
Causality Between GDP Growth and Non-performing Loans in Bangladesh: A Toda-Yamamoto Approach

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Abstract: Non-performing Loans (NPLs) are those loans of the banks' from which they are no longer able to receive interest or overdue principal payments. NPL can affect the balance sheet of banks by decreasing banks' profitability as bank cannot generate interest income from their NPLs. Banks' may have to face capital erosion due to higher level of NPL. Due to interconnectedness of banking sector with the overall financial system and the economy, there may have ripple effects throughout the financial system thereby adding to financial instability. The percentage of NPLs to total outstanding loans in Bangladesh was 9.3% in 2017. The aim of this paper is to investigate the causal relationship and the direction of causality between economic growth Gross Domestic Product Growth Rate (GDPGR) and the level of NPLs (NPLR) in Bangladesh using annual data covering the period from 2000 to 2017 within a vector autoregressive (VAR) framework using Toda-Yamamoto method. The main merit of the Toda-Yamamoto procedure is that it can be used irrespective of whether the time series in the system are integrated of different orders or non-cointegrated or both. The order of integration of the variables is initially determined using Augmented Dickey Fuller (ADF) unit root tests. The tests reveal that the maximum order of integration for the variables in the system is one. Applying Toda-Yamamoto approach of Granger causality test, an evidence of a unidirectional causality running from NPLR to GDPGR in Bangladesh is found. This research is expected to come out with good findings which will have implications for the policy makers, regulatory authorities and professionals.

Keywords: Non-performing Loans, Bangladesh, GDP Growth, Toda Yamamoto

1. Introduction

Banks play the foremost role in the developing economy like Bangladesh for mobilizing savings from the surplus economic unit and providing capital to the investors. Banks' performance has significant impacts on allocation of capital and economic growth. Thus, performance of banks is very much important not only for that specific bank, but also for the entire economy. Providing loans and advances to the customers is the banks' prime revenue generating activity. Generally, the loans and advances are the major portion of the banks' asset and their main source of income [1].

The term "NPL" is used interchangeably with "bad loans" as described by Basu [9]. Berger and De Young indicate NPLs as "problem loans" [11]. Fofack termed it as "impaired loans" [19]. In the banking industry of Bangladesh the term "Classified Loans" is also used to indicate NPL. Hou and Bloem mentioned

in their studies that, globally acceptable definition of NPL is not yet formulated [13], [22]. Banking systems of different countries define loan classification system with different scopes and contents. Issa shows that there are variations in definition of NPL among the banking systems of different countries according to their laws and regulations [24]. Bloem show that, banks used both quantitative and qualitative criteria to classify the loans [13]. Usually, number of days is used as a quantitative criterion of loan classification and all the information about the future of the borrower and loans are used as qualitative criteria for classification of loans.

Non-performing Loans (NPLs) are those loans of the banks' from which they are no longer able to receive interest or overdue principal payments. So, NPLs decrease banks' profitability. Increase in NPL also decreases the loanable fund in the financial market. Banks' may have to face capital erosion due to higher level of NPLs. NPLs can affect the balance sheet of banks and

due to interconnectedness of banking sector with the overall financial system and the economy, there may have ripple effects throughout the financial system thereby contributing to financial instability. Thus, exploring the affecting factors of NPLs is a matter of essential importance for the regulatory authorities, banks and governments concerned on financial stability. Determinants of NPL have been analyzed by many researchers and GDP growth rate is found influential on the level of NPL. GDP growth rate is a macroeconomic variable which are not in control of the banking institutions, may have significant causal impact on the non-performing loan.

1.1. Impact of NPLs on Banking Growth

A bank having a high level of NPLs has to incur carrying costs on non-income generating assets that affect not only the profitability but also the capital adequacy of a bank, and in consequence, the bank faces difficulties in augmenting capital resources. A study from IMF found that countries where the banks have high levels of NPLs credit growth remains slow. Firms those are more dependent on bank finance are likely to be affected more than other firms from the reduced lending capacity of banks. It was also mentioned from IMF that banks that have high levels of NPLs on their balance sheets, they also have a lower ability for lending to the real economy. This happens through 3 major channels:

Lower profitability: A high NPL level implies less net operating income for a bank and also reduce profits significantly due to the greater effort that required in order to manage and monitor the large stock of NPLs.

Higher capital requirements: An increased level of NPL increases the risk weights and as a result higher capital requirements will be needed.

Higher funding cost: Other Banks and investors have less willingness to lend or lend with higher rate of interest to the banks having higher level of NPLs [23].

1.2. Impact of NPLs on Economy

As per the ECB annual review high level of 'Non Performing Exposure's or NPEs (i.e. NPLs) create a severe macro prudential problem. First, a large stock of NPLs indicates that households and firms are excessively indebted and impaired, which may decrease consumption and investment, and consequently delay economic recovery. Second, scarce resources in the banking sector, capital, funding, as well as operational capacity, are absorbed by bad assets (NPLs) and cannot be reinvested in new viable investment projects. This, in turn, may elongate the period of subdued economic activity, further aggravating the NPL problem for the banking sector and the economy as a whole'.

1.3. NPLs in Bangladesh

In the context of Bangladesh, well-functioning of the banking sector and subsequent economic development has been significantly constrained by the continuing crisis of the accumulation of NPLs. To ensure transparency and quality of the banks' loan portfolios, determine the actual volume of

quality assets and strengthen credit discipline, Bangladesh Bank, in 1989, adopted prudential norms under Financial Sector Reform Program (FSRP) for Loan Classification and Provisioning covering rules, the suspension of interest due, and the making of provisions against potential loan loss.

According to IMF, A loan is non-performing when payments of interest and principal are past due by 90 days or more, or at least 90 days of interest payments have been capitalized, refinanced or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons to doubt that payments will be made in full. By bank regulatory definition non-performing loans consist of:

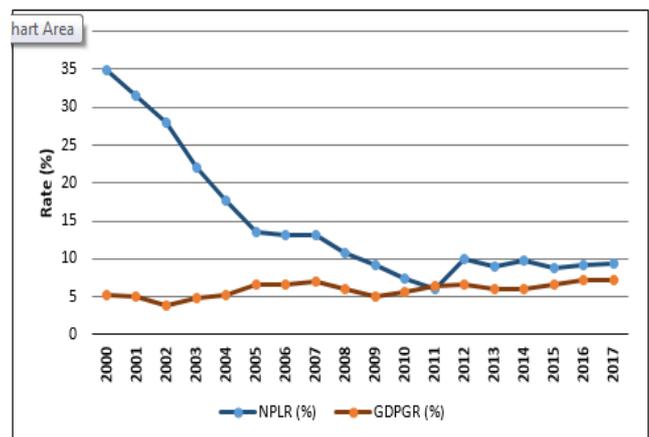
- i Loans that are past due by 90 days or more and still accruing interest, and
- ii Loans which have been placed on nonaccrual (i.e., loans for which interest is no longer accrued and posted to the income statement).

Loan may also be non-performing if it is used in a different way than that for which it has been taken. As per Section 5 (cc) of Bank Company Act 1991, 'defaulting debtor' means any person or institution served with advance, loan granted in favour of him or an institution involving interest or any portion thereof, or any interest which has been overdue for six months in accordance with the definition of Bangladesh Bank. According to Bangladesh Bank "classified loan" is the term used for any loan that a bank examiner has deemed to be in danger of defaulting. The borrower does not necessarily need to miss payments order for a bank to label the account in this manner. The ratio of gross non-performing loan to total outstanding is called the NPL rate.

1.4. Present Scenario

In the banking industry of Bangladesh, the ratio of gross non-performing loan to total outstanding is 14.6% for the last eighteen years but A steady average NPL trend of 9.2% has been maintaining during the last five years and average GDP growth rate is 5.95 for the last eighteen years.

The overall trend of NPL and GDP growth rate rate in Bangladesh from the beginning of this century is shown in the following figure.



Source: Bangladesh Bank and World Bank Group

Figure 1. NPL Rate and GDP Growth Rate trend in Bangladesh.

2. Literature Review

There are many studies conducted all over the world on the problem of NPL in the banking sector.

Makri et al. show strong correlations between various bank-specific and macroeconomic factors by using aggregate data for the period 2000-2008 on a panel of 14 countries [38]. Ekanayake et al. show that, macroeconomic variables like inflation and GDP growth rate have significant inverse relationship with NPLs [18].

Lis et al. econometrically identified various bank-specific and macroeconomic factors of NPL by using panel data of Spanish commercial banks for the period 1985-1997. They found that GDP growth rate has a negative effect on NPL [35]. Salas and Saurina found out the relationship between real growth in GDP and NPLs by studying Spanish banks' data [48].

Keeton and Morris studied on US commercial banks using simple linear regressions and found that large portion of loan losses recorded by the banks are associated to adverse local economic conditions [28]. Bercoff et al examined the fragility of the Argentinean Banking system over the 1993- 1996 periods; they argue that NPLs are affected by both bank specific factors and macroeconomic factors [14]. Rajan and Dhal found that macroeconomic factors have significant impact on NPLs. They used a panel regression analysis for their study [44]. Statistical analysis by Waweru and Kalini on the commercial banks in Kenya also found that high macroeconomic condition is one of the factors of NPLs. Islam and Nishiyama present the empirical results on how bank specific, industry specific and macroeconomics specific factors affect the bank non-performing loans in south Asian countries by using GMM estimator [25]. Waqas, Fatima, Khan and Arif M. show that both macroeconomic and bank specific variables are significantly related to NPLs [54]. Roy, Dey and Bhowmik show that two macro-economic variables GDP growth and inflation are negatively related to NPL in Bangladesh [44].

There is no literature which attempts to explore the causal relationship between GDP growth and NPL rate in Bangladesh using Toda-Yamamoto approach. Thus, this study aims to investigate the causal relationship between GDP

growth and NPL rate in Bangladesh using Toda-Yamamoto approach.

3. Methodology

3.1. Data Collection

GDP growth rate of Bangladesh and NPL data of all the 56 scheduled banks in Bangladesh is collected from secondary sources for the period from 2000 to 2017. NPL data is collected from Annual Reports of Bangladesh Bank of different years. GDP growth rate data is collected from World Bank group database.

3.2. Data Analysis

“STATA 15” statistical software package is used for both descriptive and quantitative analysis of the collected data. The present scenario of NPL in Bangladesh and the economic indicators are presented through the descriptive analysis. In quantitative analysis, Augmented Dickey-Fuller Unit Root Test is done to check the stationarity. Toda-Yamamoto test is done to identify the causal relationship among the variables.

3.3. Toda-Yamamoto Causality Test

It is an augmented Granger causality test. This procedure uses a modified Wald test for restrictions on the parameters of the vector autoregressive VAR (p) model. The test has an asymptotic Chi-squared distribution with p degrees of freedom in the limit when a VAR (p + dmax) is estimated (where dmax is the maximal order of integration for the series in the system). The main merit of the Toda-Yamamoto procedure is that it can be used irrespective of whether the time series in the system are integrated of different orders or non-cointegrated or both [49].

The procedures are as below –

Step-1: Augmented Dickey-Fuller is done to determine the maximal order of integration (dmax)

Step-2: Determining the optimal lag length (p) of the VAR in levels using the information criteria

Step-3: Applying the modified Wald procedure to the VAR (k), where $k = p + dmax$, using the following VAR(k) models:

$$NPL_t = \alpha_1 + \sum_{i=1}^k \beta_{1i} NPL_{t-i} + \sum_{i=1}^k \gamma_{1i} GDPGR_{t-i} + \epsilon_1 \quad (1)$$

$$GDPGR_t = \alpha_2 + \sum_{i=1}^k \beta_{2i} NPL_{t-i} + \sum_{i=1}^k \gamma_{2i} GDPGR_{t-i} + \epsilon_2 \quad (2)$$

In equation (1) if $\gamma_{11} = \gamma_{12} = \dots = \gamma_{1p} \neq 0$, in that case GDPGR has causal impact on NPL. Similarly, In equation (2) if $\beta_{21} = \beta_{22} = \dots = \beta_{2p} \neq 0$, then NPLR has causality on GDPGR.

4. Discussion and Findings

4.1. Descriptive Statistics

The mean, standard deviation, minimum and maximum value of the variables for the period from 2000 to 2017 is presented in Descriptive statistics.

Table 1. Descriptive Statistics.

Variable	Mean	Standard Deviation	Minimum	Maximum
NPLR	14.6	8.7	6.1	34.9
GDPGR	5.9	0.9	3.8	7.3

Source: Compiled by the author based on collected data

Table 2. NPL and GDP growth trend in Bangladesh.

YEAR	NPLR (%)	GDPGR (%)
2000	34.9	5.29
2001	31.5	5.08
2002	28.0	3.83
2003	22.1	4.74
2004	17.6	5.24
2005	13.6	6.54
2006	13.2	6.67
2007	13.2	7.06
2008	10.8	6.01
2009	9.2	5.05
2010	7.3	5.57
2011	6.1	6.46
2012	10.0	6.52
2013	8.9	6.01
2014	9.7	6.06
2015	8.8	6.55
2016	9.2	7.11
2017	9.3	7.28

Sources: NPLR from various reports published by Bangladesh Bank and GDPGR from World Bank Database

4.2. Augmented Dickey Fuller Unit Root Test Result

Augmented Dickey Fuller Unit Root Test has been done to identify that weather all the variables are stationary or not. All the variables under this study must be stationary to perform regression analysis. The result of the test is as follows:

Table 5. Granger Causality Test Results.

Null Hypothesis	P- value	Decision
GDPGR does not Granger Cause NPLR	0.002	Null Hypothesis rejected
NPLR does not Granger Cause GDPGR	0.684	Null Hypothesis Cannot be rejected

Vardar G also finds the same result i.e an unidirectional causal relationship between GDP and NPL using the data of Turkish banking sector ranging from 2007 to 2015 [20].

Sheefeni J examined the data of Namibian banking sector and also finds the unidirectional causal relationship between GDP and NPL [46]. These results are found consistent with the findings of the other similar research. The results revealed that all the macroeconomic determinants play a role in determining non-performing loans. This suggests that the macroeconomic environment is very critical for non-performing loans in the Bangladesh context.

5. Conclusion and Recommendations

Non-performing loans are considered as one of the most

Table 3. Augmented Dickey Fuller Unit Root Test – 1.

Variable	T Statistic	Significance level	I (d)
NPLR	-4.283	1%	I(0)
GDPGR	-3.262	5%	I(1)

Variable NPLR is found stationary at level I(0) at significance level of 1% and GDPGR found stationary at level I(1) at significance level 5% Thus, the maximum order of integration dmax = 1.

4.3. Optimal Lag Length Selection

Table 4. Optimal Lag Length.

Lag	AIC
0	7.21152
1	5.52305
2	5.4621*
3	5.63326
4	5.89937

Table 4 reports that, lag 2 is the optimum lag length as selected by AIC. Thus the optimum lag length i.e p = 2.

4.4. Findings from Granger Causality Test

Table 5 exhibits that there is unidirectional causal relationship exists between the variables i.e GDPGR granger causes NPLR as null hypothesis rejected at 1% level of significance and NPLR does not granger cause GDPGR.

hazardous factors for any Banking industry. The banks having high level of NPLs requires to keep higher level of provision for loan loss that decreases the bank’s revenue and reduces the funds for new lending. This study attempts to investigate the causal relationship between GDPGR and NPLR in in Bangladesh using secondary data. This study explores that there is a unidirectional causality from GDPGR to NPLR in Bangladesh. Thus, GDP growth rate is an important determinant of NPL in Bangladesh. The policy maker should consider the level of GDP growth while making policy regarding credit risk management, loan classification, single borrower exposure limit, money supply etc. The GDP growth rate also should be taken into consideration by the Banks while increasing their loan portfolio.

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