidity, and bank leverage were statistically significant for a sample of Kenyan life insurance companies. Studies undertaken in Pakistan (Sumaira & Amjad, 2013; Mehari & Aemiro, 2013) and Ethiopia came to similar conclusions, indicating that size and leverage were statistically noteworthy, but the liquidity ratio was not. Liquidity and leverage had a strong and adverse link, according to Sambasivam and Ayele's, (2013) analysis of Ethiopia, which provides profitability as ROA. Therefore, to determine bank performance, macroeconomic forces, and bank features work together.

The real GDP intensification rate was definitely but unimportantly correlated with profitability, real interest rates were significantly inversely correlated with profitability, and the exchange rate was positively correlated with profitability for commercial banks (Simiyu & Ngile, 2015). Samuelson, (1945) showed that while an increase in interest rates doesn't affect banks' performance, it does affect borrowers. The borrower will put up with the effects of a high-interest

rate, but it won't have a force on the bank's realization. Gelos, (2006) found that relatively high-interest rates, which serve as a stand-in for macroeconomic risk, had a significant off-putting weight on the efficiency of banks. Internal and external forces have each had a bang on the banking industry's structure and performance in some way (Ally, 2014). Kiganda, (2014) concludes that macroeconomic parameters like GDP, rate of inflation, and currency rate have no clash on bank performance in Kenya since they have no impact on profitability. The outcome may not be generalizable to Kenya's more than forty institutions because the case study polluted them. GDP, inflation rate, the value of the dollar, interest rates, return on assets, and exchange rates were some of the study's variables. The research establishes a strong optimistic rapport between return on assets and exchange rate as well as a weak constructive connection between GDP, returns on assets and rates of interest and it draws the conclusion that macroeconomic factors positively affect the profitability of the aforementioned studied firms (Ongeri, 2014). Kungu, (2013) concludes that macroeconomic conditions have an outcome on the financial performance of private equity organizations. In contrast to the other components, the currency rate was established to have a weakly unenthusiastic connection with return on investment. Hasan *et al.* (2022) see that foreign direct investment (FDI) is adversely correlated with GDP, interest rates, inflation rates, and trade balance; growth rate, average exchange rate, and external debt are positively correlated. At 1%, interest rates but not ROE, were shown to be significantly correlated with economic growth, inflation, and inflation rate (Anwar & Herwany, 2006). Sufian and Chong, (2008) showed that GDP has a marginally favorable effect on ROA but a negative one on inflation. Davydenko, (2010) demonstrated that GDP and inflation were positively impacted. Using fixed effects estimation of the ROA of Ukrainian banks by Damena, (2011) who analyzed 10-year data from seven of the largest Ethiopian commercial banks for their analysis, likewise validated the strong association between GDP, inflation, interest rates, and earnings. Bilal *et al.* (2013) have concluded that net interest margin, bank size, and industry manufacture intensification rate have an encouraging and considerable blow on ROA and ROE. Inflation and the proportion of non-

performing loans in total advances have a considerable off-putting bang on ROA, but real GDP has a favorable outgrowth. ROE is significantly and favorably impacted by the capital ratio. Osamwonyi and Michael, (2014) discovered that GDP and return on equity have a favorable association. Return on equity is inversely correlated with interest rates, inflation, and price growth. GDP positively affects ROE significantly, whereas interest rates have a momentous downbeat outcome (Pradhan *et al.*, 2016). Irungu, (2013) found a noteworthy optimistic connection between the rate of interest spread and the financial performance of commercial banks. Ndichu, (2014) discovered a negative correlation between interest rate increases and the financial performance of microfinance institutions that accept deposits.

Imoughele and Ismaila, (2014) found that commercial private banks' lending to SMEs, and their time, and savings deposits have a pragmatic and considerable consequence on the growth of SMEs as measured by GDP components for wholesale and retail trade, whereas the expansion of SMEs is negatively impacted by interest and currency rates. Francis, (2013) discovered that macroeconomic and bank-specific aspects both contribute to the heterogeneity in commercial bank profitability. Hasan *et al.* (2022) analyzed the effects of macroeconomic factors and observed that export and import are positively allied factors with GDP whereas rate of inflation is a negatively allied factor. According to Barasa, (2014) the bank's performance found a weakly encouraging affiliation between the chosen stock market performance and macroeconomic variables. In a 2015 study, Hong and Razak, discovered the relationship between inflation, GDP, and the financial success of Malaysia's Islamic banks.

### Research gap
The effect of macroeconomic factors on the overall economic activity of other nations has been the subject of several research studies. The best part of this research focuses on the industrialized nations' financial markets, which are unaffected by the inefficiencies that plague poorer nations. Numerous studies have scrutinized the relationships between macroeconomic characteristics and bank performance, but none of these investigations focused on the effects of macroeconomic elements on any one sector. Because of this,

an investigation was conducted to weigh up the results of macroeconomic aspects on the financial performance of Bangladeshi commercial banks.

## METHODOLOGY:
### Data source
For this analysis, the researchers practiced secondary data that was obtained from the website of the World Bank covering the period from 2010 to 2021.

### Data analysis techniques
To examine the macroeconomic factors, different descriptive statistics, correlation, multiple linear regression, and factor analysis were employed.

### Dependent variable
This study employed the return on assets calculated by the formula net income divided by total assets to measure the commercial banks' financial performance in Bangladesh. The World Bank exploited the entire portfolio and net income of all 57 commercial banks in Bangladesh.

### Independent variables
As independent variables, GDP per capita, imports, the rate of interest, the rate of inflation, and the exchange rate were all considered. The subsequent were the specifics of these variables:

### Gross domestic product per capita (GDP)
The GDP per person, of a nation serves as a proxy for its population. It implies that an economy's output or average income per person can disclose its level of living or average productivity.

### Imports
Purchases, bartering, and hand-outs of goods and services made by non-residents to residents are named as imports of goods and services. For instance, items transported abroad for customization are no longer included in exports of products, and items that have been processed are not included in imports of goods. But is it acknowledged to import industrial services worth the difference between the prices of inputs and completed goods in the country of the payer? There is no change in the overall foreign trade balance.

### Inflation rate
Price increases, or inflation, are fundamentally the result of a progressive decline in purchasing power.

The rate of buying power loss can be calculated by measuring the average rate of price growth of a sample of goods and services across time. Because of the price increase, which is typically expressed as a percentage, one unit of currency really has less purchasing power than another. Deflation, on the other hand, occurs when prices fall and purchasing power increases.

## Interest rate

The additional fee that the lender charges the borrower on top of the principal amount is known as the interest rate. When valuing money over time, a depositor into a bank or other financial organization also earns interest for the recipient, which is an extra source of income. Interest rates on various loans and deposits may vary based on the purpose and intended recipient of the funds.

## Exchange rate

Trade and the flow of money between nations are impacted by exchange rates, which are the prices at which one currency will be exchanged for another. The value of both the foreign and domestic currencies affects exchange rates.

## Multiple linear regression models

A dependent variable's connection with one or more independent variables is examined using the multiple linear regression models. The regression model's generic form is:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \varepsilon$$

$y$ = Financial performance of commercial banks in Bangladesh

$x_1$ = Gross domestic product; $x_2$ = Import; $x_3$ = Inflation rate; $x_4$ = Interest rate; $x_5$ = Exchange rate and $\varepsilon$ = Error term

Therefore, the ordinary least square fitted model from is given by

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \hat{\beta}_3 x_3 + \hat{\beta}_4 x_4 + \hat{\beta}_5 x_5$$

$\hat{y}$ is the forecasted value of $y$, $\hat{\beta}_0$ is the value of intercept, $x_1$ to $x_5$ are the explanatory variables, $\hat{\beta}_1\, to\, \hat{\beta}_5$ is the predictable value of $\beta_1$ to $\beta_5$.

$$\widehat{Financial Performance}$$
$$= \hat{\beta}_0 + \hat{\beta}_1 GDP + \hat{\beta}_2\, \text{Import}$$
$$+ \hat{\beta}_3\, \text{Inflation rate} + \hat{\beta}_4\, \text{Interest rate}$$
$$+ \hat{\beta}_5\, \text{Exchange rate}$$

## Multicollinearity test

The multicollinearity issue between the independent variables (imports, rates of interest, GDP per capita, rate of inflation, and exchange rate) was found through variance inflation factor, which was determined for each explanatory variable. According to, the variation inflation factor (VIF) fundamental's equation is

$$\text{VIF} = \frac{1}{1 - R_i^2}$$

Where, $R_i^2$ =Coefficient of determination for the i$^{th}$ explanatory variables whose value ranges from 0 to 1. If $R_i^2$ is tends to 1, then the VIF will be quite large and if $R_i^2$ is tends to 0, the VIF will be next to 1. VIF > 5 is concerning, while VIF > 10 denotes a major collinearity issue (Menard, 2001).

## Test of autocorrelation

The autocorrelation issue in the residuals from the regression analysis was found using the Durbin-Watson test. This test statistic's standard equation is

$$\text{DW} = \frac{\sum_{t=2}^{T}(e_t - e_{t-1})^2}{\sum_{t=1}^{T} e_t^2}$$

Whenever an ordinary least squares regression method is used, the residual is denoted by $e_t$. According to a study, values of less than 1 or greater than 3 are indicative of an autocorrelation issue (Field, 2009).

## Analysis of factors

Factor analysis is a system for tumbling a huge numeral of factors to a controllable number of factors. This approach takes all of the variables' most common variance and converts it to a single score. Although there are others, principal component analysis is the most often used method. A principal component study was practiced to decide the number of elements using the scree plot (Cattell, 1966).

## Model selection criteria

Several criteria were used to select the best model. Researchers (Draper & Smith, 1998) suggested the following criteria which were given below

1) Consider and prefer the highest value of $R^2 = 1 - \frac{SSE}{SST}$

2) Determine and decide the highest value of
$$R^2_{adj} = 1 - \frac{(n-1)SSE}{(n-p)SST}$$

3) Think about and select the lowest value of
$$AIC = e^{2k/n} \frac{RSS}{n}$$

4) Consider and choose the lowest value of $SIC = n^{k/n} \frac{RSS}{n}$

5) Scrutinize and pick the lowest value of
$$Mallow's C_p = \frac{RSS}{\hat{\sigma}^2} - (n - 2p)$$

**Estimation of correlation coefficient**

Correlation coefficients are a common tool for determining how stalwartly two factors is related to one another. Pearson's is the most well-liked correlation coefficient, also referred to as Pearson's R. The follo-

wing procedure was utilized to estimate a sample correlation coefficient:

$$r_{xy} = \frac{S_{xy}}{S_x S_y}$$

$S_x$ and $S_y$ are the sample standard deviations, and $S_{xy}$ is the sample covariance.

**RESULTS AND DISCUSSION:**

**Graphical analysis**

Charts, figures, and graphs are used in graphical analysis to represent data. It is especially helpful in assisting managers in processing massive amounts of data. This type of study presents a substantial amount of data in a simple style.
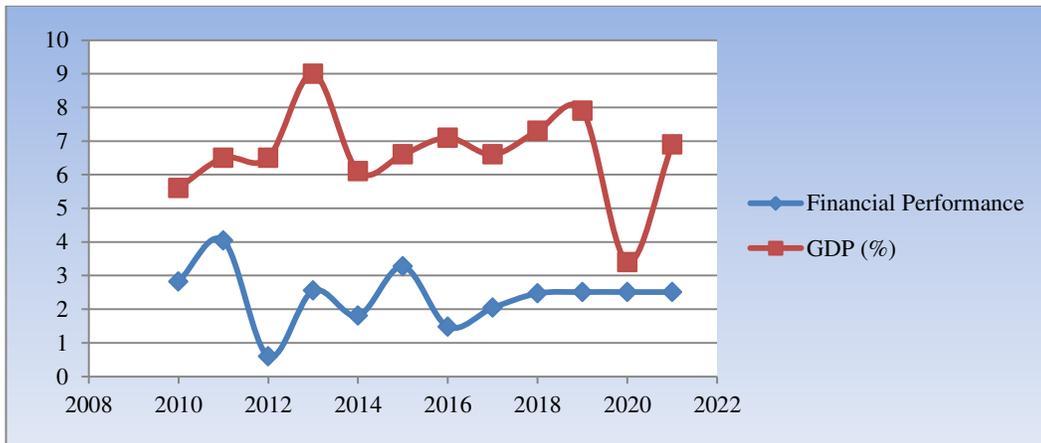


**Fig. 1:** Scatter plot for financial performance and GDP.

From **Fig. 1**, it was disclosed that financial performance decreases as GDP increases. That is, there is an inverse relation between financial performance and GDP.
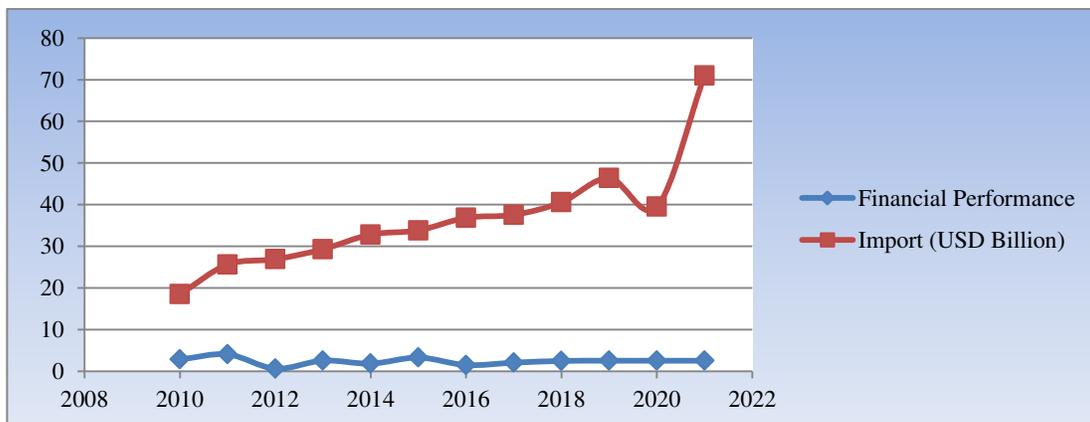


**Fig. 2:** Scatter plot for financial performance and import.

From **Fig. 2**, it was disclosed that financial performance showed decreases with the increases of import. That is, there is an inverse relation between financial performance and import.
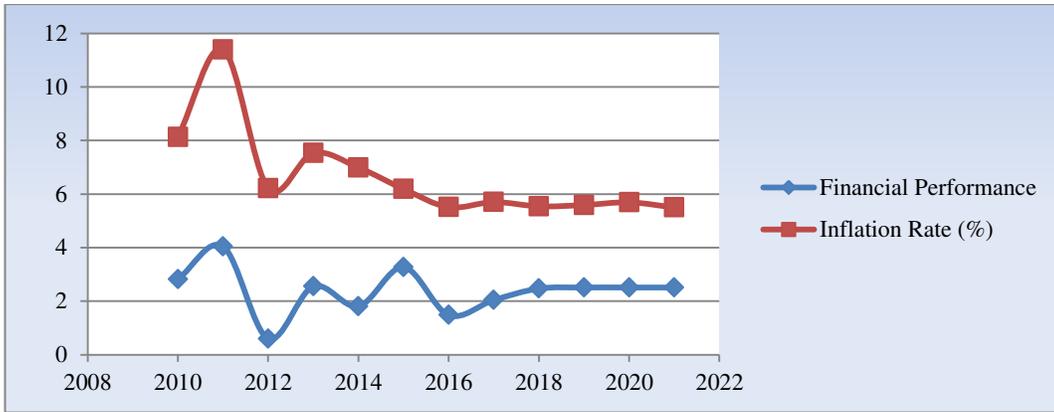
**Fig. 3:** Scatter plot for financial performance and inflation rate.

From **Fig. 3**, it was disclosed that financial performance showed fickleness with the fluctuation of inflation rate. That is, there is a proportional relation between financial performance and inflation rate.
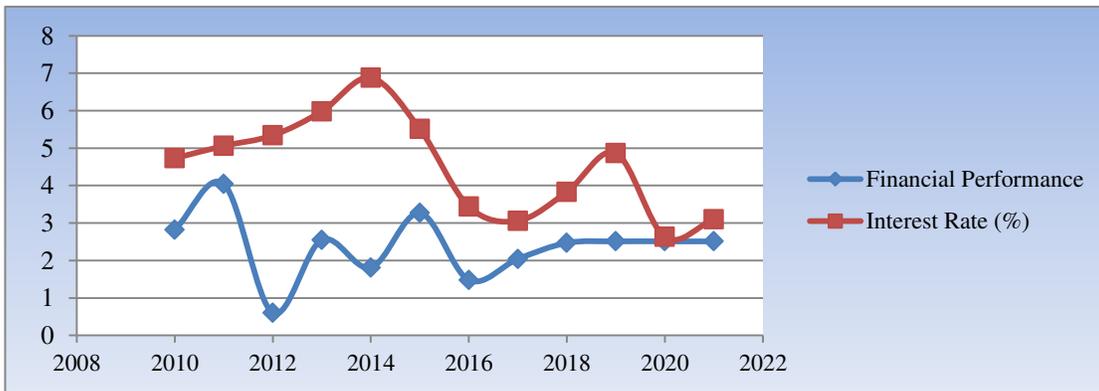


**Fig. 4:** Scatter plot for financial performance and interest rate.

From **Fig. 4**, it was disclosed that financial performance showed fickleness with the fluctuation of interest rate. That is, there is a proportional relation between financial performance and interest rate.

From **Fig. 5**, it was disclosed that financial performance decreases as exchange rate increases. That is, Exchange rate and financial performance are inversely correlated.
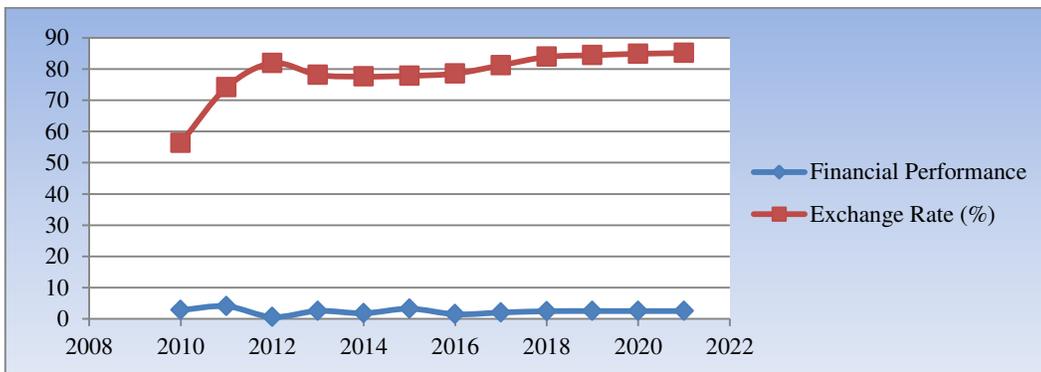


**Fig. 5:** Scatter plot for financial performance and exchange rate.

**Correlation analysis**

In research, a statistical method known as correlation analysis is used to measure the degree of linear relationship and quantify an association between two variables.

**Table 1:** Correlation between financial performance and macroeconomic variables.

| Variables | Pearson r | P-value |
|---|---|---|
| GDP | -0.078 | 0.810 |
| Import | -0.021 | 0.948 |
| Inflation rate | 0.591* | 0.043 |
| Interest rate | 0.027 | 0.935 |
| Exchange rate | -0.335 | 0.286 |

Source: Authors' calculations using gathered data.

**Table 1** represents the correlation analysis linking the financial performance of commercial banks in Bangladesh and macroeconomic variables. Although there is a highly constructive and noteworthy linear conection between the rate of inflation and the commercial banks' financial performance in Bangladesh, there is a very weak encouraging, and insignificant linear association between the rate of inflation and the commercial banks' financial performance in Bangladesh. Gross domestic product, imports, and currency rate have a very weak downbeat, and insignificant linear affiliation with the financial performance of commercial banks in Bangladesh at a 5% significance level.

**Multiple linear regression models**

**Table 2:** Analysis of the variance table.

| Sources of Variation | DF | SS | MS | F-value | P-value |
|---|---|---|---|---|---|
| Regression | 5 | 6.664 | 1.333 | 5.049 | 0.037 |
| Residual | 6 | 1.584 | 0.264 | | |
| Total | 11 | 8.248 | | | |

Source: Authors' calculations

From **Table 2**, it is seen that GDP, imports, inflation, exchange rates, and rate of interest all have a considerable effect on the financial performance of commercial banks in Bangladesh at a significance level of 5%.

**Table 3:** Analyzing the regression model's significance.

| Sources of Variation | Coefficients | Std. error | t-value | P- value | 95% CI | | VIF |
|---|---|---|---|---|---|---|---|
| | | | | | Lower | Upper | |
| Intercept | 12.052 | 5.915 | 2.038 | 0.088 | -2.420 | 26.525 | |
| GDP | -0.153 | 0.154 | -0.989 | 0.361 | -0.530 | 0.225 | 1.244 |
| Import | 0.095* | 0.027 | 3.500 | 0.013 | 0.029 | 0.161 | 5.836 |
| Inflation rate | 0.389* | 0.130 | 2.999 | 0.024 | 0.072 | 0.707 | 2.094 |
| Interest rate | 0.024 | 0.149 | 0.161 | 0.877 | -0.341 | 0.389 | 1.614 |
| Exchange rate | -0.201* | 0.079 | -2.562 | 0.043 | -0.394 | -0.009 | 5.638 |

$R = 0.899, R^2 = 0.808, R^2_{adj} = 0.648$ and $Durbin - Watson = 3.410$

*Indicates significant at 5%.

The estimated financial performance model is based on the preceding table and is as follows:

$$\widehat{Financial\ Performance} = 12.052 - 0.153\ GDP + 0.095\ Import + 0.389\ Inflation\ rate + 0.024\ Interest\ rate - 0.201\ Exchange\ rate \quad ... \quad (1)$$

GDP was inversely and in consequentially connected, import was surely and considerably linked, rate of inflation was positively and appreciably allied, rate of interest was positively and unimportantly coupled and exchange rate was inversely and drastically related with the commercial banks financial performance in Bangladesh at 5 percent significance level. Given that VIF had a value less than 10, it was strong-minded that there was no multicollinearity issue among the variables. The value of adjusted R-square 0.648 demonstrates that the GDP, imports, inflation, interest, and exchange rates accounted for 64.80% of the overall variation in financial performance.

**Determination of salient factors**

**Table 4:** Bartlett's Test and the Kaiser-Meyer-Olkin Test.

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | **0.655** |
|---|---|---|
| Bartlett's Test of Sphericity | Approx. Chi-Square | 23.732 |
| | DF | 10 |
| | Sig. | 0.008 |

We may be assured that factor analysis is adequate for these data because Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.655 (**Table 4**). Once more, component analysis is suitable because Bartlett's test for these data is significant (p < 0.01).
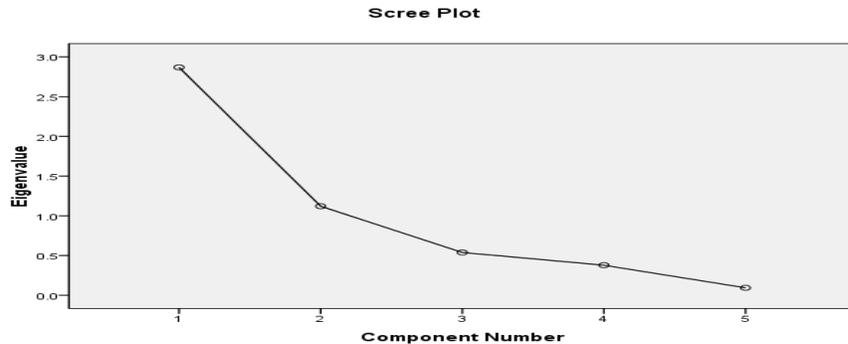


**Fig. 6:** Graph-based calculation of the ideal number of components.

**Fig. 6** demonstrates that an elbow appears in the plot at roughly i = 3 in the figure. This means that the eigenvalues following $\hat{\alpha}_2$ are all rather tiny and roughly the same size. In this case, the variance of the entire sample can be efficiently summed by the sample's two principal components.

**Table 5:** Various factors account for the entire variance.

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | **Total** | **% of Variance** | **Cumulative %** | **Total** | **% of Variance** | **Cumulative %** |
| 1 | 2.869 | 57.378 | 57.378 | 2.869 | 57.378 | 57.378 |
| 2 | 1.121 | 22.414 | 79.792 | 1.121 | 22.414 | 79.792 |
| 3 | 0.538 | 10.769 | 90.561 | | | |
| 4 | 0.378 | 7.568 | 98.128 | | | |
| 5 | 0.094 | 1.872 | 100.000 | | | |

Source: Authors' calculations using gathered data

**Table 5** shows that the first two components account for around 79.792 percent of the overall variance, leading us to only extract two variables. In other words, they account for over 80% of the variability in the initial five variables, allowing us to drastically lessen the intricacy of the data set by means of this component with only a 20% information loss.

**Table 6:** Component matrix.

| Variables | Component | |
|---|---|---|
| | 1 | 2 |
| GDP | 0.147 | 0.933 |
| Import | 0.931 | 0.104 |
| Inflation rate | -0.836 | -0.055 |
| Interest rate | -0.657 | 0.484 |
| Exchange rate | 0.922 | 0.041 |

Source: Authors' calculations using gathered data.

**Table 6** shows that Bangladesh's commercial banks' financial performance was most strongly connected with their GDP and imports. As a result, GDP and imports were more accurate in this investigation's assessment of the commercial banks' financial performance in Bangladesh.

## Multiple linear regression models of the salient variables

**Table 7:** Analysis of the variance table.

| Sources of Variation | DF | SS | MS | F-value | P-value |
|---|---|---|---|---|---|
| Regression | 2 | 0.050 | 0.025 | 0.027 | 0.973 |
| Residual | 9 | 8.198 | 0.911 | | |
| Total | 11 | 8.248 | | | |

Source: Authors' calculations using gathered data

**Table 7** shows that, at the 5% level of significance, the combined belongings of GDP and imports on Bangladesh's commercial banks' financial performance are not statistically significant.

**Table 8:** Analyzing the regression model's individual significance.

| Sources of Variation | Coefficients | Std. error | t-value | P-value | 95% CI | | VIF |
|---|---|---|---|---|---|---|---|
| | | | | | Lower | Upper | |
| Intercept | 2.778 | 1.802 | 1.542 | 0.158 | -1.299 | 6.855 | |
| GDP | -0.077 | 0.263 | -0.226 | 0.827 | -0.654 | 0.535 | 1.045 |
| Import | -0.005 | 0.021 | -0.015 | 0.988 | -0.049 | 0.048 | 1.045 |

$R = 0.078, R^2 = 0.006, R^2_{adj} = 0.215$ and $Durbin - Watson = 2.884$

The estimated financial performance model is derived from the preceding table as follows:

$$\widehat{Financial\ Performance} = 2.778 - 0.077\ GDP - 0.005\ Import \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. \quad (2)$$

GDP and import was inversely and unimportantly allied with the commercial banks financial performance in Bangladesh at 5 percent significance level. The general rule indicated that there were no issues with multicollinearity or autocorrelation among the variables.

Model selection criteria describe a collection of investigative strategies for enhancing regression models. A subset of potential predictor variables that nevertheless adequately account for the change in the observation variable in the regression model is chosen for each model selection tool. These methods are frequently useful in situations where one wants to find the most straightforward explanation for the variation in the observed variable or wishes to increase the likelihood of finding suitable parameter values for a regression model.

## Model selection criteria

**Table 9:** Criteria for selecting the best linear regression model.

| Model | $R^2$ | $R^2_{adj}$ | AIC | SIC | Mallows $C_P$ |
|---|---|---|---|---|---|
| 1 (Full model) | 0.808 | 0.648 | -12.301 | -9.391 | 6.00 |
| 2 (Reduced model) | 0.006 | -0.215 | 1.427 | 2.882 | 3.00 |

Several criteria were used to select the best model. Here, we have used $R^2$, $R^2_{adj}$, AIC, SIC, and Mallows $C_P$. Model 1 was the best for data sets when all the model selection criteria were taken into account, such as the lowest AIC, SIC, and Mallows $C_P$ values and the highest $R^2$, and $R^2_{adj}$ values. Therefore, the model run by the explanatory factors rate of interest, import, rate of inflation, GDP, and exchange rate is the best model for measuring the commercial banks' financial performance in Bangladesh.

## CONCLUSION:

Banks are greatly ancient monetary organizations that advance and treat as imperative benefit divisions within the progressed world for the development of each economy. The banks are mobilizing the investment

funds of the individuals for speculation reasons. Now, in terms of advertiser share and financial gain, private commercial banks dominate Bangladesh's banking sector. Correlation analysis showed that the rate of inflation and commercial banks' monetary performance in Bangladesh were shown to be significantly and positively connected at the level of 5% significance. The multiple linear regression model explored that import, inflation, and exchange rates all considerably affect Bangladesh's commercial banks' monetary performance at a 5% significance level. The factor analysis revealed a strong connection between GDP, imports and the Bangladesh's commercial banks financial performance and the model selection criteria displayed that the full model, or model with all variables, was found to be the best model. Therefore, the researchers recommends that if macroeconomic variables negatively impact on financial performance of three most important economic sectors of Bangladesh (manufacturing, construction, and agriculture sectors') the overall economy will be negatively impacted, so Bangladesh's government should put the necessary policies and laws into place to protect their substantial economic contributions. In order to mitigate the effects of rapid shifts in macroeconomic factors and its ramifications for the financial performance of significant sectors, the government may instruct Bangladesh Bank to design and carry out countermeasures. In this regard, cross country performance analysis may be conducted in future research, that will add some addition input to the existing body of knowledge to the stakeholder banking industry that may help in boosting up the pace of the 4th Industrial Revolution (4IR).

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## CONFLICTS OF INTEREST:

The authors declare no conflict of interest.

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