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Basak, Prianka

School of Business and Entrepreneurship, Independent University, Bangladesh (IUB)

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Does Investment Climate Matter to Foreign Direct Investment? Evidence from OECD Countries

Prianka Basak[1], Md Nazmus Sadekin[2], Md. Mahbub Alam[3], Md. Tuhin Ahmed[4], Ashiqur Rahman[5], Md. Ariful Islam[6]

[1,2,4,5]Department of Economics, Mawlana Bhashani Science and Technology University, Tangail, Bangladesh.
[3]Department of Economics, Stamford University Bangladesh, Dhaka, Bangladesh.
[6]Department of Economics, Islamic University, Kushtia, Bangladesh.
[1]*prianka.mbstu.eco@gmail.com;* [2]*sadekin@mbstu.ac.bd;* [3]*mahbub@stamforduniversity.edu.bd;*
[4]*tuhin.ahmed@mbstu.ac.bd ;*[5] *ashiqur005@mbstu.ac.bd ;* [6]*arifulislam@eco.iu.ac.bd*

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Abstract – **This study aims to examine the impact of investment climate, along with its macroeconomic determinants, on foreign direct investment (FDI) inflows using a panel data analysis for a sample of 38 OECD countries by considering the level of economic freedom (EFI), as provided by the "Heritage Foundation." By employing the two-step system GMM technique, our findings robustly demonstrate a strong positive link between EFI and FDI inflows, highlighting the crucial role of investment climate in attracting foreign investment. The findings suggest that labor force participation and trade openness have a significant positive impact on FDI inflows, whereas the inflation rate has a significant negative impact. However, domestic investment shows no significant impact on FDI inflows. Therefore, the study emphasizes the significance of strengthening economic institutions to attract FDI. To sustain FDI inflows, policymakers in OECD nations should prioritize regulatory efficiency, property rights protection, macroeconomic stability, and human capital development.**

Keywords – **Economic Freedom, Foreign Direct Investments, OECD Economies, Panel Data Analysis, Two-step System GMM**

I. INTRODUCTION

Foreign Direct Investment (FDI) denotes the capital allocated by individuals or entities from one nation into another, either directly or via affiliated firms, wherein the foreign investor maintains substantial control. It enhances productivity and generates employment, hence fostering sustainable economic development. Considering the benefits derived from FDI, firms typically possess many motivations for pursuing foreign direct investment (FDI), as elucidated by Dunning's OLI Model [1], which encompasses ownership-specific variables, location-specific factors, and internalization advantages as the key determinants guiding investment decisions.

Despite these well-established theoretical underpinnings, actual global FDI trends reveal fluctuations that highlight the influence of broader macroeconomic and institutional conditions. For example, within the OECD region, FDI inflows rose by 11% to USD 501 billion, a headline increase largely explained by significant disinvestments in Luxembourg in 2022. However, this conceals the reality that over two-thirds of OECD economies had diminished FDI inflows in 2023. The nations experiencing the most significant decline (exceeding USD 20 billion) were Australia and the United States, due to reduced reinvestment of earnings in both, diminished stock flows in Australia, and fluctuations in intra-company loans in the United States. Sweden also experienced significant declines, primarily attributed to reduced equity inflows. Significant disinvestments were observed in the Netherlands in 2023, alongside notable disinvestments in Luxembourg the preceding year, while the United Kingdom also experienced substantial disinvestments [2].

These patterns suggest that while firm-level factors remain important, they are insufficient on their own to sustain long-term FDI inflows. Instead, the investment climate and policy framework of host countries play a decisive role in shaping investment outcomes. In particular, economic openness emerges as a critical determinant in attracting FDI, which in turn delivers both wealth and expertise to the countries that are receiving it, as well as introducing modern technologies [3].

While much of the literature has traditionally focused on the direct impact of several variables, including infrastructure, trade openness, return on capital, labor costs, political instability, and domestic macroeconomic policies on FDI inflows, fewer studies have explored the role of domestic investment climate in facilitating FDI inflows up to this point because there is generally a lack of a consistent and accurate set of numerical information on the investment climate. This study contributes to that gap by positioning economic freedom as provided by the "Heritage Foundation," not merely as an outcome of development but as a proactive determinant in attracting foreign capital and fostering international economic integration. Therefore, the study has the following specific objectives:

- To examine the impact of economic freedom on FDI inflows in OECD countries.

Consequently, we utilize data on 38 OECD nations from 2004 to 2024 and employ the two-step system GMM.

The selection of OECD countries for this study is motivated by their composition as a diverse group of both advanced and emerging economies, exhibiting a wide spectrum of economic freedom levels. This diversity

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provides an ideal context for analyzing the multifaceted relationship between economic freedom and FDI inflows.

II. METHODOLOGY

A. Variables and Data Sources

This study examines the macroeconomic impact of domestic investment climate, inflation rate, domestic investment, labor force, and trade openness on foreign direct investment inflows. The sample size comprises 38 OECD countries over the period 2004 to 2023. Table 1 displays a summary of these variables together with their sources.

B. Model Specification

The investigation's model can be expressed as follows:

lnFDIit=α+ 1EFIit+2INFit+ 3GFCFit+4lnLFit+5TOit+it #1

Where,

FDI = Foreign Direct Investment inflows in a country i and period t;

EFI = Economic Freedom Index in a country i and period t;

INF = Inflation in a country i and period t;

GFCF = Gross Fixed Capital Formation in a country i and period t;

LO = Labor Force in a country I and period t;

TO = Trade openness in a country i and period t.

A dynamic panel regression model is given below:

Yit=δYi,t-1+βXit+it #2

In this case, the dependent and independent variables are denoted by Y, X, and Yt-1 respectively; the term it is the sum of the time-invariant and unobserved effects (ui) and the random disturbance term (vit); and ui~NID(0,2); vit~NID(0,2). For us to write,

it=ui+vit 3

Therefore, equation (1) can be converted as follows:

lnFDIit=δlnFDIi,t-1+1EFIit+2INFit+ 3GFCFit+4lnLFit+5TOit+it 4

Here, lnFDIi,t-1 is the lagged value of the FDI inflows. Using the lagged dependent variable as an independent variable in the regression equation's right-hand side can help with a few econometric issues. The primary issue in this case is that it produces autocorrelation. Therefore, an endogeneity problem arises when there is a link between the explanatory variables and the error term, which goes against the homogeneity assumption. The results will be biased and inconsistent when unit effects and a lagged dependent variable are present in the model. The Generalized Method of Moments (GMM) is thus the most suitable estimating technique that can resolve the endogeneity issue.

There are two distinct varieties of GMM: Difference GMM and System GMM. Arellano & Bond [4] have developed Difference GMM, whereas Arellano & Boverb [5] and Blundell and Bond [6] have developed System GMM. According to Difference GMM, the instrumental variables can be used to address the endogeneity issue that results from employing the lagged-dependent variable as an explanatory variable. The first difference of the model, which can remove unobserved country-specific effects (ui) is employed for this purpose. The adoption of the lagged values of the independent variables as instruments removes the possibility of endogeneity and the link between the lagged dependent variable and the new error term, which makes it superior to the 2SLS model and instrumental variable (IV) estimators. Nevertheless, the country-specific effects will eventually disappear, and the correlation between the lagged dependent variable and the error term will become negligible when the time series units (T) are greater than the cross-section units (N) [7]. In that instance, using the Generalized Methods of Moments is not necessary.

lnFDIit-lnFDIi,t-1=δlnFDIi,t-1-lnFDIi,t-2+1(EFIit-EFIi,t-1)+2(INFit-INFi,t-1)+3(GFCFit-GFCFi,t-1)+4(lnLFit-lnLFi,t-1)+5(TOit-TOi,t-1)+(εit-i,t

1) *(5)*

This leads to a new statistical difficulty arising from the first difference technique. The lagged levels of these variables are regarded as a weak instrument that lowers the efficiency of the outcomes when the endogenous variables are persistent over time. However, Arellano & Boverb [5] and Blundell and Bond [6] demonstrate that the lagged values of the independent variables as instruments could result in biased estimators. Therefore, they offer the System GMM to get around this problem; this method produces more useful results than the difference GMM. Two equations are used by the System GMM to construct a system; one equation is differentiated, while the other is left level. While the lagged levels are utilized as instruments for the differenced equation, the lag differences "(5)" are employed as tools for the level equation "(4)."

Two specification tests must be performed to demonstrate the consistency of the System GMM estimators: (i) the joint validity test of every instrument, and (ii) the absence of second-order autocorrelation AR(2). In this case, first-order autocorrelation can be expected, but autocorrelation in second-order autocorrelation should not be expected. The presence of a significant AR(2) indicates an issue of autocorrelation.

Using Hansen's J-statistic, the validity of the instruments can be evaluated. It is implied that parameter estimates are consistent and that the parameters are orthogonal to errors when the null hypothesis is adopted [8].

III. RESULTS

A. Descriptive Statistics

The descriptive statistics that comprise of mean, standard deviation, min, and max value of the selected variables are presented in Table 2.

B. Correlation Matrix

The correlation matrix of the selected variables is presented in Table 3.

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C. *Estimation Results of Dynamic Panel Data Estimators*

The results are summarized in Table 4. To demonstrate the accuracy of the System GMM results, we must first justify the outcomes of a few diagnostic tests. the number of instruments shouldn't exceed the number of groups [9]. There are 37 groups and 25 instruments in this model, which satisfy the condition. The probability values of AR(1) and AR(2) are 0.004 and 0.527, respectively, suggesting first-order autocorrelation but not second-order correlation.

The Hansen test assesses the validity of the instruments in the regression model. The table indicates a p-value of 0.163. This signifies that the Hansen test fails to reject the hypothesis, indicating the instruments are valid at a 5% significance level. Since these results are legitimate, we may now proceed with our interpretation. However, as we are now addressing the lagged variables, the magnitude of each coefficient has become smaller than the coefficients from the fixed-effect model.

The results for OECD member countries obtained from the two-step system GMM show that, except for one variable, all the other variables are significant, but the level of significance varies among variables. The substantial coefficient of lagged FDI is 0.1779994, indicating the self-reinforcing impact of FDI; precisely, the level of lagged FDI considerably influenced foreign investment for the current year.

An enhancement of one unit in the overall EFI (Economic Freedom Index) results in an approximately 4.98% increase in FDI inflows, and it is statistically significant at 1% significance level. By the same token, an enhancement of 1% in the inflation rate results in an approximately 0.0234% decline in FDI inflows. Analogously, an increase of 1% in the labor force causes FDI to increase by approximately 0.83 % in the case of OECD countries. Similarly, A 1 unit improvement in trade openness leads to a 0.99 increase in lnFDI inflows, and it is statistically significant at a 1% significance level. But there is no significant relationship between domestic investment and FDI inflows.

IV. DISCUSSION

The study shows a significant impact of economic freedom on foreign direct investment (FDI) inflows. It is well-documented and robustly corroborated by multiple studies [10], [11], [12], indicating that increased economic freedom improves the investment climate and attracts greater foreign direct investment (FDI). Because a stable, transparent, and business-conducive condition mitigates investment risks and augments profitability.

The inflation rate is found to have a significant negative relationship with FDI inflows in OECD countries in our study. Because rising inflation will erode the currency's value and lower investors' returns. The outcomes correspond with previous research [13], [14].

Our study fails to show any significant relationship between domestic investment and FDI inflows. OECD nations often possess advanced infrastructure and substantial domestic investment levels. Excessive domestic investment may suggest that local enterprises prevail in the market, hence restricting chances for foreign investors. This outcome of the study is aligned with previous studies [15] and [16].

The labor force has been found to have a positive relationship with FDI inflows in our study. For foreign investors looking for efficient production, a competent workforce is essential since it increases efficiency. This outcome supports what some authors [17], [18] have said.

Similarly, FDI is found to be responsive to trade openness in OECD countries. Decreased obstacles indicate a pro-business climate, promoting foreign direct investment in manufacturing and export-focused industries. It is robustly corroborated by multiple studies [19], [20].

V. CONCLUSION

The findings demonstrate that investment climate is a positive and statistically significant factor influencing FDI. This study's further noteworthy findings indicate that labor force, inflation rate, and trade openness are generally crucial predictors of FDI in OECD nations, while local investment is negligible. This confirms that OECD countries can attract greater FDI if their economies are more liberalized.

These findings of the current study have some fascinating policy implications, which are:

- To encourage FDI inflows, this study recommends that governments should implement economic freedom-improving policies and procedures that foster an enabling investment climate that are customized to the economic and geoeconomic features of the host nations.
- Countries should invest in education and training programs to improve the skills of their workforce to attract increased FDI inflows.
- To attract FDI, they should strengthen regional economic cooperation projects like the EU or NAFTA to give investors broader integrated markets.
- It is recommended that policymakers sustain a reduced inflation rate using several strategies, including monetary, fiscal, and exchange policies, as investors like stable economies over volatile ones.

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APPENDIX

TABLE I
SUMMARY OF THE VARIABLES & DATA SOURCES

Variables	Indicators	Unit of measurement	Symbol	Data source
Foreign Direct Investment	Foreign Direct Investment	Current US$	FDI	WDI
Economic Freedom	Economic Freedom Index	-	EFI	US Heritage Foundation
Inflation Rate	CPIt-CPIt-1CPIt-1×100	-	INF	WDI
Domestic Investment	Gross Fixed Capital Formation	% of GDP	GFCF	WDI
Labor Force	Labor Force	Total	LF	WDI
Trade Openness	Exports+Imports GDP	-	TO	WDI

Source: World Bank, 2023 & The Heritage Foundation, Washington DC

TABLE II
DESCRIPTIVE STATISTICS

Variables	Mean	Std. Deviation	Min	Max
lnFDI	23.22212	1.602875	17.32819	27.32154
EFI	71.18763	6.452574	50.6	84.4
INF	3.096838	4.347336	-4.447547	72.30884
GFCF	22.66497	4.101063	10.97046	53.22203
lnLF	15.67136	1.486983	12.06405	18.95551
TO	.9838528	.5905516	.2307978	3.942207

Source: Author's estimation

TABLE III
CORRELATION MATRICS

Variables	FDI	EFI	INF	GFCF	LF	TO
FDI	1.0000					
EFI	0.1330*	1.0000				
INF	-0.0625	-0.1570*	1.0000			
GFCF	-0.0872*	0.2094*	0.2040*	1.0000		
LF	0.5634*	-0.0233	0.0156	-0.0539	1.0000	
TO	-0.1782*	0.1509*	-0.0003	0.0115	-0.4104*	1.0000

Note. The significance level of 5% is indicated by "*".

TABLE IV
RESULTS OF TWO -STEP SYSTEM GMM

Dependent Variable: lnFDI					
Explanatory Variables	Coeff.	Corrected Std. Err.	t	p>|t|	[95% conf. interval]
lnFDI (lagged)	.1779994**	.0867558	2.05	0.048	.0020505 .3539482
EFI	.0498049***	.0114797	4.34	0.000	.0265231 .0730867

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INF	-.0234343**	.0104162	-2.25	0.031	-.0445593	-.0023093
GFCF	.0228151	.0139404	1.64	0.110	-.0054574	.0510876
lnLF	.8287631***	.1471538	5.63	0.000	.5303213	1.127205
TO	.9960933***	.2550269	3.91	0.001	.4788747	1.513312
Constant	1.254705	1.875701	0.67	0.508	-2.549392	5.058803
No. of observations: 576						
No. of groups: 37						
Diagnostic Tests						
F Statistic Prob > F = 0.000						
Arellano-Bond test for first order autocorrelation AR (1): z = -2.84 Prob > z = 0.004						
Arellano-Bond test for second order autocorrelation AR (2): z = 0.63 Prob > z = 0.527						
Hansen test of over identifying restrictions chi2(18) = 23.77 Prob > chi2 = 0.163						
No. of instruments < No. of groups: 25 < 37						

Notes. Variables with "*," "**," and "***" are significant at p<10%, p<5%, and p<1% respectively.

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Impact of Loan Default on the Sustainability of Financial Health: A Study on Selected Private Commercial Banks in Bangladesh

Senjuti Barua[1], Thein Ayetha[2]
[1,2]Department of Finance and Banking, Bangladesh University of Professionals
[1]senjuti.barua@bup.edu.bd
Paper ID: ICEBTM-25-1111

Abstract - **This study aims to examine the influence of loan default over the sustainability of financial health of selected private commercial banks listed on Dhaka Stock Exchange (DSE) in Bangladesh. The banking sector of the country faces significant challenges in terms of loan defaults. The study applies panel data analysis to investigate how non-performing loan ratio (NPLR), capital adequacy ratio (CAR), provision maintenance ratio (PMR), credit deposit ratio (CDR), and cost-to-income ratio (CIR) influence the sustainability of bank performance, as measured by a profitability indicator- return on assets (ROA). The study utilizes secondary data of 19 private commercial banks over a 16-year period (2008-2023), representing strongly balanced panel data. Hausman specification test recommends fixed effect regression model which reveals that NPLR has a significant negative influence over ROA, whereas CDR shows a significant positive impact. This study provides valuable insights for bank management in Bangladesh to better manage non-performing loans and optimize credit strategies to maintain profitability.**
Keywords - **Credit deposit ratio, fixed effect regression, non-performing loan ratio, profitability**

I.INTRODUCTION

Economic growth of a country relies on the sustainability of its financial sector. Without ensuring the financial health of that industry, a country faces numerous challenges to develop its economic performance. Specifically, when an effective allocation of resources and capital is needed to be executed, a nation's banking system must be sustainable enough to safeguard its financial health. Reference [6] executes the application of panel GMM to investigate and reveals that financial instability has a significant negative influence on economic development. Not only effective fiscal policy, but also regulation of the financial institutions and markets plays a vital role to derive higher financial sustainability, leading toward economic growth [13].

To be more specific, banking sector plays a critical role in implementing such financial sustainability for an economy. Return on assets (ROA), one of the bank profitability measures, is used to assess a firm's ability to create profits by comparing profits generated and costs incurred within a given period. In this empirical research, non-performing loans (NPLs) are examined as a significant variable that negatively influences commercial banks' profitability [10]. Another study focuses on credit risk to be found as one of the specific risks faced by commercial banks because of the nature of their facilities provided. This emphasizes the association between credit risk management (NPLs and capital adequacy ratio) and commercial banks' profitability (return on assets and return on equity) [5]. A study on Chinese banks incorporates both macroeconomic (gross domestic product, inflation rate, foreign exchange rate, and effective interest rate) and banking industry-specific (banks' type, risk-taking behaviour, ownership concentration, debt, and credit quality) variables to specify the determinants of NPLs [15]. A study on Pakistan Stock Exchange examines that operating efficiency and profitability have significant negative association with NPLs, whereas capital adequacy and income diversification have insignificant positive association with NPLs [9].

To represent the company's success (profitability), non-performing loan ratio (NPL ratio), liquidity ratio, capital adequacy ratio (CAR ratio), gross domestic product (GDP), and bank size can be used as significant determinants [4]. In line with this study, there is strong positive association between CAR and profitability of Deposit Money Banks in Nigeria [12]. Another study on Indonesia reveals how economic condition, business risk, lending interest rate, and NPLs are associated with corporate financial sustainability [2].

Bangladesh has been a growth focused country where the banking industry has played a pivotal role in facilitating economic growth and advancement through financial intermediation. One of the significant challenges faced by this industry has been the looming issue of loan defaults, also known as non-performing loans. According to a latest report from Bangladesh Bank, it has been disclosed that aggregated NPLs indicate approximately 24.13% of the total loans that have been disbursed by 61 commercial banks. This designates around 25% of the total loans disseminated by the banking industry are going to be classified as troubled or have already been defaulted [7].

Reference [1] investigates how increasing volume of NPLs is leading toward a negative turn into the banking industry and the overall economy of Bangladesh. The researcher also mentions about higher percentage of NPLs that exists in Bangladesh, being compared to the worldwide standard (to be 2% or less). Another panel data analysis conducted on the corporate governance practices and NPLs of Bangladeshi banking sector reveals that banks with effective corporate governance (e.g. board size, number of independent directors, independence of audit committee chairman), can reduce the NPLs of Bangladesh [3].

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When extensive study has been conducted in explaining the factors influencing non-performing loans in Bangladesh, there has been limited literature in explaining the important variables representing default that impact profitability of Bangladeshi private commercial banks. This study is expected to guide investors, policymakers, and researchers into understanding the measures to prioritize for evaluation and decision-making. It also promotes the practice of making objective and evidence-based decisions by the users. The objective of the study is: i) to identify the significance of the association between NPLs and profitability, and ii) to determine the significant variables that influence the selected banks' profitability.

II. METHODOLOGY

The study employs a quantitative ex post facto design to examine how the selected financial indicators influence the private commercial banks' profitability in Bangladesh. The methodology is grounded in secondary data extracted from 19 listed private banks' annual reports over a 16-year period (2008-2023), resulting in a balanced panel dataset of 304 observations. The banks have been chosen considering their availability and consistency of their published financial reports over the mentioned period. Incorporating panel data allows for the tracking of both cross-sectional (across banks) and time-series (across years) variations, enabling more precise estimation by controlling for unobserved heterogeneity at the firm level.

A. Panel Regression Model Development

According to the Hausman test results, the fixed effect model has been selected and the fixed effect estimations applied to explain the relationship and impact of the explanatory variables (NPLR, CAR, PMR, CDR, and CIR) on the dependent variable ROA.

Here, subscript *i* signifies the cross-sectional dimension and *t* signifies the time series effect, α stands for constant and ε_{it} is the error term,

NPLR = Non-Performing Loans Ratio,
CAR = Capital Adequacy Ratio,
PMR = Provision Maintenance Ratio,
CDR = Credit deposit ratio,
CIR = Cost-to-income ratio.

Regression equation:

$$\boldsymbol{ROA}_{it} = \boldsymbol{\alpha}_{it} + \boldsymbol{\beta}_1\boldsymbol{NPLR}_{it} + \boldsymbol{\beta}_2\,\boldsymbol{CAR}_{it} + \boldsymbol{\beta}_3\,\boldsymbol{PMR}_{it} + \boldsymbol{\beta}_4\,\boldsymbol{CDR}_{it} + \boldsymbol{\beta}_5\,\boldsymbol{CIR}_{it} + \boldsymbol{\varepsilon}_{it} \quad (1)$$

TABLE I: MEASUREMENT OF VARIABLES
Note: Yearly data is collected for all the dependent and independent variables

Variable	Measurement	Expected Sign	Reference
ROA	ROA is calculated as the percentage of net income over the total assets.	Not applicable	
NPLR	Non-performing loans ratio gives the total amount of NPLs as a percentage of the total amount of loans outstanding.	-	[8,10]
CAR	Capital adequacy ratio represents the proportion of the bank's regulatory capital as a percentage of its risk-weighted assets.	+	[4,12,16]
PMR	Provision maintenance ratio is the percentage of loan provision maintained to the required loan provision of the banks.	-	[11]
CDR	Credit deposit ratio is the percentage of total loans to the total deposits of a bank.	+	[11]
CIR	Cost-income ratio calculates the proportion of operating expenses incurred as a percentage of the operating income earned.	-	[14]

III. RESULTS

Preliminary Analysis

Table II provides the summary statistics describing the pattern of the one dependent variable ROA, and five independent variables- NPLR, CAR, PMR, CDR and CIR. The average return on assets across the 19 banks over the span of 16 years is 1.025% with a standard deviation of 1.028. The range of minimum value (-5.87%) to maximum value (4.553%) indicates that certain banks suffered substantial losses while others experienced remarkably above average profits. The mean NPL ratio is relatively high, reflecting asset quality issues with maximum NPLR reaching 50.39%. The mean CAR of 12.21% and the negative minimum value (-22.79%) suggests that several banks may have failed to maintain the Bangladesh Bank prescribed 12.5% while certain bank's capital was even negative.

Variables	No. of Observations	Mean	Std. Dev.	Minimum	Maximum
ROA	304	1.025	1.028	-5.87	4.553
NPLR	304	6.083	7.399	0.44	50.39
CAR	304	12.212	4.606	-22.79	20.45
PMR	304	64.902	33.344	0	179.51
CDR	304	84.129	8.619	51.11	109.967
CIR	304	54.825	16.644	29.83	182.4

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TABLE II: DESCRIPTIVE STATISTICS OF THE VARIABLES

Based on the correlation matrix in Table III, the strongest positive correlation of 0.580 is between ROA and CAR. Both NPLR and CIR have a negative correlation with ROA, the former being strong and the latter being moderate. Between the explanatory variables, only NPLR and CAR have a Pearson correlation coefficient of -0.7397 exceeding the -0.7 to 0.7 range.

TABLE III
PEARSON CORRELATION MATRICES

Variable	ROA	NPLR	CAR	PMR	CDR	CIR
ROA	1.000					
NPLR	-0.7367	1.000				
CAR	0.5795	-0.7397	1.000			
PMR	0.3095	-0.3508	0.1988	1.000		
CDR	0.4356	-0.4576	0.3587	0.2758	1.000	
CIR	-0.3954	0.4087	-0.3245	-0.3462	-0.188	1.00

Based on the Hausman specification test in Table IV below, the chi-squared value of 21.43 and Prob>chi2 = 0.0007 rejects the null hypothesis, thereby supporting the application of fixed effect model due to the non-systematic changes in coefficient.

TABLE IV
HAUSMAN SPECIFICATION TEST

Variables	(b) Fixed	(B) Random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
NPLR	-0.963241	-0.846218	-0.0117023	0.0078382
CAR	0.0101244	0.0129121	-0.0027877	0.0021121
PMR	0.0022988	0.0011759	0.0011228	0.0009481
CDR	0.0215239	0.016249	0.0052748	0.0035297
CIR	-0.009312	-0.007381	-0.0019318	0.0019754

Followed by the Hausman Test, Table V below depicts the fixed effect regression model that gives the regression equation following (1): ROA = 0.0379 – 0.0963NPLR + 0.0101CAR + 0.0023PMR + 0.0215CDR – 0.0093CIR. ROA or profitability has a positive relation with or tends to experience an increase when CAR, PMR and CDR increase. Whereas ROA experiences a decrease as NPLR and CIR rise. The fixed effects model yields an R^2 value of 0.5648 or 56.48% indicating a moderately good fit for within bank variations over time. It is the amount of variation in the dependent variable being explained by the five explanatory variables. The rest of the percentage variation is due to other factors not included in our model and by related error term. The validity or fitness of the model can be confirmed by the F-value which is 114.74 or the p-value of 0.000. Based on this, we can infer that there is an overall meaningful influence by the explanatory variables on the profitability of the 19 banks included, at the 5% level of significance.

TABLE V
FIXED EFFECT REGRESSION MODEL

Variables	Fixed Effect Panel Regression		
	Coefficients	t-value	p-value
Constant	0.037898	0.04	0.968
NPLR	-0.0963241	-3.04	0.007
CAR	0.0101244	0.25	0.805
PMR	0.0022988	0.89	0.386
CDR	0.0215239	3.87	0.001
CIR	-0.0093129	-1.34	0.195
R2	0.5648		
Adj. R2	0.4076		
F-Stat	114.74		0.0000

According to Table VI below, the modified Wald test for group-wise heteroskedasticity revealed a significant result of chi2 value 1193.38 and p-value of 0.0000, suggesting the presence of heteroskedasticity in the data. Furthermore, the statistically significant skewness and kurtosis test for normality reveals that residuals are also not normally distributed (chi2=196.65 and p-value=0.0000).

TABLE VI
SUMMARY OF POST-DIAGNOSTIC TESTS

Tests	Statistics	p-value
Modified Wald Test	1193.38	0.0000
Skewness and kurtosis tests for normality	196.65	0.0000

To control the issues with heteroskedasticity where variance of the error term is not constant across observations and non-normal distribution of residuals, the regression has been run with the robust option given in Table IV above. Under the robust option, NPLR and CDR continue to have significant impact on ROA based on their p-values (0.007 and 0.001) and statistically significant t-values. The notable change is observed in the variable CIR which becomes insignificant after incorporating robust test. The other variables experienced no major changes other than slight differences in their t-values and standard error.

Based on the VIF test in Table VII below, it is concluded that there is no sign of multicollinearity as the mean VIF is 1.76.

TABLE VII
VARIANCE INFLATION FACTORS TEST

Variables	VIF	1/VIF
NPLR	2.71	0.368819
CAR	2.24	0.445829
PMR	1.29	0.772708
CDR	1.28	0.782172
CIR	1.25	0.800294
Mean VIF	1.76	

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IV. DISCUSSION

A. Non-performing loans (NPLR) and ROA

NPLR has a coefficient value of -0.0963, t-value of -3.04 and p-value of 0.007. The analysis shows a significant negative association between NPL ratio and bank profitability across all model specifications. This finding aligns with existing literature [8,10] which views rising NPLs as a direct drain on earnings due to higher provisioning costs and reduced interest income.

B. Capital adequacy ratio (CAR) and ROA

CAR has a coefficient value of 0.0101, t-value of 0.25 and p-value of 0.805. While theory supports that higher capital buffers enhance resilience and investor confidence [4,12,16], CAR did not show a statistically significant positive influence on profitability.

C. Provision maintenance ratio (PMR) and ROA

PMR has a coefficient value of 0.0023, t-value of 0.89 and p-value of 0.386. Although provisioning is a critical part of a bank's risk management framework intended to absorb expected credit losses [11], it appears that variations in PMR across banks or over time were not sufficient to explain changes in profitability.

D. Credit deposit Ratio (CDR) and ROA

CDR has a coefficient value of 0.0215, t-value of 3.87 and p-value of 0.001. CDR shows a significant positive influence on profitability [11], suggesting that more aggressive credit deployment relative to deposits contributes positively to returns.

E. Cost-to-income Ratio (CIR) and ROA

CIR has a coefficient value of -0.0093, t-value of -1.34 and p-value of 0.195. Reference [14] suggests that higher CIRs correlate negatively with ROA as cost inefficiencies erode bank profitability. However, this relationship was found to be statistically insignificant possibly due to the impact not being consistent or strong enough in this dataset to draw firm conclusions.

V. CONCLUSION

One of the major problems existing in the banking industry of Bangladesh has been the problem of non-performing loans. There are many factors that instigate loan default and create the environment for this problem to sustain. Lack of strict regulatory policy building and monitoring allows for banks to be lax about their lending and provision policies. Lending huge funds based on informal and personal relations have caused major credit risk to many banks in Bangladesh, eventually pushing them towards bankruptcy.

Banks have also shown lenient recovery practices and scheduling policies that allow more potential defaulters to thrive causing a spike in the volume of non-performing loans in our country. Thus, the significant measures from this study should be taken under consideration to increase the private commercial banks' profitability and to ensure the overall economic growth of the country.

VI. RECOMMENDATION

To combat this issue, strict policy measures including above-mentioned variables must be implemented and monitored by the central bank, besides strengthening and intensifying the internal control and risk management of the banks themselves.

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