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Sensitivity of Non-Performing Loan to Macroeconomic Variables: Empirical Evidence from Banking Industry of Bangladesh

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Abstract

This paper attempts to examine the potential effect of macroeconomic variables on the downfall of loans. The data used in this study range from 2005 to 2014 and cover 22 commercial banks operating in Bangladesh. Failure of credit policy is measured with the rate of nonperforming loan (NPL) which indicates vulnerability of credit system in banking and financial industry. Several researches have been conducted in many countries where mix pattern of relationships has been found. In this research paper, four macroeconomic variables named GDP growth rate, inflation rate, interest rate spread of banking sector and rate of unemployment are tested with NPL ratio in order to ascertain significant relationship for commercial banks of Bangladesh. The result of econometric analysis revealed that NPL is negatively sensitive to inflation rate and interest rate spread and positively sensitive to GDP and unemployment rate.

Index terms— non-performing loan, GDP, inflation, interest rate spread, unemployment, banks.

nomic variables are external forces of determinants of credit assets quality and banks specific policies, staff quality, morale, asset management mechanism so on are internal drivers of banking performance. In Bangladesh, NPLs are investments of banks and financial institutions which are not repaid by borrowers have to keep provisioning set aside from their earnings according to regulation of central bank which hits negatively on their profitability.

The lofty height of NPL has enforced the banking industry to lessen new borrowers. In the last few years as NPL has wounded up banks, management committee of banks should be vigilant in paying more attention in credit assessment system and smart collection strategy from borrowers. This is needed for regaining complete confidence of depositors on their banks side a side boosting sustainable growth of the country's economic activities.

As already mentioned macroeconomic variables and bank specific indicators are assumed to be responsible for NPLs. Several researches already have come into light with a conclusion of having significant relationships of NPL with those factors. This paper attempts to assess the sensitivity of macro variables such as GDP growth rate, inflation, unemployment rate, etc with Non-performing loan ratio of commercial banks of Bangladesh since banking industry is susceptible to total economic activities of the country. This study is found to be important as the NPL gets down confidence of investors in banking framework, drains out productive scant resources and threatens efficient resource distribution procedure.

1 II.

2 Literature Review

Non-performing loan is like bug of any bank which creates discomforts in every action of financial system of a country. It wastes management valuation time, bank's profitability, depositor's confidence index and harms country's financial systems as well.

Many authors conducted various researches to find out the determinants of NPL. It remained difficult to state one exact relationship between them as different studies contain different determinants of NPL and those variables have shown different relationship with NPL.

3 Introduction

anks and financial institutions in a country act as intermediary between supply side and demand side of fund. At present, 56 scheduled banks and 31 financial institutions are actively working at Bangladesh. Total credit provided in Bangladesh as on November 19, 2015 is BDT 5,721,461 and NPL ratio to total loan was 9.7% (up to June 2015) accordingly. Total assets of banking industry in 2014 reached at BDT 9,143 billion from BDT 8,000 billion in 2013 but NPL amount also increased to BDT 501.6 billion from BDT 226.2 billion in 2013 (net increase of BDT 275.4 billion in one year). This situation is raising a red flag for efficiency and effectiveness of banking system. There is clear evidence that banking industry is persisting excess liquidity as the total liquidity stood at BDT 6,965.1 billion in 2014 from BDT 6,273.0 billion in 2013. Conversely, rate of industrialization has been declining due to paucity in investor confidence, political instability, degrowth in real estate sector etc. Consequently, surfeit liquidity leads ambitious business projections of the banks subsequently pouring money in non-productive sectors mostly by taking over of other banks' customers by extending facility limit.

In general, banking sector performance is affected by both internal and external forces. Macroeco-B for more than 90 days. Banks and financial institutions NPLs of banks depend on both bank-specific and macro-economic variables in Sri Lanka. They regressed nine variables to be statistically significant with NPL. The empirical results reveal that efficiency and size of the bank is also having explanatory power over NPLs. In line with previous research, this study discloses that when efficiency of the bank increases NPLs reduce. Size of the bank has inverse relationship with NPLs. Macroeconomic variables GDP growth rate and inflation have recorded a significant inverse relationship while lending rate has recorded a significant positive influence.

From the view of Vasiliki Makri, Athanasios Tsagkanos and Athanasios Bellas (2014), using aggregate data on a panel of 14 countries for the period 2000-2008 and applying the difference GMM estimation, strong correlations between NPL and various macroeconomic and bank-specific factors are consecutively instituted.

(2014) originated both exogenous determinants (macroeconomic indicators) and exogenous determinants (specific for the banking activity) are responsible for NPL. In Estonia, the NPL has proved to be strongly influenced by the unemployment rate. As for the influence of the other determinants, a significant, but negative influence has the decreasing growth rate of the GDP that is impacting on the banking sector by increasing NPLs ratio. Latvia exhibits a somewhat similar situation to that of Estonia's showing an increased rate of bad loans. In this case, the drop of the GDP had a significant impact, followed by the unemployment rate.

Ahlem Selma Messai et al (2013) depicted variables that can affect and influence doubtful accounts at credit institutions for a sample of European banks. The results showed that GDP growth and return on assets of credit institutions have a negative impact on NPLs. The unemployment rate and the real interest rate affect impaired loans positively. Furthermore, it was found that the provisions of banks increase with the NPLs.

In evaluating NPLs Sensitivity to macro variables for Malaysian Commercial Banks, Mohammadreza Alizadeh Janvisloo et al (2013) found strong confirmation of cyclical sensitivity of asset quality in commercial banks of Malaysia. Their result showed FDI-net outflow (%GDP) are the most effective factors on NPL ratio with simultaneous positive effects and a reverse effect with one-year delay. Also there is a robust negative relationship between NPL and GDP growth with the effects operating with up to two year lags. Inflation and domestic credit growth have positive and negative effects respectively and their effects last for up to two years, but a mild.

Bruna ?KARICA (2013) outlined determinants of the changes in the non-performing loan (NPL) ratio in selected European emerging markets. Bruna ?KARICA performed the study into single economy analysis and panel analysis. Real GDP growth rate was the main driver of the increase of the NPL ratio during the past 5 years in CEE countries.

Ali Shingjergji (2013) said that there exists positive relationship between the GDP growth and the NPLs ratio that is contrary to international evidence. According to international evidence the inflation rate is negatively related with NPLs ratio even in the Albanian banking system.

Wondimagegnehu Negera (2012), in assessing determinants of NPLs in Ethiopia, depicted that poor credit assessment, failed loan monitoring, underdeveloped credit culture, lenient credit terms and conditions, aggressive lending, compromised integrity, weak institutional capacity, unfair competition among banks, willful default by borrowers and their knowledge limitation, fund diversion for unintended purpose, over/under financing by banks ascribe to the causes of loan default. The study indicated that poor credit assessment ascribing to capacity limitation of credit operators, institutional capacity drawbacks and unavailability of national data for project financing that had also led to setting terms and conditions that were not practical and/or not properly discussed with borrowers had been the cause for occurrences of loan default.

Mamun, Yasmeen, Mehjabeen (2012) examined factors responsible for lending decision by Bangladeshi banks using a set of decision variables available in the standard loan application process. Among the variables examined investment type, investment risk grading score and borrower's previous transaction record have been identified as the most important determinant for loan approval probabilities.

Mabvure Tendai Joseph et al (2012) conducted a study in order to determine the causes of NPLs of Zimbabwe. They found internal factors such as poor credit policy, weak credit analysis, poor credit monitoring, inadequate risk management and insider loans have a limited influence towards non performing loans. Factors namely natural disaster, government policy and the integrity of the borrower were the major factors that caused NPLs. Findings indicated that there is an upward trend in NPLs since the adoption of multicurrency in 2009. The agricultural sector has not been performing well owing to climate changes and expensive costs related with farming in Zimbabwe. **??**rum Berger and DeYoung (1997) draw heavily on the relationships between the specific characteristics of banks, the efficiency indicators and bad loans. According to them, possible mechanisms are worth formulating. More specifically, they maintained that 'bad luck', 'bad management', 'skimping', 'moral hazard', and 'capital adequacy' are all contributing factors leading to problem loans. Working on a sample of US commercial banks over the period 1985-1994, Berger and DeYoung (1997), **??**illiams (2004) found out that decrease in measured cost efficiency generally led to increased future bad debts.

Keaton and Morris (1987) investigated of 2,500 banks in the USA. They found that a substantial part of the variation in loan losses was due to differences in local economic conditions and to unusually poor performance in particular industries like agriculture and energy.

4 III.

5 Objectives

The primary objectives of this research study are:

1. To explore the sensitivity of NPL to macroeconomic variables.

2. To find out the current situation of NPLs of Bangladesh banking industry.

3. To investigate the factors affecting the NPL in the banking industry of Bangladesh other than the bank specific variables.

4. To formulate an empirical relationship between NPL and four macroeconomic variables over a period of ten years for banks operating in Bangladesh.

IV.

6 Research Methodology a) Data Collection

The study relates to the period of most recent ten years for twenty two sample banks starting from 2005 and ending on 2014. For the purpose of this study, only secondary data have been used as information related to credit risk, credit policy, NPLs, loan recovery system, default rate are very much confidential to any lending institution specially a bank. The study employed the use of secondary data obtained from the audited balance sheets and profit & loss accounts and also the annual reports of the respective banks. The reason for choosing this source is primarily due to the better reliability of the audited financial statements. Data were obtained from the Dhaka Stock Exchange Library, past publications and official websites of Bangladesh Bank, World Bank and the banks incorporated in the study.

7 b) Variables of Study

The research takes into account the key variables that possibly can affect and has influence on NPL. Choice and selection of variables is influenced by the past research and different study conducted by different researchers on credit risk and NPL. All the variables (dependent and independent) have been used to test and examine the sensitivity of NPL to different macroeconomic variables. The independent variables selected are annual GDP growth rate, inflation rate, interest rate spread and unemployment rate. The dependent variable is NPL ratio. Hence all the data of this study are in relative form. Indicators have been selected by reviewing the literature to represent variables that are most suited for the country's financial system. NPL is denoted as the ratio of classified loans to total loans for bank. The annual growth rate in GDP is also considered. The annual percentage change of the Consumer Price Index (CPI) value is taken as the indicator of country's inflation growth rate. The gap between average lending and deposit rate has been considered as the interest rate spread in the economy. Unemployment rate is measured as a percentage of the labor force without jobs from total labor force in the country.

8 c) Hypotheses Formulation

Based on the early literature and variables of study following hypotheses are formulated: 1. There is significant relationship between the GDP growth rate and NPLs' rate. Where, NPL is the proxy used for banks NPLs' rate, GDP for annual GDP growth rate, IFR is inflation

9 e) Methods of Data Analysis

For the study, entire analysis is done by personal computer. Microsoft excels as well as a well known statistical package named EViews were used in order to analyze the data. This study makes the use of statistical tools for both its descriptive and quantitative analysis. In the descriptive sector of analysis, data were analyzed only to find out the general statistics. On the other hand, in quantitative analysis portion, data were analyzed by employing Augmented Dickey-Fuller (ADF) V.

10 Analysis and Findings a) Descriptive Statistics

Descriptive statistics presents the general statistics of the variables. The statistics gives the mean value, median value, standard deviation value, maximum and minimum value of the variables of interest in the study over the 10 years.

11 Source: Compiled by the author

Table 1 shows the descriptive statistics of dependent and independent variables in the study. The mean NPL of all the 22 banks over the ten years is 7.3478. This suggests that banks could not recover 7.35 percent of every loan provided to the borrowers. The highest NPL is 44.59 while the lowest is 0.00. Among the macro-economic variables the mean GDP growth rate over the test period is 6.20 percent, with the highest growth in 2007 of 7.10 percent and the lowest growth of 5.00 percent in 2009. The highest inflation growth of 7 percent was recorded in 2014. The correspondent minimum and mean recorded values for inflation are 5.74 and 6.29 percent. The mean value of interest rate spread is 4.83 percent with a standard deviation of 1.96 meaning that interest rate spread can vary from the mean value to both sides by 1.96 percent. The maximum value for that interest rate spread is 6.82 percent in a year while the minimum is 1.42 percent. The mean rate of unemployment is 4.45 percent with a low standard deviation of 0.21143. The lowest and highest unemployment rate of 4.20 and 5.00 percent were recorded in 2006 and 2009 respectively.

12 b) Quantitative Analysis i. Augmented Dickey-Fuller (ADF) Unit Root Test

All the variables under the study must be stationary otherwise spurious regression may be found. Henceforth, Augmented Dickey-Fuller (ADF) Unit Root Test has been implemented to ensure that all the variables in the regression equation are stationary. The result is shown below: As all the series are not stationary, first differences of the non-stationary variables are taken. Three new variables are found named DNPL (1 st difference of NPL), DGDP (1 st difference of GDP) and DUNEMP (1 st difference of UNEMP). Again the test is done on the new three variables. All the series are now stationary. The results of ADF test with the three new variables are as follows: Results of the Correlation analysis between DGDP and DNPL depict a positive coefficient of 0.044387. It denotes that if GDP increases it will have a positive impact on the NPL. The test result shows a negative relationship between inflation rate (IFR) and DNPL. It indicates that if the IFR increases it will have a negative impact on the NPL. The same relationship is found between the interest rate spread (IRS) and DNPL. The correlation between unemployment rate (UNEMP) and DNPL is 0.011516. It implies that NPL will be increased with increase of the unemployment rate. No significant strong relationship is found among the exogenous variables in the matrix. So it can be assumed that the data set is free from Multicollinearity problem.

13 iii. Granger Causality Test

The simple correlation does not imply anything regarding the causality amongst the variables. To find out the causal relationship between two variables Engle-Granger (1969) causality model is implemented between each exogenous variable and dependent variable.

The result presented in table 5 shows that there is no bilateral directional relationship between DGDP and DNPL, IFR and DNPL, IRS and DNPL, and even DUNEMP and DNPL at 5% significance level. The test results are tabulated below:

14 iv. Regression Analysis

The regression equation gives an estimation of the linear relationship between a dependent and one or more independent variables. The four explanatory variables named DGDP, IFR, IRS and DUNEMP are regressed on the one and only dependant variable DNPL to test the multiple regression of the selected empirical model. The coefficients of determination (R-square) represents a value of 0.042459 which means that the explanatory power of the four independent variables (DGDP, IFR, IRS and DUNEMP) of this model is very low to explain the variation in the dependent variable (DNPL). Here, the intercept term of the equation is 12.37451 but it is not statistically significant. The regression coefficient of DGDP is 0.938095 which affects the NPL positively though the result is not statistically significant at 5% significance level. The regression coefficients of IFR and IRS are -1.656781 and 0.419316 respectively and both of them are statistically significant at 5% significance level. This result implies that NPL is significantly sensitive to the increase or decrease in inflation rate and interest rate spread. The last regression coefficient of this model is 1.181748. This indicates that as the unemployment rate increases by 1% the NPL will increase by 1.18% although the result is statistically insignificant.

15 VI.

16 Concluding Remarks

Non-performing loan is considered to be one of the most perilous factors of any economy since this is derived from inefficiency, hinders growth and proficient resource allocation. With the growth of the economy, NPL has to be reduced to a level so that it cannot be headache of any economic escalation aspect. This research paper analyzed selected macro economic variables namely GDP growth rate, interest rate spread, inflation rate and unemployment rate with relation to non-performing loan ratio.

Findings of this research concluded that inflation rate has 1.656 points negative relationship with NPL considering other factors constant. Inflationary effects increase repayment capacity because it seems to be less costly of the borrowings in highly inflationary economic provision thus decreases non-performing loan ratio. Side a side, interest rate spread has 0.4193 points positive relationship with NPL ratio considering other things constant. This relationship makes sense in practice as higher the interest rate spread, higher the cost of borrowings which leads to lower debt servicing capacity of the borrowers thus increase non-performing loan ratio.

Nonetheless, other two factors; GDP growth rate and unemployment rate are statistically insignificant according to the results of the analysis. Practically, GDP growth rate and unemployment rates are stirring factors to the increase of economic activity and non-performing loan ratio should have relationship with those variables. In this research paper it is found that there is a positive relationship between GDP growth rate and NPL ratio. This relationship is questionable in practice as higher GDP growth will lead to higher earning capacity of borrowers which will eventually help the economy to get a lower NPL ratio. On the contrary, as the unemployment rate increases NPL also increases. This is true because unemployed borrowers cannot repay their debts as they have limited purchasing power to fulfill their financial obligations.

This paper only took into account of four macroeconomic variables to find out the sensitivity of NPL. Other microeconomic factors, such as banks internal management, credit assessment criteria,

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Volume XVI Issue IV Version I Year ( ) lending policy, borrowers' demographic factors, receivable collection strategy, equity base, profitability, C operating efficiency etc., have not been considered in the analysis. Therefore, the whole analysis of this paper is limited to macroeconomic variables only. It is expected that further studies will be carried out incorporating bank specific variables also known as micro variables along with macroeconomic variables. [1] [2]

Ekanayake E.M.N.N et al (2015) suggested that Interest rate and Real GDP per capita with the NPLs rate.

Sofoklis D. Vogiazas and Eftychia Nikolaidou (2011) applied time series modeling techniques to investigate the deterministic factors of NPLs in the financial system; a system dominated by foreign-owned commercial banks. They suggested those macroeconomic variables, specifically the construction and investment expenditure, the inflation and the unemployment rate, and the country's external debt to GDP and M2 together influence the credit risk of the banking system. Dash and Kabra (2010) researched NPLs in Indian banking sector and found that both bank-level and macroeconomic-level data provided evidence of importance of loans growth, loans to assets ratio, economic growth, and exchange rate for loan losses.

In an empirical study of Liliana DONATH et al In assessing relationship of NPLs with macro economic variables, Khemraj and Pasha (2009) established that GDP growth rate has inverse relationship with NPLs where exchange rate has significant positive force with that NPL. Glogowski (2008) investigated set of macroeconomic variables such as GDP growth, real interest rates and unemployment in relation to NPL for 108 Polish banks.

In a study on Growth Rate and Non Performing Retail Loans, Sedat Mahmudi (2013) investigated that retail credit loan follows the business cycle and also has a positive relationship with growth of real GDP. Gross national product (GNP) also has direct sensitivity with NPLs of a bank.

1

	NPL	GDP	IFR	IRS	UNEMP
Mean	7.347818	6.202000	6.297000	4.832000	4.450000
Median	4.210000	6.310000	6.210000	5.885000	4.450000
Maximum	44.59000	7.100000	7.000000	6.820000	5.000000
Minimum	0.000000	5.000000	5.740000	1.420000	4.200000
Std. Dev.	8.179807	0.568423	0.370574	1.960507	0.211431
Observations	220	220	220	220	220

Figure 2: Table 1 :

2

Variables	Probability	Findings
NPL	0.1123	Non-stationary
GDP	0.1533	Non-stationary
IFR	0.0000	Stationary
IRS	0.0000	Stationary
UNEMP	0.1756	Non-stationary

[Note: Source: Compiled by the author]

Figure 3: Table 2 :

3

Variables	Probability	Findings
DNPL	0.0025	Stationary
DGDP	0.0434	Stationary
IFR	0.0000	Stationary
IRS	0.0000	Stationary
DUNEMP	0.0129	Stationary

Source: Compiled by the author

ii. Pearson Correlation Analysis

The Pearson correlation test reveals the correlation among the variables. It indicates how the variables are related with each other and also to what extent.

Figure 4: Table 3 :

4

	DNPL	DGDP	IFR	IRS	DUNEMP
DNPL	1.000000	0.044387	-0.067582	-0.158227	0.011516
DGDP	0.044387	1.000000	0.487664	-0.129348	-0.616200
IFR	-0.067582	0.487664	1.000000	-0.156869	-0.407353
IRS	-0.158227	-0.129348	-0.156869	1.000000	0.168328
DUNEMP	0.011516	-0.616200	-0.407353	0.168328	1.000000

Source: Compiled by the author

Figure 5: Table 4 :

5

Null Hypothesis:	Obs	F-Statistic	Probability
DGDP does not Granger Cause DNPL	217	3.88952	0.02193
DNPL does not Granger Cause DGDP		2.07150	0.12854
IFR does not Granger Cause DNPL	217	8.02152	0.00044
DNPL does not Granger Cause IFR		2.60243	0.07646
IRS does not Granger Cause DNPL	217	8.93290	0.00019
DNPL does not Granger Cause IRS		2.42981	0.09050
DUNEMP does not Granger Cause DNPL	217	6.79722	0.00138
DNPL does not Granger Cause DUNEMP		0.53738	0.58507
Source: Compiled by the author			

Figure 6: Table 5 :

6

Dependent Variable: DNPL
Method: Least Squares
Sample(adjusted): 2 220
DNPL=C(1)+C(2)*DGDP+C(3)*IFR+C(4)*IRS+C(5)*DUNEMP

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	12.37451	6.419712	1.927580	0.0552
C(2)	0.938095	0.674145	1.391534	0.1655
C(3)	-1.656781	0.998430	-1.659387	0.0485
C(4)	0.419316	0.165006	2.541214	0.0118
C(5)	1.181748	1.567125	0.754086	0.4516
R-squared	0.042459	Mean dependent var		-0.086484
Adjusted R-squared	0.024561	S.D. dependent var		4.751687
S.E. of regression	4.692970	Akaike info criterion		5.952575
Sum squared resid	4713.130	Schwarz criterion		6.029951
Log likelihood	-646.8069	Durbin-Watson stat		2.295605

Source: Compiled by the author
The regression equation can be written as follows:
DNPL=12.37451+0.938095*DGDP-1.6567816*IFR+0.419316*IRS+1.181748*DUNEMP

Figure 7: Table 6 :

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