

Determinants of Non Performing Loans: Case of US Banking Sector

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Non Performing Loan Rate is the most important issue for banks to survive. There are lots of factors responsible for this ratio. Some of them belong to firm level issues and some are from macroeconomic measures. However this study is based on the blend. It considers the Real GDP per Capita, Inflation, and Total Loans as independent variables, and Non Performing Loan Ratio as dependent variable. Study uses the data of US banking sector from official web sources of US Federal Reserve System. Years from 1985 to 2010 constitute the study period. Employing correlation and regression tests show that research model used is of good statistical health. All the selected independent variables have significant impact on the depended variable, however, values of coefficients are not much high. Banks should control and amend their credit advancement policy with respect to mentioned variables to have lower non-performing loan ratio.

Keywords: Non Performing Loans, Determinants, NPLs, Banks, Write-offs, United States

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1. Introduction

The link between the Non Performing Loans (NPLs henceforth) and loss of banks, is regarded a fact in literature of banking. Increase in NPLs rate is referred often as the failure of credit policy too. By viewing other side of the picture, it is also evident that financial crisis is also the effect of high NPLs rate in the banking sector. Financial crisis of late 2000s, which started from US and spread into whole world having trading relationships with US, is also labeled as cause of default in mortgages/loans. Increases in NPLs' rate are the main reason of reduction in earnings of banks. The reason behind the bad debts is low repaying capacity of borrowers, which in turn is the result of uneconomic use of loans, low per capita, and high interest rate. Extra flexible credit rationing policy could also be the reason of high NPLs rate.

Hence, it is clear why NPLs rate is most crucial for banks. The aim of this study is to analyze the sensitivity of non-performing loans to macroeconomic indicators in United States of America. In particular, it employs regression analysis and a time series dataset covering 25 years (1984 to 2010) to examine the relationship between non-performing loans rate and several key macroeconomic variables along with the amount of Total Loans.

Literature Review

Lot of researches has been conducted on the widespread issues of banking activities. NPLs also have a lot of literature due to its importance for the survival of banks. While talking about the determinants of NPLs specifically, different categories are involved. At first step there are bank specific determinants, then macroeconomic variables, and at last the regulatory framework. In bank specific factors, total loans, and credit policy are important. In the class of macroeconomic determinants, real GDP per capita, Interest rate are well known. Below paragraphs include literature on the relationships of these factors with NPLs rate.

There is no global standard to define non-performing loans at the practical level. A non-performing loan (NPL) is defined as a sum of borrowed money upon which the debtor has not made his or her scheduled payments for at least 90 days. A nonperforming loan is either in default or close to being in default. Once a loan is nonperforming, the odds that it will be repaid in full are considered to be substantially lower. If the debtor starts making payments again on a nonperforming loan, it becomes a re-performing loan, even if the debtor has not caught up on all the missed payments.

According to BIS, the standard loan classifications are defined as follows:

Passed: Loans paid back

Special Mention: Loans to incorporations, which may get some trouble in the repayment due to business cycle losses

Substandard: Loans whose interest or principal payments are longer than three months in arrears of lending conditions are eased. The banks make 10% provision for the unsecured portion of the loans classified as substandard;

Doubtful: Full liquidation of outstanding debts appears doubtful and the accounts suggest that there will be a loss, the exact amount of which cannot be determined as yet. Banks make 50% provision for doubtful loans;

Virtual Loss and Loss (Unrecoverable): Outstanding debts are regarded as not collectable, usually loans to firms which applied for legal resolution and protection under bankruptcy laws. Banks make 100% provision for loss loans.

Non-performing loans comprise the loans in the latter three categories, and are further differentiated according to the degree of collection difficulties.

The term used in this paper is 'charge-off' which is defined as either a debt that is deemed uncollectible by the reporting firm and is subsequently written off. This type will be classified as 'bad debt

expense' on the income statement, and removed from the balance sheet. Or a probable one-time extraordinary expense incurred by a company that negatively affects earnings and results in a write-down of some of the firm's assets. The write-down arises due to impairments of assets.

One of the early and important studies on the subject of loan losses includes Keeton & Morris (1987). It used NPLs net of charge offs rate as the proxy for loan losses. The study regarded the macroeconomic conditions as the reason of low payback. It also concluded that too much loaning in a sector is the major cause of high bad debts, upon the bad performance in that sector. Study also highlighted that risk taking behavior of banks also lead to the greater loan losses ratios. Many other similar studies proposed that a balanced issue of credit should be made for all sectors of economy, and conservatism prickle should be adhered while issuing loans.

Another research which focused the loan loss ratio of commercial banks in US is Sinkey & Greewalt (1991). They used the loan loss ratio by the proxy constituting charge offs plus NPLs divided by total loans. Study resulted in both external and internal determinants of the NPLs. Excessive financing and interest rate (high) is regarded main reason for high rate of NPLs in US banking sector. Study of Salas & Saurina (2002) conducted the analysis for NPLs by combining the macroeconomic and firm specific factors by employing the Spanish commercial banks' data. It covered the period of 1985 to 1997. It concluded that there is the problem of management inefficiency that leads to greater NPLs rate. The study found that bank size is not related to the NPLs rate, rather these are firm specific factors that generate more loan losses and raise the NPLs rate.

Study of Rajan & Dhal (2003) employed the regression analysis for Indian banks. It claimed that macroeconomic factors and financial factors both have significant impact over the NPLs rate. Reported macroeconomic factors include the GDP growth, among financial

factors; maturity, bank size, credit orientation, and credit terms were included. Some studies also considered the impact of ownership structure on the NPLs rate. One of those is Hu et al (2006) which studied Taiwan's banking sector. It covered the study period of 1996 to 1999. It claimed that government owned banks have fewer NPLs rate. It also found negative relationship between the bank size and NPLs rate. The impact of diversification is not proven significant.

The literature suggests a strapping association between NPLs and several macroeconomic factors. These are annual growth in *GDP*, credit growth, real interest rates, the annual inflation rate, real effective exchange rate annual unemployment rate, broad money supply (*M2*) and *GDP* per capita etc. This study only considers the real *GDP* per capita, Interest Rates and Total Outstanding Loans including Leases and NPLs Rate.

Research Design

To test determinants of NPLs empirically, proper research methodology is used. This section explains the variables of study, hypotheses, data collection, and statistical methods used for data analysis. These items are discussed below one by one.

Variables of study

The variables chosen for this paper are Real *GDP* per capita, Interest rates, Total Outstanding Loans and Non Performing Loan rates.

The study is conducted for the period of 1985 till 2010 as the data for charge off rate which is also known as NPL rate was provided since 1985. Though the real *GDP* per capita, interest rates and Total outstanding loans data was present since 1964 but we cannot use the data starting from 1964 due to the absence of data for NPLs rate.

One of the issues for carrying this study is that some of the earlier researchers used charge off rate as NPLs rate and some studies used write-off rates as their NPLs rate.

Study employs four variables. Three are independent and one is dependent. These variables are:

NPLs' Rate (Dependent)
Total Loans (Independent)
Interest Rate (Independent)
Real GDP per capita (Independent)

Hypotheses

Based on the early literature and variables of study following hypotheses are formulated:

There is significant relationship between the Total Loans and NPLs' rate.

There is significant relationship between the Interest rate and NPLs' rate.

There is significant relationship between the Real GDP per Capita and NPLs' rate.

NPLs' rate can be significantly determined by using Total Loans, Interest rate, and Real GDP per capita collectively.

Research Model

Research model can be expressed mathematically as:

$$NPLR = a_0 + \beta_1 TL + \beta_2 IR + \beta_3 GDPPC + \epsilon$$

Where NPLR is the proxy used for NPLs' rate, TL for Total loans, IR is interest rate, and GDPPC denotes the GDP per capita. ϵ is the error term.

Data Collection

Data is collected from the website of US Federal Reserve System, Bloomberg and website of Statistics department of United States. The data used for analysis is yearly data. London-Interbank Offered Rate of British Bankers Association Fixing for US is taken from Bloomberg. Real GDP per capita is taken from Bureau of Economic Analysis present at Bloomberg. The total loans data is taken from Federal Deposit Insurance Corporation (FDIC). The total loans are in US \$ and in millions. The data of total loans was quarterly data but converted into yearly. NPLs Rate data is taken from the website of

Federal Reserve. Federal Reserve US Charge off Rates for All Banks Total Loans and Leases is used as NPLs rate.

Data Analysis

Due to quantitative research design certain statistical methods are used to empirically test the formulated hypotheses. We used descriptive statistics, Pearson's correlation analysis and Ordinary Least Squares (OLS) regression. In case of OLS we also used diagnostic tests for our data and appropriate remedy as well. In first step descriptive measures are calculated it shows that data contains high variation. While correlation provides that Real GDP per capita has strongest (68%) relationship with NPL rate. Other variables also have significant relations of 40.7% (Interest Rate) and 28.1% (Total Loans). It is evident from the regression analysis that there is good multiple correlation (76.8%) between these variables. Coefficient of determination is 58.9%. It means that 58.9% changes in the NPLs rate can be predicted by the chosen independent variables. Same is the case for adjusted R-squared. It shows the overall goodness of fit for the model. Value of 42.8% is showing that model used is of good statistical health. While discussing variables individually we can see that all the independent variables have their probability values less than the selected significance level 5%. However only statistical significance is not important rather mathematical significance should also be observed. By mathematical significance we mean the coefficients here. Coefficients of the regression equation are the slopes or rates of change in dependent variable due to an independent variable. So in case of mathematical significance results are not too much strong and supporting. Interest rate is showing high value (-0.099) with expected sign of negative, which means the inverse relationship with the dependent variable. Other two coefficients are also very small.

Conclusion

This study attempted to ascertain the determinants of NPLs in the US banking sector. Our empirical results support the view that macro-factors, such as, Interest rate and Real GDP per capita have association with the NPLs rate. Different studies provide different variables based on their statistical research designs. However this change depends on the situational factors which include country level factors, bank level factors and the characteristics of legal and regulatory framework. Study suggests that US banks should consider Real GDP per Capita while issuing loans. More studies could be done by including the saving and other macroeconomic variables to get the true picture of story.

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Appendix

Table 1

Descriptive Measures

Measure	Interest Rates (X_1)	Total Loans (USD Millions) (X_2)	Real GDP Per Capita (X_3)	NPL Rate (Y)
Mean	4.7340	17124291	36689.2056	1.0435
Standard Error	0.5087	1588385	972.2498	0.1228
Median	5.2128	14844080	36679.5684	0.8700
Standard Deviation	2.5937	8099205	4957.5208	0.6263
Kurtosis	-0.8021	-1.026	-1.5325	3.0737
Skewness	-0.1789	0.550	-0.0413	1.6839
Range	9.3694	25108082	15027.7286	2.6200
Minimum	0.2506	6729701	28762.9902	0.4200
Maximum	9.6200	31837783	43790.7188	3.0400

Table 2

Correlation Matrix for Variables of Study

		X1	X2	X3	Y1
X1	Pearson Correlation P-value	1			
X2	Pearson Correlation P-value	-.694** (.000)	1		
X3	Pearson Correlation P-value	-.660** .000	.952** .000	1	

Y	Pearson Correlation	-.407*	.281	.068	1
	P-value	.039	.164	.742	
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).					

Table 3

OLS Regression for Research Model

<i>Regression Statistics</i>					
Multiple R		0.768			
R Square		0.589			
Adjusted R Square		0.533			
Standard Error		0.428			
		<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Interest Rates (X_1)		-0.099	0.046	-2.151	0.04
Total Loans (USD Millions) (X_2)		0.000	0.000	4.340	0.00
Real GDP Per Capita (X_3)		-0.000	0.000	-4.761	0.00

Diagram 1

Graphical View of NPL Rate in US Banking Sector

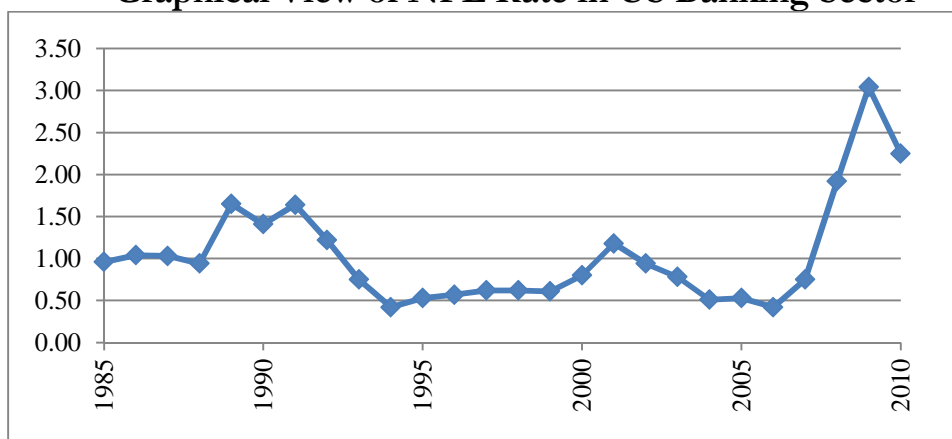


Diagram 2

Trends of Interest Rate in US Economy

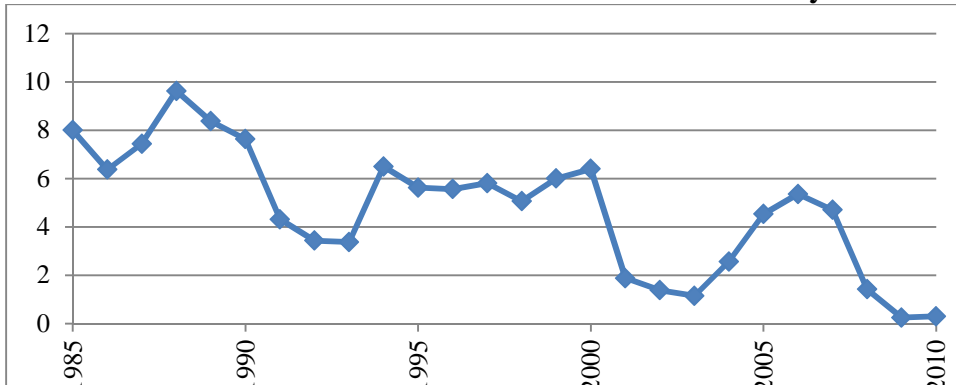


Diagram 3

Real GDP per Capita of US Economy

