Analysis on “Non-performing loans vs Macroeconomic factors”

1. **Introduction and Literature Review**

Banking sector is one of the main instruments of development of the economy of the country. Stability of banking sector is important for country’s growth. The main functions of the banks to give out loans is to use the surplus deposit which get from people those have extra money. Banks give loans and advance sector of the country such as agriculture, industry, personal and government. For most countries, nonperforming loans is the number one priority for economic recovery as reducing the excessive level of nonperforming loans. The NPL plays central role in the financial crisis. It is very crucial for every bank to manage bad loan and crisis. situation.

Non-performing loans are the loans a borrower fail to pay the scheduled payment past 90 days. This involves two scenarios where a borrower declares that he has no money to pay back (and it has been 90 days already) and another scenario could be a borrower didn’t pay back past 90 days of scheduled payments. In the second case, I would say it has high probability of being a defaulter whereas in the first scenario, a borrower is a defaulter. NPL ratio is calculated by dividing bank nonperforming loans to total gross loans. In this analysis, we will not focus on the above two scenarios, rather our focus is on the macroeconomics factors which include GDP growth, Inflation-GDP deflator, Official exchange rate, Tax revenue, Foreign direct investments net inflows, Foreign direct investment net outflows, Borrowers from commercial banks, Bank capital to assets ratio, Real Interest rate and Lending Interest rate. These are macroeconomic factors that will be used to analyze the relationship between each variable with non-performing loans.

On reviewing various literature, we found that NPL and GDP growth has a negative relationship, when GDP growth increases the NPL will decrease as it increases the living style which reduces the number of borrowers. Talking about inflation and NPL, they have a positive relationship. As the inflation increases, it increases the number of borrowers, reduces the purchasing power as income is reduced. It further leads to increase in borrowers and high probability of NPL. Another variable considered was bank from commercial banks (BCB) which defines the number of borrowers per 1000 adults, higher this number, higher the probability of NPL. Like the above we will further be analyzing the relationship of other variables with NPL.

1. **Data and Methodology**

The data has macroeconomics factors and non-performing data based on several countries from year 2001 to 2020. But for this analysis, panel data hasn’t been considered. The data is collected from world bank under world development indicators section. On collecting the raw data, we had a lot of missing values. Those observations were omitted. We have further taken that data set to perform the analysis which include data exploration and regression analysis using charts and graphs.

Nonperforming loans are considered as output variable and other macroeconomics variables are independent variables which will define the relationship with the dependent variable. Total there are ten independent variables. Hereby are the variables:

Y: Bank nonperforming loans to Total gross loans

X1: GDP, growth rate

X2: Inflation, GDP deflator

X3: Official exchange rate

X4: Tax Revenue

X5: Foreign Direct Investment-net inflows

X6: Foreign Direct Investment-net outflows

X7: Borrowers from commercial banks

X8: Bank capital to assets ratio

X9: Real Interest rate

X10: Lending Interest rate

The methodology used is simple linear regression and to justify or evaluate the models, we used exhaustive search using a software i.e XLminer. This software is friendly, and the results were interpreted easily. Hereby are the variables and how they are treated for the model. The model that has been used for first part of analysis is as follows:

Y = β0 + β1X1 + β2 X2 + β3X3 + β4 X4 +β5X5 + β6X6 + β7X7 +β8X8 + β9X9 +β10X10+ε

Using exhaustive search on XLminer, we performed missing data handling and looked for the best subsets which suggested best models to understand the trend of nonperforming loans. To identify which, out of the two models, is a good model, we must observe the increasing trend of adjusted R square. The increasing adjusted R square is a good sign, with respect to the variables, to identify the best model. Adjusted R-square is not the only element to be observed. In the analysis we will also observe how R square, SSE, RSS, variable p-value, model p-value, removing outliers, data quality, etc., to understand the analysis. Moreover, visuals will be helpful to understand the data and relationship.

1. **Analysis and Results**

On analyzing the model including all the variables from the data set, we received the following analysis. Hereby are few graphs and charts which can help identify the relationship much better. Also, it will provide clarity to the reader.

1. Data Exploration

A screenshot of a computer

Description automatically generated with medium confidenceGraphical user interface, text, application

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Table1: Descriptive statistics

Table1 shows the descriptive statistics of the variables showing the potential relationship among the variables.

Table, Excel

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Table2: Correlation Matrix

Table 2 is a correlation matrix which is used to summarize the data and understand the patterns of the variable. To understand the correlation, we have a range i.e., -1 to 1, where -1 indicates a perfectly negative linear correlation, 0 indicates no linear correlation and 1 indicates perfectly positive correlation among the two variables. Most of the variables has negative linear correlation.