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Impact of Non-Performing Loan on Profitability of Banks in Bangladesh: A Study from 1997 to 2017

Md. Sazzad Hossain Patwary [α] & Nishat Tasneem [σ]

Abstract- **Bangladesh being a developing country heavily depends on the banking sector for smooth financial intermediation. Banking industry of Bangladesh has been facing the acute problem of NPL since long. This paper aims to discover the impact of non-performing loan ratio, capital adequacy ratio and provision maintenance ratio on the return on asset (ROA) of all banks based on the last twenty-one years data. This study also investigates the root causes and adverse effects of the non-performing loan. Secondary sources of data are collected from the annual reports of Bangladesh Bank and analyzed by Ordinary Least Square (OLS) method and Vector Auto Regression (VAR) model using STATA 14.2. The results of the study reveal that there are different directional short-run causality exist between variables and the OLS regression analysis confirms that two independent variables; non-performing loan ratio and provision maintenance ratio are statistically significant to the dependent variable; return on asset (ROA).**

Keywords: non-performing loan, profitability, banks, bangladesh.

I. Preamble

1.1) Background of the Study

Bangladesh being a developing country depends heavily on the banking industry for smooth financial intermediation. Banks thus contribute to the development of the economy through effective and efficient lending. However, our banking sector currently facing the acute problem of NPL as a sign of ineffective lending practices and day by day the problem increases although many reform measures have been carried out. As the name suggests, non-performing loans are irregular loans from which interest and principal amount becomes due for a specific period. The increasing amount of NPL threatens the financial performance of the banks especially the SCBs. In state-owned commercial banks the impact of NPL is in an alarming situation. NPL not only reduce the bank's profit but also the capacity of lending by reducing bankable assets. Depositors and investors started losing faith over the bank as they feel insecure of getting back their invested money with an expected return. Increasing trends of NPL also diminishes the international image of our banking industry as well.

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1.2) Objectives of the Study

a. Examining the significance of NPL on the profitability of banks in Bangladesh.
b. Explore the relationship among variables of the study.
c. Find out the root causes of NPL along with their possible adverse impact on the banking industry.
d. Recommend some possible initiatives to control the adverse effects of NPL.

1.3) Limitations of the Study

This study considers only 21 years data to draw inference due to unavailability of data before the year 1997 and after the year 2017.

II. Review of Related Literature

Non-performing loan arises from various sources. Banks should identify them and take the necessary steps to eliminate the NPL from the industry. However empirical studies show that there is an adverse effect of NPL on the profitability of banks in all over the world. Following are some quotes from the article related to NPL.

Shinkey (1991) stated that the bank's lending policy has a significant influence on NPL. Before the lending decision banks need to evaluate the probability of default along with cost and benefit analysis.

Reddy (2004) argues about the negative consequences of NPL that leads the banks to incur additional costs on non-operative assets that affect bank's profitability along with capital adequacy which ultimately restrain the bank from increasing their capital base.

Mohanty (2006) explores the negative impact of NPL resulting from the financial risk which affects the standard of living and also reduces the profitability of banks thus hinder economic development due to this crisis.

Adhikary (2007) on his research paper found that the banking sector of our country greatly affected by the large amount of NPL which continuously influences the economic development. According to him, the main factors responsible for the massive growth of NPL are-

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lack of effective monitoring & supervision, political pressure, weak legal infrastructure, and ineffective NPL recovery strategies.

Khemraj & Pasha (2009) conducted an econometric model based study about NPL in Guyana that reflects an inverse relationship of GDP with the volume of NPL. The study results recommended that a progress in country's GDP contribute to decreasing the NPL.

Karim *et al.* (2010) in their study shows the relationship between NPL and bank efficiency in Malaysia and Singapore by using the Tobit regression model. The outcome stated that higher NPL reduces cost efficiency and also the lower cost efficiency increases NPL and profitability.

Podder (2012) found NPL, Advance/Deposit ratio, Total Asset, Equity/Total Asset ratio as some prominent determinants of profitability of banks during the period 2001-2010 observed on 30 PCBs in Bangladesh.

Lata (2015) has analyzed time series data and concluded that NPL is one of the foremost factors that influence banks profitability and it has a considerable negative impact on Net Interest Income of State-owned Commercial Banks in Bangladesh.

Nsobilla (2015) has investigated the effect of NPL on financial performance. Secondary data was collected from six selected rural Banks of Ghana for the period of 2004-2013. Applying OLS model, it discovers that the NPL, cost-income ratio, loan recovered and total revenue variables are found statistically significant on ROA.

Adebisi & Matthew (2015) confirm that the first model of their study revealed there is no significant association between the NPL and ROA of the Banks in Nigeria. The shareholder's return is affected as the second model showed that there is a connection between the NPL and Return on Equity (ROE) of Banks in Nigeria.

Hussain & Ahamed (2015) in their study based on data for the period of 2012-2016 on top 15 conventional PCBs in Bangladesh and applying fixed effect panel data regression analysis explores that NPL, TIN, NII, OPEX, CAP, SIZE, DPST variables are significant to explain ROA.

Bhattarai (2016) has examined the effect of NPL on the profitability of Nepalese commercial banks and found that the NPL ratio has a negative effect on ROA whereas NPL ratio has a positive effect on ROE.

Kiran and Jones (2016) have discovered the effect of NPL on the profitability of banks. The study confirms that except for SBI all other banks show a negative connection between their gross NPL and net income.

Mondal (2016) in a study using descriptive statistics, correlation analysis, granger- causality and regression analysis found that NPL and interest rate spread of banks are negatively related to each other.

Chimkono et al. (2016) investigated the effect of NPLR and other determinants on the financial performance of commercial banks in the Malawian. The study concludes that NPLR, cost efficiency ratios, and average lending interest rate had a significant effect on the performance of banks.

Akter and Roy (2017) found the negative impact of NPL on profitability (Net Interest Margin). Moreover, Net Profit Margin found also negatively influenced by the NPL as well while considering 30 banks data of Bangladesh for the year 2008 to 2013.

Balango & Rao K. (2017) investigated that there is a significant association between profitability and the amount of NPL. The results of the analysis stated that NPL has a negative and significant effect on ROA while CAR has a positive and relatively insignificant effect on ROA of commercial banks in Ethiopia.

Matin (2017)in his study applying The Feasible Generalized Least Squares(FGLS) model for panel data on 47 commercial banks of Bangladesh during the period 2010-15 found that NPL, loan loss provisions, bank size, cost efficiency, and liquidity had a significant negative effect on ROA.

Islam & Rana (2017) in their study considering data period 2005-10 and using panel data regression model found NPL and operating expenses have a significant effect on ROA. Results also have shown that elevated NPL may lead to less profit due to the provision of classified loans.

Kingu et al. (2018) in their study examined the impact of NPL on bank's profitability using information asymmetry theory and bad management hypothesis. The study establishes that occurrence of NPL is negatively related to the level of profitability in commercial banks of Tanzania.

III. Methodology of the Study

a) *Nature of the study:* This study is analytical since this study is trying to explore the cause and effects relationship among variables. The quantitative approach is used in this study to estimate and measure the variables. In other sense, this study is an empirical research because of its dependence on secondary data and some other empirical works.

b) *Types and Sources of Data:* Secondary data are analyzed in the study and all the data are collected from the annual reports of Bangladesh Bank from the period of 2002 to 2017. Annual reports are extracted from the website of Bangladesh Bank.

c) *Study Period:* In this study total 21 years data of all banks in Bangladesh have been applied. Due to unavailability of most recent and some previous year's data, we have used data from the year 1997 to 2017.

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d) *Variables of the Study:* Identification of the variables in the study is summarized below:

Target Variable	Definition
ROA	A very common and widely used indicator of profitability. Return on Assets (ROA) stated as a percentage of net income to total assets of a bank. Hence indicate the earning efficiency of a bank.
Explanatory Variables	
NPLR	Non-Performing Loan Ratio (NPLR) is a relative measure of non-performing loan to its total loan outstanding as stated as percentage as well. Measuring the assets quality of a bank.
CAR	CAR is stands for Capital Adequacy Ratio. It also stated as percentage of capital to total risk weighted assets of a bank therefore measures the adequacy of capital.
PMR	Provision Maintenance Ratio (PMR) is denoted as a relative measure of Loan Provision Maintained to Loan Provision Required by the banks. Thus this ratio can be used as a proxy of management efficiency as it is a measure of compliance issue directed by central bank.

e) *Model Specification:* In this study, Ordinary Least Square Regression Analysis has been applied to find out the impact of non-performing loan ratio on the profitability of banks in Bangladesh. The following model has been framed in the light of OLS, which assumed that the association among the variables is linear.

$$Y = \beta 0 + \beta 1X1_t + \beta 2X2_t + \beta 3X3_t + u_t$$

Y= Return on Assets (ROA)

β0= Constant term

X1= Non-Performing Loan Ratio (NPLR)

X2= Capital Adequacy Ratio (CAR).

X3= Provision Maintenance Ratio (PMR)

$u_{t=}$ Disturbance term

f) *Techniques of Data Analysis*

i. *Tests of Stationarity*

To avoid foul or spurious regression, Test of Stationarity is an obvious issue while working with time series data. Stationarity or Unit root test simply a statistical procedure to confirm whether the time series variables are non-stationary or possess unit root or not. Non-stationary variables are very much unpredictable since their mean, variance and covariance changes over time. So, to conduct a good forecast, affirmation of the stationarity of variables must be addressed at the outset of the estimation procedure. In our study, we will conduct widely used Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Test of unit root.

ii. *Tests of Cointegration*

Tests of cointegration discover the nature of associations between sets of variables. Economic theory repeatedly suggests long-term relationship among various economic variables. Although those variables can be derived from each other on a short term basis. Tests of cointegration guided us how to determine the said nature of associations. In this study, we will perform commonly used Johansen Cointegration test.

iii. *Vector Auto Regression (VAR) Model*

Empirically we have seen that the Vector auto regression (VAR) model has treated as one of the most flourishing, flexible, and easy to use models used for examination of multivariate time series. The VAR model has to be especially helpful for telling the dynamic behavior of economic and financial time series.

iv. *Ordinary Least Square (OLS) Method*

Ordinary least square (OLS) is a method for estimating the unknown parameters in a *linear regression* model. OLS identifies the parameters of a *linear function* by using the principle of *least squares.* In this study, we have applied OLS to identify the impact of explanatory variables on our target variable.

g) *Operational Method*

Throughout the study, we have used STATA 14.2 software for data analysis and result interpretation. However, MS-Excel of Microsoft Office 2007 software is also used in limited scale for data preparation only.

IV. Data Analysis, Results & Findings

4.1) Augmented Dickey-Fuller (ADF) Unit Root Test

While examining Augmented Dickey-Fuller (ADF) unit root test, we have to formulate the following hypothesis:

H_0: Variable is not stationary/ Variable has unit root

H_1: Variable is stationary/ Variable has no unit root.

Here is the result using STATA 14.2:

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Table 1: (Output of ADF Unit Root Test)

Variables	At Level		First Difference		Remarks
	t-statistics	Critical Values	t-statistics	Critical Values	
roa	-1.415	-4.380* -3.600**	-4.931	-4.380* -3.600**	I(1)
nplr	-0.216	-4.380* -3.600**	-4.253	-4.380* -3.600**	I(1)
car	-3.177	-4.380* -3.600**	-5.349	-4.380* -3.600**	I(1)
pmr	-1.881	-4.380* -3.600**	-4.275	-4.380* -3.600**	I(1)

*Note: * and ** denotes Significance at 1% & 5% level, respectively.*

Decision Rules: When the t-statistics > Critical Values: Reject H_0

t-statistics < Critical Values: Fail to reject H_0

From the table-1, we have found that all the variable's t-statistics is less than the critical values at level. So, here we cannot reject H_0, rather we accept the H_0 that is the variables are not stationary at their levels. But at their first difference values, all the variables become stationary since t-statics of the variables is greater than the critical values. So, here we can reject the H_0 and accept the H_1 that is the variables are stationary at their first differences.

Findings: Variables are integrated at order one: I(1)

4.2) Phillips-Perron (PP) Unit Root Test

In the case of Phillips-Perron (PP) unit root test, we also have to design the following hypothesis:

H_0: Variable is not stationary/ Variable has unit root

H_1: Variable is stationary/ Variable has no unit root.

Here is the result using STATA 14.2:

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Table 2: (Output of PP Unit Root Test)

Variables	At Level		First Difference		Remarks
	t-statistics	Critical Values	t-statistics	Critical Values	
roa	-1.363	-4.380* -3.600**	-5.009	-4.380* -3.600**	I(1)
nplr	-0.413	-4.380* -3.600**	-4.667	-4.380* -3.600**	I(1)
car	-3.157	-4.380* -3.600**	-5.536	-4.380* -3.600**	I(1)
pmr	-2.051	-4.380* -3.600**	-4.278	-4.380* -3.600**	I(1)

*Note: * and ** denotes Significance at 1% & 5% level, respectively.*

Decision Rules: When the t-statistics > Critical Values: Reject H_0

t-statistics < Critical Values: Fail to reject H_0

From the table-2, we have seen that at the level all the variable's t-statistics is less than the critical values. So, here we cannot reject H_0, rather we accept the H_0 that is at their levels the variables are not stationary. But we see that after first differencing, all the variables become stationary since the t-statistics of variables is greater than the critical values. So, here we can reject the H_0 and accept the H_1 that is the variables are stationary at their first differences.

So, both the stationarity test robust our decision that all the variables after first difference become integrated at order one: I (1) and ready for further analysis.

4.3) Johansen Cointegration Test

After the stationarity test, we are likely to have three outcomes:

1. Variables are integrated at their level that is I (0),
2. Variables are integrated at their first difference: I (1) and
3. Variables are integrated at different orders: I (0) and I (1).

For the first scenario no need to perform any sort of cointegration tests. In case of third scenario bound test is appropriate for checking cointegration. For scenario two, Johansen Cointegration test and some other tests are appropriate and widely applied. In our study, variables are found stationary at their first difference, so Johansen Cointegration test has been adopted for checking whether there is long-run equilibrium relationship or short-run dynamic relationship exist among variables or not.

The following hypothesis needs to be formulated:

H_0: There is no cointegration equation among variables

H_1: H_0 is not true

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We have obtained the results of Johansen Cointegration Test:

Trend: constant Number of obs = 20

Sample: 1998 – 2017 Lags =1

Johansen tests for Cointegration

Table 3: (Results of Trace statistics)

Maximum Rank	Parms	LL	Eigenvalue	Trace Statistics	5% Critical Value
0	4	208.73043	.	29.2755*	47.21
1	11	216.44679	0.53774	13.8428	29.68
2	16	219.60958	0.27114	7.5172	15.41
3	19	221.79243	0.19610	3.1515	3.76
4	20	223.3682	0.14579		

Table 4: (Results of Max statistics)

Maximum Rank	Parms	LL	Eigenvalue	Max Statistics	5% Critical Value
0	4	208.73043	.	15.4327	27.07
1	11	216.44679	0.53774	6.3256	20.97
2	16	219.60958	0.27114	4.3657	14.07
3	19	221.79243	0.19610	3.1515	3.76
4	20	223.3682	0.14579		

Here, the decision rule is if the Trace Statistics/ Max Statistics > 5% critical value then we can reject the null hypothesis and accept the alternative hypothesis. But if the Trace Statistics/ Max Statistics < 5% critical value then we fail to reject the null hypothesis. The cointegration test results are furnished in Table-3 and 4. The results tell us both the trace and max statistics is less than 5% critical value. So, we cannot reject the null hypothesis. So there is no cointegration equation exists among the variables meaning that there is no long-run equilibrium relationship exists among the variables.

4.4) Vector Auto Regression (VAR) Analysis

The previous section confirms that there is no long-run equilibrium relationship exists among the variables. So, here we are unable to conduct the Vector Error Correction Model (VECM) rather the Vector Auto Regression (VAR) model would be appropriate to investigate the short-run causal relationship. The VAR model can be constructed if the variables are integrated at their first difference and not co integrated. Our previous analysis and results confirms that there is no cointegration and variables are integrated at I (1), so we can now run the VAR model in our study.

Here is the results of the VAR model using STATA 14.2. Optimum lag lengths selection criteria the suggests us to take lag length as 1.

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Vector Auto Regression

Sample: 1998 - 2017 Number of obs = 20

Log likelihood = 223.3682 AIC = -20.33682

FPE = 1.81e-14 HQIC = -20.14244

Det (Sigma_ml) = 2.34e-15 SBIC = -19.34109

Table 5: (Outcome of VAR model)

Equation	Parms	RMSE	R-sq	chi2	P>chi2
roa	5	.003371	0.5487	24.3212	0.0001
nplr	5	.026438	0.9582	458.8866	0.0000
car	5	.011392	0.7342	55.24962	0.0000
pmr	5	.11875	0.7692	66.67153	0.0000

roa equation

Table 6: (Outcome of ROA Equation)

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
roa						
L1.	.4766956	.2536774	1.88	0.060	-.0205031	.9738942
nplr						
L1.	-.0133143	.0096229	-1.38	0.166	-.0321748	.0055461
car						
L1.	-.0753189	.0735225	-1.02	0.306	-.2194203	.0687825
pmr						
L1.	.0042303	.0067425	0.63	0.530	-.0089847	.0174453
_cons	.0101505	.0060914	1.67	0.096	-.0017883	.0220894

nplr equation

Table 7: (Outcome of NPLR Equation)

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
roa						
L1.	-1.073191	1.989384	-0.54	0.590	-4.972312	2.82593
nplr						
L1.	.9414219	.0754642	12.48	0.000	.7935148	1.089329
car						
L1.	-.4489267	.5765763	-0.78	0.436	-1.578996	.6811421
pmr						
L1.	.0850605	.0528757	1.61	0.108	-.018574	.188695
_cons	-.0154319	.0477695	-0.32	0.747	-.1090584	.0781946

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car equation

Table 8: (Outcome of CAR Equation)

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
roa						
L1.	-.5409454	.8572421	-0.63	0.528	-2.221109	1.139218
nplr						
L1.	-.0705466	.0325181	-2.17	0.030	-.134281	-.0068122
car						
L1.	.0518666	.2484515	0.21	0.835	-.4350895	.5388226
pmr						
L1.	.0492718	.0227846	2.16	0.031	.0046148	.0939288
_cons	.0686555	.0205843	3.34	0.001	.028311	.1089999

pmr equation

Table 9: (Outcome of PMR Equation)

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
roa						
L1.	-3.066761	8.935532	-0.34	0.731	-20.58008	14.44656
nplr						
L1.	-.5884714	.3389555	-1.74	0.083	-1.252812	.0758692
car						
L1.	-1.342672	2.589755	-0.52	0.604	-6.418498	3.733153
pmr						
L1.	.7796231	.237497	3.28	0.001	.3141377	1.245109
_cons	.4247128	.2145619	1.98	0.048	.0041792	.8452464

From Table-8, it has been observed that the lagged value of NPLR and PMR cause CAR on short-run basis at 5% significant level. Table-9 confirms that the lagged value of NPLR cause PMR at 10% level of significance.

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4.5) Granger Causality Wald Test

Table 10: (Results of Granger Causality Wald Test)

Equation	Excluded	chi2	df	Prob > chi2
roa	nplr	1.9144	1	0.166
roa	car	1.0495	1	0.306
roa	pmr	.39365	1	0.530
roa	ALL	2.1333	3	0.545
nplr	roa	.29102	1	0.590
nplr	car	.60623	1	0.436
nplr	pmr	2.5879	1	0.108
nplr	ALL	3.1262	3	0.373
car	roa	.3982	1	0.528
car	nplr	4.7065	1	0.030
car	pmr	4.6764	1	0.031
car	ALL	11.877	3	0.008
pmr	roa	.11779	1	0.731
pmr	nplr	3.0142	1	0.083
pmr	car	.2688	1	0.604
pmr	ALL	3.7435	3	0.291

Table-10, tells us about the direction of causality of individual variable and the combined effect of variables on each equation. In ROA equation NPLR, CAR and PMR individually and together do not cause ROA since probability value is greater than 5%. In NPLR equation ROA, CAR and PMR individually and together do not cause NPLR since probability value is greater than 5%. In the case of CAR equation the scenario is a little bit different. In CAR equation NPLR and PMR individually cause CAR at 5% level of significance and ROA, NPLR & PMR together cause CAR at 1% level of significance. Lastly at PMR equation NPLR individually causes PMR at 10% significant level, whereas ROA, NPLR and CAR together do not cause PMR.

From the above results and discussion, we can conclude that from NPLR to ROA there exists independent causality. From CAR to ROA there is also independent causality exist. From PMR to ROA independent causality also exists. In case of NPLR to CAR unidirectional causality found and from PMR to CAR we have seen unidirectional causality as well. While NPLR to PMR shows bidirectional causality at 10% significant level.

4.6) Diagnostic Checking of VAR Model

Lagrange-multiplier test: This test confirms that whether there is autocorrelation at lag order exists or not. Here is the hypothesis:

H_0: No autocorrelation at lag order

H_1: Autocorrelation at lag order

Table 11: (Results of Lagrange-multiplier test)

lag	chi2	df	Prob> chi2
1	13.7322	16	0.61866

Here, the probability value is higher than 5%. So, we cannot reject the null hypothesis rather we accept the null hypothesis that is there is no autocorrelation at lag order.

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Jarque-Bera test: This test measures whether the residuals are normally distributed or not.

Table 12: (Results of Jarque-Bera test)

Equation	chi2	df	Prob > chi2
roa	0.176	2	0.91574
nplr	1.761	2	0.41454
car	1.352	2	0.50871
pmr	0.972	2	0.61506
ALL	4.261	8	0.83283

From the outcome shown in Table-12, we obtained all the individual equation has the probability value more than 5% stated that residuals are normally distributed and as a whole, the p-value is also more than 5% that also confirms the entire model's residuals are normally distributed.

Eigenvalue Stability condition:

Table 13: (Results of Eigenvalue Stability condition)

Eigenvalue	Modulus
.8280433 + .04696056i	.829374
.8280433 - .04696056i	.829374
.5158688	.515869
.07765175	.077652

Table-13 shows that all the eigenvalues lie inside the unit circle meaning that VAR model satisfies the stability condition.

So, the VAR model satisfies normality of residuals, the stability of eigenvalue and has no autocorrelation which affirms the model as a whole is a good one.

4.7) OLS Regression Analysis

Source	SS	df	MS
Model	.000231947	3	.000077316
Residual	.000165223	17	9.7190e-06
Total	.00039717	20	.000019858

Number of obs	=	21
F(3, 17)	=	7.96
Prob > F	=	0.0016
R-squared	=	0.5840
Adj R-squared	=	0.5106
Root MSE	=	.00312

Table 14: (Outcome of OLS Analysis)

roa	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
nplr	-.0218155	.0083497	-2.61	0.018	-.0394317	-.0041992
car	-.1134578	.0735258	-1.54	0.141	-.2685837	.0416681
pmr	.013699	.0063004	2.17	0.044	.0004064	.0269916
_cons	.0116502	.0058046	2.01	0.061	-.0005964	.0238969

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The goodness of fit, R square stated that the explanatory variables together explain about 58.40% variations of the dependent variable. The value of adjusted R square confirms 51.06% variation in ROA is explained by variations in independent variables. The p-value which is 0.16% only affirms the overall significance of the model at 1% confidence level. The coefficient of the NPLR is -0.0218, indicating that a one percent increases in NPLR will decrease the ROA by 0.0218 percent. Likewise, one percent increase in PMR will increase the ROA by 0.0136 percent. Both the variables are significant at 5% level of confidence. On the other hand, the p-value of CAR is more than 5%, so this variable has no significant impact on ROA.

4.8) Diagnostic Tests of OLS Method

The diagnostic tests of OLS, verify the validity of the inference by checking the existence of multicollinearity, serial or auto-correlation, heteroscedasticity and normality of population distribution.

Multicollinearity Test

Multicollinearity refers to a condition where two or more independent variables in a *multiple regression* model are highly related to each other. Here, we test VIF (Variance Inflation Factor) for multicollinearity checking.

Table 15: (Outcome of VIF Test)

Variable	VIF	1/VIF
car	4.22	0.237147
pmr	3.82	0.261829
nplr	2.08	0.480961
Mean VIF	3.37	

Here from the Table-15, we have the scores of VIF of all the independent variables. The scores all are below 5, implying that there is no presence of multicollinearity among the explanatory variables.

Auto Correlation Test

Autocorrelation indicates the degree of connection between a given *time series* and a lagged version of itself over consecutive time intervals. We will go with the following autocorrelation tests:

Durbin's alternative test for autocorrelation

Table 16: (Outcome of Durbin's alternative test for autocorrelation)

lags(p)	chi2	df	Prob> chi2
1	2.380	1	0.1229

Breusch-Godfrey LM test for autocorrelation

Table 17: (Outcome of Breusch-Godfrey LM test for autocorrelation)

lags(p)	chi2	df	Prob> chi2
1	2.719	1	0.0992

H_0: There is no autocorrelation

H_1: There is autocorrelation

Both Durbin's alternative and Breusch-Godfrey LM test for autocorrelation reveals the p-value is higher than 5%. So, here we fail to reject the null hypothesis that is there is no autocorrelation exists which is desirable.

Heteroscedasticity Test: For testing heteroscedasticity, here we have applied the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity.

H_0: The residuals are homoscedastic

H_1: The residuals are heteroscedastic

Breusch-Pagan/Cook-Weisberg test for heteroske-dasticity

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chi2(1) = 1.98
Prob > chi2 = 0.1593

The chi-square value is 1.98 and the corresponding p-value is 0.1593 which is more than 5%. So, here we cannot reject the null hypothesis rather we accept the null hypothesis that is the error terms are homoscedastic which is also a good sign for the model.

Normality Test

Normality tests are used to decide whether a data set is well-modeled by a normal distribution. We have applied here Shapiro-Wilk test for checking the normality.

H_0: Residuals (U) are normally distributed

H_1: Residuals (U) are not normally distributed

Shapiro-Wilk W test for normal data

Table 18: (Outcome of Shapiro-Wilk W test for normal data)

Variable	Obs	W	V	z	Prob>z
U	21	0.92263	1.896	1.293	0.09794

Table-18 tells us residuals denoted as variable U has the p-value more than 5% implying the failure of rejection of the null hypothesis. So, here we accept the H_0 that is the error terms are normally distributed which is also an indicator of a good model.

V. Causes & Effects of NPL

5.1) Root Causes of Non-Performing Loan in Bangladesh

The non-performing loan has become the main concern for the banking industry in recent time. Many economist and analyst found that the main reason behind recent bank failure, continuous loss of SCBs and banking scams all are arises from the adverse impact of NPL. In order to find the solution to the problem the study discover some of the root causes of NPL in the banking industry which are discussed below:

Corruption: One of the major reasons behind increasing the NPL in the banking industry is the involvement of the corrupted person in sanctioning and disbursing loans. If we recall the case of the BASIC bank, it turns into a bad bank through the corruption of top management.

Lack of Monitoring: Sometimes performing loan becomes defaulted due to lack of monitoring. If the monitoring system was good, and proper action was taken from the beginning period when the bank comes to know about the loan to be defaulted, the NPL amount wouldn't be as large as it is now.

Borrower Selection: A loan is considered as a bad loan from the beginning if it is provided to the wrong borrower without correctly evaluating their information. There are many borrowers who take the loan from banks by using false documents.

Political Influences: It works in two ways- Firstly, while bank is sanctioning the loans and secondly interfering when the bank takes steps against the bad loan.

Lengthy Recovery Procedure: If the recovery procedure through releasing collateral becomes difficult and legal process consume more time then banks have no choice but to keep the NPL forcefully in the loan portfolio.

Repetition of Rescheduling: Rescheduling of loans is not the ultimate solution of NPL problem. It rather increases NPL when the bank applies it repeatedly for the non-deserving loan which ultimately encourages the default culture.

Lending above the Exposure Limit: Crossing lending exposure above the prescribed limit by BB to a single borrower create huge NPL as the client become defaulter thus ruin the loan portfolio as well.

Recapitalization Facility: When any state-owned bank faces financial difficulties and capital shortage, government help them through injecting capital from taxpayer's money. These practices de-motivated the govt. banks to earn money on their own as they think govt. will always be there for them supporting at the time of distress all the time.

Unskilled Personnel: In our banking industry many bankers have a little knowledge about the risk assessment factors that they should apply while measuring the risk associated with loans and advances.

Failure of Business of the Borrower: Due to lack of business knowledge, experience in the field of business or other reason borrower's business become fail which makes them unable to repay the loan to the banks.

Willful Default by the Borrower: Most of the people of our country tend repaying the money as late as possible. When this type of borrower borrows money from the bank they have the intension not to repay the loan at all or to pay as late as possible.

Poor Management Quality of Borrowers: If the management quality of the borrower's company found to be weak, the risk of loan default increases.

Lack of Proper Action Taken against Defaulters: In our country loans are hardly monitored in due time as a result banks remain unaware of the defaulted loan, even if they come to know it. Delay in taking action or proper legal action against borrower keep the defaulted loan in the bank's portfolio for a long time results from an increase in the aggregate NPL.

Adverse Economic Conditions: Some borrowers are not willful defaulters rather they fail to repay loans for some adverse economic factors that affect their business such as recession, political instability, increasing inflation, etc.

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Fund Diversion: Sometimes borrower takes the loan for one purpose but uses them for another purpose causing extra risk for banks. Regular monitoring of the loan is thus essential to ensure their proper utilization.

Delay in Assessing and Distributing Loans: Due to delay in assessing or disbursing loan banks failed to provide money to business enterprises at the time when they need it most. As a result, the business fails as they suffer from the shortage of funds.

Improper Documentation: When the loan becomes defaulted, the bank fails to track the borrower as they didn't maintain proper documentation at the beginning of loan contact thus make it difficult to take proper action against the defaulters.

Lack of Applicability of Regulation: There are several regulation and guidelines for managing non-performing loan such as The Bankruptcy Act, Money Loan Court Act, etc. but in practice, they are not followed entirely and efficiently.

5.2) Adverse effects of Non-Performing Loan in Bangladesh

This study finds some of the major adverse effects of NPL which are given below:

Reduce Capacity to Provide New Loans: Honest borrowers are deprived of getting the new and adequate amount of loans as NPL reduces the investable funds of the bank.

Shrinking Profits: NPL reduces interest income with the principal amount of loan. Again banks need to maintain the provision for NPL which ultimately reduces net income.

Rise in Lending Rates: Due to NPL banks lose interest income, but they need to maintain operating costs to run their business smoothly. As an incidence of that bank further increases lending rates for new loans.

Deteriorate Economic Growth: Non-performing loan requires provision and to meet this requirement banks have to cut off their profit with a vast amount of provisioning requirement. Due to huge profit cuts and the rising cost of capital resulting from NPL the investment opportunity of banks decreases, therefore, upsets the economic development.

Decreases Reinvestment of Fund: NPL blocks the money of banks by the defaulters and restrains the bank from reinvesting that fund that they could have invested in the more profitable sector.

Credit Crunch: This situation arises when due to the increase of NPL bank failed to provide sufficient fund at the previous interest rate to new loans.

Hampers Performing Loans: It also negatively affect the performing loans. From the bad experience of NPL, banks forced to follow the restrictive lending policy which ultimately adversely affects the performing loans also.

Disruption in Money Cycle: Due to NPL banks failed to provide the adequate amount of return to its depositors resulting in the withdrawal of funds by the depositor that ultimately cause the shortage of funds. Thus disruption in money cycle emerged due to NPL.

Decreases Employment Opportunity: Due to huge NPL, banks face difficulties to expand their business hence decreases the employment opportunity. Due to this problem prospective businesses also shrink their expansion as they don't get sufficient funds.

Increase the Cost of Banks: As banks need to perform several NPL management strategies, more supervision and strong monitoring required which in turns increases the overall costs of the bank.

Reduce the Capital Adequacy Ratio: NPL decreases the capital by reducing profit and also the increasing NPL leads in increasing risk-weighted assets thus eventually ruin the capital adequacy ratio.

VI. Recommendations & Conclusion

Non-performing loan as a major problem of the banking industry should be treated more seriously by all the banks in the industry. This study found some initiatives to control the adverse impact of NPL on the bank's performance. The key initiatives are recommended below to reduce NPL:

Lessen the Interference of Political Parties: BB should apply the quasi-judicial power to prevent corrupted parties from becoming the BoDs of a bank even if the government appoints any.

Ensuring Accountability of Employees: Employees associated with loan sanctioning and disbursement procedure should be accountable for his/her work. Banks should monitor the employees within the office so that any employee cannot fraudulently provide any loan to any false customer.

Reducing Recapitalization: The Govt. should stop recapitalization facilities from the taxpayer's money as it establishes poor professionalism and accountability among the bank's personnel.

Adopting Improved Loan Recovery Procedure: Collateral collected against loans should regularly be checked whether it has sufficient value or legal ownership so that no delay occurs while selling them for recovery.

Strictly Follow Rules and Regulation Provided by BB for NPL Management: To prevent the risk of default, banks should strictly follow guidelines and regulations provided by BB time to time.

Intensify the Internal Risk Management of Banks: Banks should maintain the database for large credit to identify vulnerabilities associated with a large amount of credit disbursement, default and recovery.

Proper Lending Practices: Significant amount of loans should be disbursed to the productive sector so that the

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borrowers can have the ability to repay the loan on time. To avoid the risk associated with lending large amount, banks should provide loan by syndication.

Judicial Use of Rescheduling and Write-off: Bank should provide rescheduling facility only to those who has proper justification and follows the guidelines for rescheduling appropriately.

Punishing Willful Defaulters through Legal Proceedings: The prevailing corruption practices in our banking industry should be controlled through applying legal action against convicted defaulters and corrupted persons as quickly as possible.

Structured and Regular Monitoring: Bank should periodically monitor its outstanding loans and arrange visits and making reports by the officials regularly to ensure proper utilization of funds.

Client Profile & Documentation: For safeguarding bank's interest bank officials should properly maintain loan documentation and collect sufficient data of borrower time to time and update them in a regular fashion.

Incentive and Training Programs for Employees: Employees should get incentive based on their performance for achieving recovery target and should get training facilities.

We know the saying "prevention is better than cure". Similarly, for NPL banks need to take some preventive measures to clean up the ever growing amount of NPL in the industry. The borrower should be motivated to repay the loan by providing them some benefits such as exemption, monetary incentives, etc. The above mention initiatives if practiced accordingly and if govt. and central bank assists the banks of our country, soon the adverse effect of NPL can be eliminated from the industry. The study shows different causes, effects, analysis and initiatives regarding NPL. Banks should consider all the causes and the consequences of NPL and develop effective NPL management tools to reduce it so that the banks can ensure maximum dedication on the development of the banking industry and hence can contribute to the economic development of the country.

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