Dissertation On

Forecasting Non-Performing Loan: Perspective of Bangladesh

Submitted to

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Letter of Transmittal

Date: 19th September,2020

To,

Dr. Sayedul Anam

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Subject: Submission of Dissertation Report on "forecasting non-performing loan: perspective of Bangladesh".

 Dear Sir, it is a great pleasure for me to submit this dissertation on ''forecasting non-performing loan: perspective of Bangladesh". This is a special opportunity to fulfill my partial supplement - Bachelor of Business Administration, in this paper, I tried to illustrate non-performing loan Analysis of Bangladesh. At the time of the dissertation program you can represent and monitor the organization at any time Noticed arrested.

I owe you really for your suggestions and recommendations I would be glad if you render your valuable comments and observations.

Sincerely, Yours

Name: Hridoy Islam Ronel

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Declaration

I do therefore declare that the dissertation paper on ''non-performing loan'' was set up subsequent to finishing every one of my courses under the broad supervision and direction of Dr. Sayedul Anam, Assistant Professor, Department of Business Administration, Daffodil International University. The college I have composed this paper without anyone else and have not been taken from any sources other than assistance from books, diaries and website pages referenced on the reference page.

I announce that the paper is just for scholarly purposes and not for a prize in degrees.

Sincerely,

Hridoy Islam Ronel

…………………………

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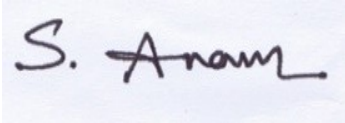
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Letter of Acceptance

This is to certify that Hridoy Islam Ronel, ID: 162-11-5142, a student at Daffodil International University of BBA program has completed the dissertation on ''Forecasting non-performing loan: perspective of Bangladesh", under my supervision. I am pleased to state that he has worked hard in preparing this report and he has been able to present a good picture of the concerned paper. The data and findings presented in the dissertation seem to be authentic. All the information has mentioned on his paper are truly informative and gathered from authentic sources for the purpose of his dissertation study material.

I wish his every success in life.

………………………

(Dr. Sayedul Anam)

Assistant Professor

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Acknowledgement

As the beginning of paper, I am believed myself as privilege granter to almighty for giving strength and chance and well sophisticated sound mind for finishing the Dissertation. Its common follow to give thanks all those folks that contributed to the task that one should attain and that I see no reason to vary this practice. For the purpose of creating the paper on "forecasting non-performing loan: perspective of Bangladesh" isn't associate best task wherever all information ought to analysis accurately and properly and a few data however to be disclosed on the paper. This descriptive paper is that the outcome of my sensible operating expertise in Bangladesh. For the properly completion of this paper, I can call me as a lucky person for possessing the support, helping and encouragement of several of people. Some of those have made overall a decisive role in serving to ME making this report. For properly complete of this paper, I truly have been lucky to have the assistance, help and backing of collection of people. A couple of them fight a definitive occupation in serving to ME making this report, all despite the way that I genuinely settle for full obligation with respect to all of the goofs and avoidance.

 As an issue of first significance I am stunningly glad to my executive, Dr. Sayedul Anam, Assistant Professor, Daffodil International University, who continually offer pointers and suggestion all through the ratio of finishing my dissertation. I might wish to take this opportunity to convey my sincere feeling to those while not whose cooperation this report would not are potential. I might wish to offer my heartiest feeling to Dr. Gouranga Chandra Debnath, Associate Professor & Head, Department of Business Administration, Faculty of Business and Entrepreneurship, Daffodil International University for provision also thankful to Md. Mosfiqur Rahman,   Senior Lecturer, Department of General Educational Development, Daffodil International University. Then my appreciation goes to the secondary sources data for rendering me their experience, information and giving me the chance of getting a specific expertise through this dissertation paper . By the help of all the secondary date sources like central bank, online paper along with journal quantitative information allowed me to satisfy my paper information sophisticatedly . So, it would be my full responsibility for creating all the errors and omission through the dissertation paper if I make.   Lastly, I conjointly acknowledge my family and friends for their support and

encouragement throughout my situation amount and conjointly whereas making ready this dissertation.

Abstract

Non-Performing loan is growing gradually with respect to time in Bangladesh. In this paper, we discuss the trend of Nonperforming loan (NPL) in the banking sector of Bangladesh. The paper discloses that the alarming amount of NPL is gradually increasing in the Banking sector of Bangladesh as well as the flaws and suggestions regarding the recovery of NPL. Finally, we develop a linear regression model for the forecasting of NPL in Bangladesh. This model helps to forecast how much NPL increased in near future that help us to give the focus of recuperating the loan.

Keywords: *Time series, ARIMA, ACF, PACF, ADF, Stationary, Autoregressive, Moving average,NPL*

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Abbreviation and Terminology

NPL   Non-performing Loan

ARIMA   Autoregressive Integrated Moving Average

ARMA   Autoregressive Moving Average

AIC   Akaike Information Criterion

BIC   Bayesian Information Criterion

ADF   Augmented Dickey-Fuller

Chapter1. General Background of the Study

1.1 Introduction:

Non-performing loan is a type of advance which is near to default or which is being default over time. Default   Sometimes this agreement depends on several contracts according to bank's or borrowers own policy as well as their demand too. According to International Monetary Fund , borrower has a term of 90 days or more which maturity time is fixed for the borrower for their installments. But agreements can be renegotiated in some condition between borrower and lender.

By the definition of bank administrative, non-performing loan is made of advances which are 90 days past or due but is able to collect interest on the hand loan has not been settled yet.

Having a developing country like Bangladesh, we have structure of undeveloped capital market. As a consequence , people need to depend on not only government bank but also private commercial banks as well as foreign banks either. Generally banking sector saves and provides capital to the investor. According to this function , all the banks has done their activities . if we look at the of our financial sector for the last couple of decades, we can find proper output of banking industry performance in non-performing loan in Bangladesh. By seeing the amount of NPL we can easily say that the amount of NPL ratio is rocketing up every year which is an upward trending movement for the banking sector. According to banking data we had the ratio (41.1%)of total classified loans in banking sector in 1991. The ratio of non-performing loan is not a fixed or not a certain level because in some years it may stay at a upward position but after a couple of period the amount ratio can be lowered level. So, the ups and down trend caused the banking sector vulnerably more weaken. It is clear that NPLs decrease the profitability because bank cannot collect the interest amount from the borrower of defaulting from different types of performing loan. As a result, loanable funds decreased because of loan defaulter.it will be great suffer for those banks whose already have most loan defaulter than that of saver .

As already mentioned, the hostile impact that is financial condition of both government and private banks provide not only information about   low profitability but also weak capital structure in banking sector in Bangladesh. It is a trouble of concern that we are the

borrowers of those culture where a number people have the bank default culture tendency with unethical issue too.

There are several reasons against bank default in Bangladesh. People in general they are not care about repayment after getting full amount of loan because unwillingness trend or culture is worked into their mind . Also, proper legal regulation is not applied those people who are politically supported. Though some of businessperson and other have the positive tendency to repay loan in time but they face inability to utilize the money in perfect sources for the good investment. So , lack of effective knowledge is not applied in borrower's investment . on the other hand, problem like natural calamity can create another obstacle to the debtors. another crucial part is the unfair issue of tax which can impact the business as well as the borrower.

if we look at the information of Bangladesh bank and other financial data which provides information about total amount of non-performing loan , there is a fluctuate trend throughout the years. In 2002 , the total amount of NPL was 228.51 billion BDT while the amount of loan was 238.57 billion BDT in the year of 2002. So, it looks that the amount of NPL is increasing in the following year. From 2003 to 2006 , the amount of total loan was plunged to 200.1 billion BDT. But the amount was not downward permanently because the NPL amount dramatically changed from 2012 which value was 427.4 billion BDT. According to the latest information from the central bank the amount of total non-performing loan is went up in the highest level in the history of Bangladesh. In June 2019, the amount of non-performing loan was 1124.2 billion BDT while amount of NPL was 939.2 billion BDT in 2018. So, we can the vast amount of differences between 2018 to 2019.

 In banking-financial system, NPL can negatively   affect the overall operating margin. Operating margin of a banking sector is curtailed by the effect of NPL. As the problem has mentioned bank creates new loan to the new borrower but it would be great concern to economy because of giving loan to borrower banks can use their own funded capital to make credit process.

this concern of NPL will be surging up if the borrower have the reluctant mentality and borrower is not eager to pay his or her payment in time according to terms and condition , it may negatively affect other new borrowers who are exactly wants to take loan from the banks. So, lack of willingness and creation of loan default solution from the old borrower will force the good borrower not to take loan . As a result, the problem on NPL will be rocketed

because of the defaulter . Then banks face several difficulties like lack of capital resources to maintain the capital adequacy on the other hand operating margin has faced downward trend in banking process. If this crisis is made by the defaulter as well as by the help of banker, it may plunge the overall financial condition of a bank and in the end the condition of banking sector can be caused in uncertainty .

1.2 Classified loans

Classified loan is a kind of loan which is considered near to bank default because it has risk of appearing default by the borrower where both principal and interest are reckoned as due. On the contrary, past due is not mandatory for classified loan. Before giving loan to the borrowers , lender analyze the borrowers according to borrower's creditworthiness so that lender may prevent the danger of getting default.

In terms of banking sector in Bangladesh , central bank has created a system of frame which will characterize the borrowers for granting loan from the lenders. Most used characters are Sub-standard , Doubtful and Bad/Loss .

a) <u>Sub-standard</u> : it is a kind of classified loan where lender in risky situation to provide loan to a borrower. Lender predict the consequences that is borrower has a less ability to repay their installments or borrowers may unfavorable transaction records.

b) <u>Doubtful</u> : in terms of this loan total loan repayment process is considered as dubious. Lender would not sure that if repayment is going to happen or not for the entire time of period because it also uncertain to the lender.

c) <u>Bad/Loss</u> : this loan has most probability of facing loss also not recoverable to a banker. Entire amount may in danger because to the lender.

1.3 Objective of the Study:

The objectives of this paper are:

i.   To provide the present scenario of non-performing loan in banking sector of Bangladesh

ii.   To show the trend of the "loan default problem'' in Bangladesh.

iii.   To talk about the legal issues for recovering the non-performing loan form borrowers.

iv.   To research the loan default situation of all banks.

v.   To know the possible reasons and redresses for the NPL.

Chapter2. Literature Review

In Bangladesh, the ratio of NPL is not a sophisticated position because the trend of ratio of the NPLs are went down (Adhikary, B. K., 2006). According to report, the percentage of gross loan in 2000was 34.9 % whereas the amount of gross was 13.2 % and which was downward from the year of 2000 to 2006. But in 2007 non-performing loans were remained same as like as the previous year and which rate was started from 13.6 %. If we see the data of NPL's ration from the year of 1990, the amount of NPL was 26.09%. On the other hand, NPL's ratio was increased in 1999 which was surged by 41. 11 %. In 1970 and 1980 respectively, State-owned Commercial Banks and State-owned Development Financial Institutions weren't involved with any kind of commercial perspectives. So, in that time banks were involved with loan programs with the customers and banker's duty was to disburse the loan. (Annual report, Bangladesh bank). Less quality Assets must be burden to the banks Because of Defective measurement while the disbursement of loan affects the banking sector due to less observation. However, underlying Securities can create negative impact the accumulated bad loans.

As of late, non-performing loan recovery rate has been increasing significantly. As we know banking sector of Bangladesh has made several mechanisms along with effective ideas to slow the rate of NPL.

In accordance with Bangladesh bank, the ratio of net NPL to net total loans of States owned Commercial Banks was 1.9 in 2009 and 2010 respectively where there was a little amount of difference in percentages in the years 2009 and 2010 for the Development Financial Institutions. Also, the amount of net total loans was 1.7 and 1.3 in the years 2009 and 2010. So, the trend of Net total loan for NPL went down from 2009 to 2011 but in 2012, the total amount of loan was 4.4 in banking sector among the SCBs, DFIs, PCBs and FCBs. In the end of the of 2012 SCBs, DFIs, PCBs, FCBs illustrates a ratio of Non-performing loans to net total loans 12.8, 20.4,0.9, -0.9 and 4.4, respectively. After the year of 2012, the

percentage of net total loan had increased at a partial rate. And rates were too much closer among the years. Eventually, the ratio of net total was highest which was 2.5 % in the June 2019 (Bangladesh Bank report).

Bank always liable for the carrying cost if the level of non-performing loan is than the previous term. Finally, bank appears in a situation that is tough for a bank to increase the resources (Makri et al, 2014). Macroeconomic forces and management quality of a bank in a country plays a crucial role so that industry like Greek impacts non-Performing loan in banking sector

(Louzis, 2012). So, ARIMA model has been used in this paper to analyze as well as forecasting the overall data. This also observed by both Gianluca Bontempi (2013) and Anam tel (2017).

According to the information by Chowdhury et al (2020), he illustrates a idea which is has been provided information about non-performing loan also stated that NPL have the most possibility to make an impression for banking sector capacity   of a country. He also described the Autoregressive Integrated Moving Average model to interpret NPL data.

Chapter 3. Methodology

I.   As a primary starting of analyzing the data, state-owned commercial banks, state owned development financial institutions, private commercial banks and foreign commercial banks have been selected for the study and analyze material in Bangladeshi banking sectors. So, secondary data also collected from several sources like banking website, International journals, internet, individuals along with different institutions. Quantitative has been collected from the years 2000 and 2019.

II.   After collecting the required data from various sources,   an advanced level of statistical tool has been used for the analyze. To perform the overall tool, Autoregressive Integrated Moving Average (ARIMA) is used as a principle tool. For predict the future trends by analyzing the time series data, ARIMA model is used for the financial statement's data analysis of Bangladeshi banking sectors.

III.   At last time series analysis, The Akaike information criterion (AIC), Bayesian information criterion (BIC), Statistical stationary, Augmented Dickey-Fuller test, Unit root, Null hypothesis, P-value, correlogram, autocorrelation, regression coefficient etc. variable along with statistical tools has been utilized for the data.

Time series analysis : A time series analysis is a kind of data analysis between two variables or among variables for a number of periods. It can measure an economical change by the use of variables over time.

Time series data : A bunch of data which uses in time series analysis in a particular period of time.

ARIMA : This is a statistical tool to predict the future according to the given data over time. ARIMA means Autoregressive Integrated Moving Average.

Autoregressive : Autoregressive component is used in statistical equation in time series analysis where autoregressive is identified by p. suppose p =0 , so it says that there is not a possibility of autocorrelation over time. One the hand if we suppose p =2 , that means the possibility of correlation among or between the variables in time series data analysis and series auto-correlation is till two lags.

Integrated: According to time series data , d is used as an integrated variable. Integration is a variable which is the opposite of differencing in time series data. If we denote the d =0 , that means that the time series is stationary . if d= 1 , it indicates that it's not a stationary and

require to take the first difference over time periods and if d= 2, it also indicates that the time series has differenced for twice over time .

Moving average : According to Autoregressive Integrated Moving Average model moving average is illustrated by letter which is q and if we suppose that q= 1 , that tells that this has an error term also there is no possibility of auto-correlation along with one lag in a particular time periods .

The Akaike information criterion (AIC): It is a statistical tool which is used to estimate the error in sample prediction data. By this statistical tool, research can calculate along with measure several types of models in research.

Bayesian information criterion (BIC): it also called Schwarz information criterion, and which is a criterion for model selection among a finite set of models. And this model is closely related to the Akaike information criterion .

Stationarity: Stationary is a kind of stochastic process whose parameters doesn't keep themself change over period of time and parameters like mean, variance, auto-correlation etc. will be called as constant in a particular time period also stationary is statistical tool, which is being used to predict the data easily.

Augmented Dicky-Fuller : according to a time series sample, analysis Augmented Dicky-Fuller is used to examine the several types of hypothesis like null hypothesis where unit root is also used in this ADF model. By doing this test, researcher can easily find out that if a time series is stationary or not.

Unit root: It is a type of quantitative process which have the possibility to create several problems in statistical inference in terms of time series models.

Null hypothesis : Null hypothesis is identified by (H_0). This hypothesis indicates that there is no significant relation or difference between two variables, samples, or populations.

P-value: In null hypothesis testing in statistical data, p value is used to measure the hypothesis, and which also measure the probability of an event.

Correlogram: A correlogram is a kind of graphic presentation of several data which gives a idea of autocorrelation between variables in terms of different time.

Autocorrelation: According to autocorrelation, it defines a relationship between two variables in a time period where there will have both current and past value for the relation.

Autocorrelation Function : This function defines the correlation between described two values of the signal changes .

Partial correlation: It assess the degree of connection   between two identified variables.

Regression coefficient: This is a statistical measurement of the average functional relationship between two or more variables. In regression analysis, one variable is called as dependent and other called as independent. It also defines the degree of dependence between variables.

Independent variable: This type of variable does not depend on another variable because this variable, but it can affect the other variable.

 Dependent variable: It is the variable which is affected by another variables. If independent changes ,then dependent variable will be changed.

3.1 Time Series Analysis:

In terms of time series analysis, Autoregressive Integrated Moving Average has been used for analyzing the model. For the implementation for this model , time management has used to portray this paper timely.

An Autoregressive Moving Average (ARMA) procedure is used for the testing and it undertakes a key job in the displaying of time arrangement statistics. At the point when a period arrangement is not fixed, several activities have been utilized for most of the periods of time in the fitting slack. And then mean has been deducted from the model as well as Autoregressive Moving Average is placed to the data. A stationary zero mean ARMA (*p*,*q*)

model is defined as (Brockwell and Davis, 2002) a sequence of random variables {X_t }

which satisfy, $X_t - \phi_1 X_{t-1} - ...... - \phi_p X_{t-p} = Z_t + \theta_1 Z_{t-1} + ... + \theta_q Z_{t-q}$ for every *t* and where {Z_t } is a

sequence of uncorrelated random variables with zero mean and constant variance σ^2 . A

process is said to be an ARMA process with mean μ , if {X_t - μ } is an ARMA (*p*, *q*) process. A process is called an ARMA (*p*, *d*, *q*) process if *d* is a nonnegative integer such that

$(1-B)^d X_t$ is an ARMA (*p*, *q*) process and where *B* is the usual backward shift operator.

$E(\xi_t / \xi_u, u \triangleleft t) = 0$, $t \in z$

This model also incorporates the Akaike Information Criterion (AIC), Corrected Akaike Information Criterion (AICC), and Bayesian Information criterion (BIC). The AIC statistic is

defined as, $AIC = -2 \ln L + 2(p+q+1)$, where L is the Gaussian Likelihood for an ARMA (p, q) process. On the contrary, the AICC statistic is defined as,

$$AICC = -2 \ln L + \frac{2(p+q+1)n}{(n-p-q-2)}.$$

Since, the AICC model has a more outrageous penalty than the AIC statistics; it would counteract fitting very large models. The Bayes Information Criterion (BIC) is given by,

BIC= -2 (Log likelihood) +p log (n).

Usually, BIC penalizes models with a bigger number of boundaries more firmly than AIC.

Chapter 4. Results and Discussion

Here the yearly data of NPL are collected from Annual Report, Bangladesh Bank (2004-04, 2010-11, 2018-19) that are given in below data table.

End of June	NPL in Billion(BDT)
2019	1124.2
2018	939.2
2017	743.1
2016	621.8
2015	594
2014	501.6
2013	405.8
2012	427.4
2011	226.5
2010	227.1
2009	224.8
2008	224.8
2007	226.2
2006	200.1
2005	175.14
2004	187.03
2003	203.2
2002	238.57
2001	235.99
2000	228.51

The line graph of the above table is given below (Fig-1). To develop ARIMA (p, d, q) at first, we have to go stationary test. If the data set is stationary at first time, then the value of 'd' is zero. If data is not stationary at first chance, then we have to take the first difference (lag 1 & d=1). Gradually we have taken difference until data is not stationary.

NPL in Billion(BDT)

Fig-1: Time graph of NPL

For stationary test, this research considers Augmented Dickey-Fuller test. This test suggests that the absolute value of test statistic would be greater to accept alternative hypothesis (data is stationary).

Table-1: NPL Table

Null Hypothesis: NPL_IN_BILLION_BDT_ has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.800336	1.0000
Test critical values:	1% level	-3.831511	
	5% level	-3.029970	
	10% level	-2.655194	

*MacKinnon (1996) one-sided p-values.

For time series analysis our prerequisite is data is to be stationary. The above graph **(Fig-1)** shows that the data is not stationary. The data are, therefore, differenced once at lag-1 and the plot is shown in Figure-2.
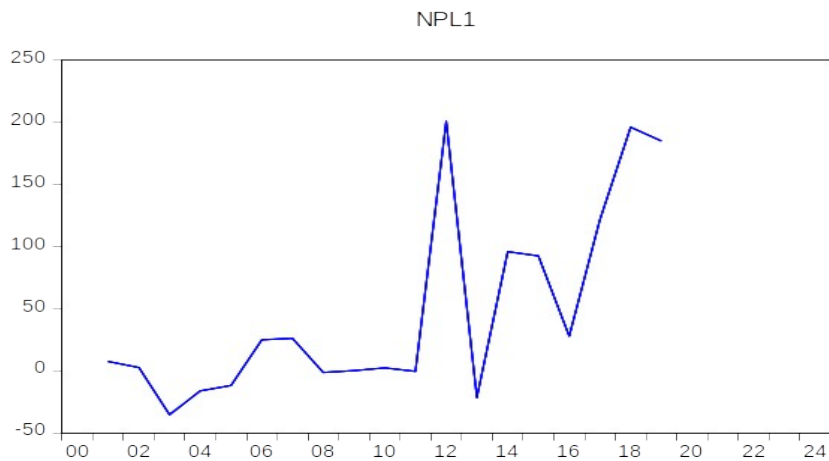
NPL1

Fig-2: Lag-1 graph of NPL

Table-2: Lag-1 table

Null Hypothesis: NPL1 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.366241	0.1641
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

The above graph **(Fig-2)** shows that the data is not stationary. The data are, therefore, differenced once at lag-2 and the plot is shown in Figure-3.

This study has tested ADF and found 5.242605 which is greater than 3.920350 at 0.01 critical levels i.e. expectedly the study rejects the null hypothesis. The graph and the table showed in fig-3 and table-3. Finally, it is established that data set is stationary in lag 2.
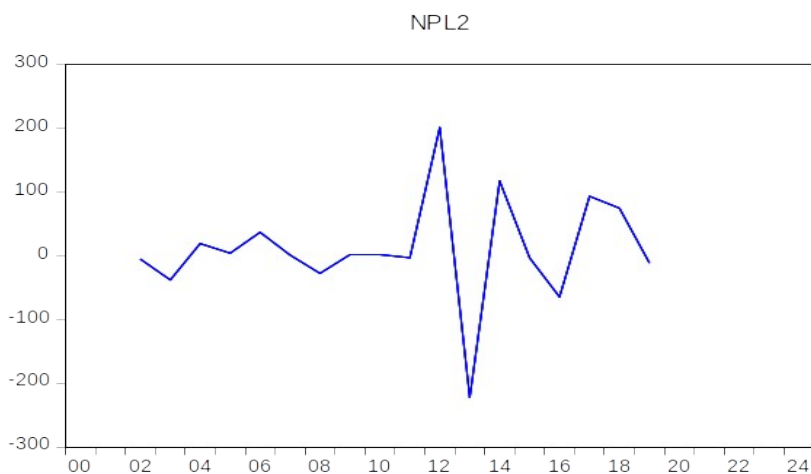
Fig-3: Lag-2 graph of NPL

Table-3: Lag-2 table of NPL

Null Hypothesis: D(NPL_IN_BILLION_BDT_,2) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.242605	0.0008
Test critical values:	1% level	-3.920350	
	5% level	-3.065585	
	10% level	-2.673459	

*MacKinnon (1996) one-sided p-values.

From the above discussion we got the data is stationary at second difference (lag 2). Therefore, the value of d is two. For further analysis we have estimate the value of p and q in ARIMA (p, d, q) model. The correlogram test is well fitted to evaluate the value of p and q. In this test the significant number of large spikes of Autocorrelation (ACF) indicates the value of p and the significant number of large spikes of Partial correlation (PCF) indicates the value of q.

Table-4: Correlogram table for ACF and PCF

```
Date: 08/10/20  Time: 15:00
Sample: 2000 2024
Included observations: 18

   Autocorrelation    Partial Correlation      AC     PAC   Q-Stat  Prob

                                          1  -0.593 -0.593  7.4362  0.006
                                          2   0.075 -0.425  7.5636  0.023
                                          3   0.180 -0.016  8.3407  0.039
                                          4  -0.262 -0.160  10.102  0.039
                                          5   0.059 -0.302  10.199  0.070
                                          6   0.169 -0.033  11.054  0.087
                                          7  -0.098  0.192  11.370  0.123
                                          8   0.070  0.275  11.544  0.173
                                          9  -0.120 -0.058  12.120  0.207
                                         10   0.035 -0.127  12.175  0.274
                                         11   0.008 -0.006  12.179  0.350
                                         12  -0.001  0.063  12.179  0.431
```

The above table shows that the Autocorrelation (ACF) spike is 1 so p=1 and Partial correlation (PCF) significant spike is 1, *i.e.* q=1 (Table-4).

Since p=1, d=2, and q=1 so our expected model is ARIMA (1, 2, 1) for the data. If we run this model then we got the following forecasting graph (fig-4) and the regression coefficient table (Table-5).
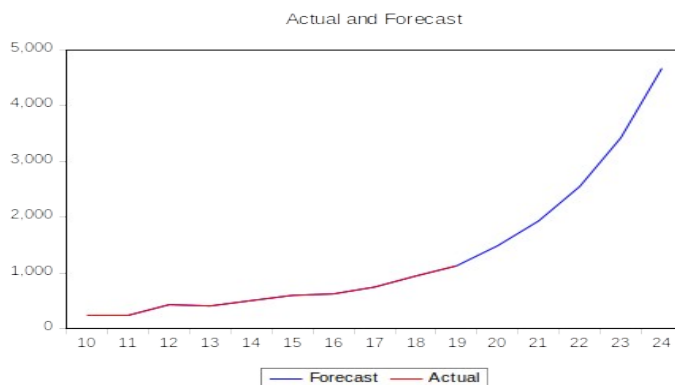

Fig-4: Forecasted graph of NPL

Table-5: Regression coefficient table

```
ARIMA regression

Sample:  2002 - 2019                    Number of obs    =         18
                                        Wald chi2(2)     =      10.58
Log likelihood = -101.0919              Prob > chi2      =     0.0050
```

D2.NPL	Coef.	OPG Std. Err.	z	P>|z|	[95% Conf. Interval]
ARMA						
ar L1.	-.2757392	.7681481	-0.36	0.720	-1.781282	1.229804
ma L1.	-.4571323	.7934885	-0.58	0.565	-2.012341	1.098077
/sigma	65.50549	7.414005	8.84	0.000	50.9743	80.03667

Hence, the fitted ARIMA (1, 2, 1) model and the forecasted graph (**Fig-4**) can be stated by the following regression line.

$$\text{NPL} = 65.50549 - 0.2757392\, y_t - 0.4571323\, \mu_{t-1}$$

Chapter 5. Conclusion

Undoubtedly the amount of NPL is getting higher day by day in Bangladesh. The research developed a regression line that estimate the change of NPL with respect to time. That means, it would be easier to use this equation to predict the NPL. Therefore, financial organization can easily set their goal to recovery their non-performing loan as well as their future plan related this NPL. This equation also helps to measures those issues like no trade off with due ingenuity in the endorsing procedure, activity plan for potential NPL, identification of profoundly hazard delicate borrowers in the credit portfolio, identification of geographical zone shrewd risk sensitivity etc.

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