

Comparative Analysis of Factors Non-Performing Loan in Ukraine and India

Hanna Strokovych¹, Amit Kumar², Nataliia Pohorelenko³,
Oleksiy Dzenis¹, Viktoriia Dzenis¹

¹ Simon Kuznets Kharkiv National University of Economic, ave. Nauki, 9-A, Kharkiv, 61166, Ukraine

² Integral University, Lucknow, U.P., Dasauli, Bas-ha Kursi Road, Lucknow, 226026, India

³ Scientific Institute of the State High Educational Institution "University of Banking", ave. Peremohy 55, Kharkiv, 61174, Ukraine

Abstract – The article is devoted to theoretical and methodological problems of bank unrecovered loan in Ukraine and India. The purpose of this article is to identify the key sensitive indicators of unrecovered loan in Ukraine and Indian banking system. The article solves the following research tasks: a descriptive statistical analysis of bank unrecovered loan to the total loans, bank cash reserves to the ratio of bank assets, inflation, consumer prices, interest rates on loans, GDP; data on bank bad loans to the total amount of total loans, bank cash reserves, the ratio of bank assets, inflation, consumer prices, interest rates on loans, GDP are standardized; a regression model of the dependence of non-performing bank loans on the total loan on the factors of the ratio of bank cash reserves to bank assets, inflation, consumer prices, interest rates on loans and GDP was built; analysis of the remains of the regression model. According to the results of the study, the main factors that affect bank unrecovered loan for the total amount of loans are: for Ukraine – the ratio of cash reserves to bank assets and GDP; for India – consumer price inflation and GDP.

Keywords – unrecovered loan, economic, stability, indicator, banking system, Ukraine, India, cash reserves, bank assets, ratio, inflation, consumer prices, lending interest rate, GDP.

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Corresponding author: Hanna Strokovych,
Simon Kuznets Kharkiv National University of Economic,
Ukraine.


Email: annastrokovych@gmail.com

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1. Introduction

The banking system ensures the implementation of all processes of accumulation, redistribution of both external and internal financial resources. In fact, it remains the main financial intermediary in the context of globalization. Therefore, ensuring the smooth operation of the banking system is essential for the effective operation of global business. Vertical and horizontal integration of the banking sector is being carried out, which allows attracting a greater amount of financial resources, offering customers a large list of various services, and creating a network of branches around the world.

At the same time, the problem of accumulation of unrecovered loan remains very serious and negatively affects the work of the banking system. It will become especially aggravated during the quarantine and post-quarantine periods, as according to some estimates the world economy will reach the level of 2008 and even worse. Therefore, banks will be forced to adapt in order to ensure efficient operation in the new conditions. Therefore, it is important to identify key sensitive indicators of unrecovered loan. The analysis is carried out on the example of banking systems of Ukraine and India.

The purpose of this article is to identify the key sensitive indicators of unrecovered loan in Ukraine and Indian banking system.

Based on the goal, the article solves the following research tasks:

- a descriptive statistical analysis of bank unrecovered loan to the total loans, bank cash reserves to the ratio of bank assets, inflation, consumer prices, interest rates on loans, GDP;
- data on bank bad loans to the total amount of total loans, bank cash reserves, the ratio of bank assets, inflation, consumer prices, interest rates on loans, GDP are standardized;
- a regression model of the dependence of non-performing bank loans on the total loan on the factors of the ratio of bank cash reserves to bank assets, inflation, consumer prices, interest rates on loans and GDP was built;
- analysis of the remains of the regression model.

The basis of the study was scientific papers on unrecovered loan in the banking system and statistical data. To achieve the goal, the following methods were used: abstract-logical method, method of analysis and synthesis – formation and substantiation of the system of indicators of evaluation of unrecovered loan in Ukraine and India banking system; regression analysis – for form a model of dependency bank unrecovered loans to total loans from factors of bank cash reserves to bank assets ratio, inflation, consumer prices, lending interest rate and GDP.

2. Literature Review

The problem of unrecovered loan is due to many factors. İslamoğlu examines the effect of macroeconomic variables on the unrecovered loans of various banks of Istanbul and finds the relationship between stock/GDP ratio and commercial loan rates [7]. Author finally conclude that increase in the public borrowing requirements would cause to decrease in loanable funds in loan market and therefore bank are obliged to limit their loan placement.

Slavyuk, Shkvarchuk, Kondrat focus on the main reason for the financial market [11]. The imbalance in Ukraine lies in the fact that financial intermediaries do not fulfill their functions of turning savings into real investments. They prove that their main activity is speculative and involves a high level of risk and does not affect the GDP of Ukraine.

Beck, Jakubik, and Piloiu indicate a continued downward trend in global economic activity, which is the most important risk for the quality of banking assets [2]. In particular, a depreciation of the exchange rate can lead to an increase in unrecovered loan in districts that have a high degree of leadership in foreign currency with respect to unhedged borrowers.

Korpaniuk analyses the accounting of non-performing long-term bank loan in Ukraine [7], [9]. According to her the banking system of the country, trends in the development of methodical support of the given process. It has been found that the present situation, the use of European experience in this field is important, she finally concludes the accounting of unrecovered loan obtained by using updated accounting method analysis.

According to Mohanty, Das, Kumar, corporate variables, such as net sales growth and net profit margin, have a statistically negative effect on gross arrears ratio [8], [10]. This implies that higher rates of economic growth, an increase in the stock market index and improved performance in the private corporate sector will lead to a decrease in the gross arrears ratio, so that as a result of a bank scan, more loans will be provided to meet the demand for credit in the economy. The authors argue that capital injection is one of the factors that delay the problem of unrecovered loan.

Research Altunbas et al. [1] indicate that unrecovered loan lead to inefficient financing in the banking sector. Berger and De Yung [3] note that poor governance in banking institutions leads to poor quality loans and, consequently, increases the level of unrecovered loan.

The results of the Nkusu [9] study showed that adverse macroeconomic development, in particular, a decline in real GDP, high unemployment, high interest rates, falling housing prices and falling stock prices negatively affected bad loans.

A study by De Bock and Demyanets [4], [5] showed that a reduction in real GDP, depreciation of the currency against the US dollar, weaker trading conditions and outflow of debt - which leads to an increase in capital, leads to an increase in the aggregate coefficient of overdue debt in the banking sector.

Kjosevski and Petkovski [6], [8] used ROA and ROE as measures of effectiveness for the banks. These indicators are based on net profit, loan impairment costs have been deducted from the operating income. The profitability indicator includes part of the impact arising from increased credit risk. Thus, the author recommends inputting the limitation and offers to researchers use other profitability measures.

3. Research Results

Unrecovered loan have been a huge issue to provide economic stability and constantly growth of economies. In Ukraine, unrecovered loan had maximized value to total loans in 2017, 2018, due to influence external and internal factors. As a result, minimum non-performing loan was in 2008 (Table 1). In India, unrecovered loan had maximized value to total total loans in 2017 and the minimum unrecovered loans were in 2008-2010 (Table 2).

Table 1. Unrecovered loan in the Ukraine Banking System and other indicators

Indicator Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bank unrecovered loans to total total loans (%)	3,88	13,70	15,27	14,73	16,54	12,89	18,98	28,03	30,47	54,54	52,85
Bank cash reserves to bank assets ratio (%)	4,23	4,95	6,30	5,81	5,49	7,01	5,77	11,66	11,36	11,16	10,74
Inflation of consumer prices (annual %)	25,23	15,88	9,37	7,96	0,57	-0,24	12,07	48,70	13,91	14,44	10,95
Lending interest rate (%)	17,49	20,86	15,87	15,95	18,39	16,65	17,72	21,82	19,24	16,38	19,00
GDP (mln US\$)	179992	117228	136419	163160	175781	183310	131805	90615	93270	112154	130832

Source: World Bank Group.

Table 2. Unrecovered loan in the India Banking System and other indicators

Indicator Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bank unrecovered loans to total total loans (%)	2,45	2,45	2,45	2,67	3,37	4,03	4,35	5,88	9,19	9,98	9,46
Bank cash reserves to bank assets ratio (%)	11,26	10,00	9,80	9,15	8,79	8,12	8,54	8,47	10,23	8,19	8,12
Inflation of consumer prices (annual %)	8,349	10,882	11,989	8,858	9,312	10,908	6,353	5,872	4,941	2,491	4,861
Lending interest rate (%)	13,31	12,19	8,33	10,17	10,6	10,29	10,25	10,01	9,67	9,51	9,40
GDP (mlrd US\$)	1198,9	1341,89	1675,62	1823,05	1827,64	1856,72	2039,13	2103,59	2290,43	2652,24	2718,73

Source: World Bank Group

The data for this study was analyzed over the period 2008 to 2018. Table 3, 4 presents a summary statistics of bank unrecovered loans to total loans,

bank cash reserves to bank assets ratio, inflation, consumer prices, lending interest rate and GDP over the period 2008 to 2018.

Table 3. Descriptive statistics for Ukraine

Indicator Name	Valid N	Mean	Minimum	Maximum	Std. Dev.
Bank unrecovered loans to total total loans (%)	11	23,8	3,88	54,5	16,43
Bank cash reserves to bank assets ratio (%)	11	7,7	4,23	11,7	2,91
Inflation of consumer prices (annual %)	11	14,4	-0,24	48,7	13,36
Lending interest rate (%)	11	18,1	15,87	21,8	1,97
GDP (mln US\$)	11	137687,8	90615,00	183310,0	33635,61

Source: development of authors

We can analyze the information presented in Table 3 about Ukraine. The average bank unrecovered loans to total total loans size is 23,8 % with a maximum size of 54,54 % in 2017 and a minimum size of 3,88 % in 2008. Standard deviation is 16,43. Bank cash reserves to bank assets ratio size is 7,7 % with a maximum size of 11,7 % in 2015 and a minimum size of 4,23 % in 2008. Standard deviation is 2,91. Inflation, consumer prices size is 14,4 % with

a maximum size of 48,7 % in 2015 and a minimum size of -0,24 % in 2013. Standard deviation is 13,36. Lending interest rate size is 18,1 % with a maximum size of 21,82 % in 2015 and a minimum size of 15,87 % in 2010. Standard deviation is 1,97. GDP size is 137687,8 mln US\$ with a maximum size of 183310 mln US\$ in 2013 and a minimum size of 90615,00 mln US\$ in 2015. Standard deviation is 33635,61.

Table 4. Descriptive Statistics for India

Indicator Name	Valid N	Mean	Minimum	Maximum	Std. Dev.
Bank unrecovered loans to total total loans (%)	11	5,116	2,450	9,980	3,0304
Bank cash reserves to bank assets ratio (%)	11	9,152	8,120	11,260	1,0378
Inflation of consumer prices (annual %)	11	7,711	2,491	11,989	3,0188
Lending interest rate (%)	11	10,339	8,330	13,310	1,3609
GDP (mlrd US\$)	11	1957,085	1198,900	2718,730	477,4918

Source: development of authors

Then we can analyze the information presented in Table 4 about India. The average bank unrecovered loans to total loans size is 5,116 % with a maximum size of 9,98 % in 2017 and a minimum size of 2,45 % in 2008-2010. Standard deviation is 3,0304. Bank cash reserves to bank assets ratio size is 9,152 % with a maximum size of 11,26 % in 2008 and a minimum size of 8,12 % in 2013. Standard deviation is 1,0378. Inflation, consumer prices size is 7,711 % with a maximum size of 11,989 % in 2010 and a minimum size of 2,481 % in 2017. Standard deviation is 3,0188. Lending interest rate size is 10,339 % with a maximum size of 13,310 % in 2008 and a minimum size of 8,33 % in 2010. Standard deviation is 1,3609. GDP size is 1957,085 mlrd US\$ with a maximum size of 2718,730 mlrd US\$ in 2018 and a minimum size of 1198,900 mlrd US\$ in 2008. Standard deviation is 477,4918.

Thus, unrecovered loan adversely affect economic stability and economic growth. The statistical analysis carried out indicates more significant deviations in the analyzed indicators in the banking system of Ukraine compared with India. The gradual growth of unrecovered loan in Ukraine, their increase by 13.62 times leads to deflation, and after that - to sharp inflationary processes and an increase in interest rates on loans. This impedes the development of the economy. In India, we observe a gradual increase in unrecovered loan and their increase by 3.87 times over 11 years, which is characterized by slight inflationary fluctuations and lower lending rates. This allows the development of the Indian economy.

Therefore, it seems appropriate to determine the factors that have the most significant effect on unrecovered loan. Based on the objectives of the study, the dependent variable is non-performing bank loans in total loans. Independent variables in this study are considered as: bank cash reserves to bank assets ratio, inflation, consumer prices, lending interest rate and GDP.

At first, the initial data were normalized in order to eliminate differences in the indicators measurement units (Table 5, 6).

Then a regression analysis was conducted. The results of determining the regression estimates of the equation for each of the countries are presented in tables 7, 8.

According to the information presented in Table 7, 8: correlation coefficient is 0,8664 for Ukraine and 0,97689152 for India. The correlation coefficients belong to the range (0.6; 0.9) therefore linear relationship is sufficient.

Multiple correlation coefficient is 0,7507 (Ukraine) and 0,9543 (India), therefore, a strong correlation is observed between the effective sign and these factor signs. Multiple determination coefficient is only 75,07 % (Ukraine) and 95,43 % (India), of the variance of the effective trait is associated with these factor traits. The value of the Fisher test is 4,5173 (Ukraine) 31,335 (India); number of degrees of Fisher criterion is $k_1=4$ i $k_2=9$, the number of freedom degrees (the Student's criterion) is 9. The calculated value of the Fisher criterion is greater than the critical value and, therefore, the regression equation as a whole is statistically significant and there is good agreement with the observational data. Therefore, the regression model is suitable.

Table 5. Data standardization for Ukraine

Period	Indicator Name				
	Bank unrecovered loans to total total loans (%)	Bank cash reserves to bank assets ratio (%)	Inflation of consumer prices (annual %)	Lending interest rate (%)	GDP (mln US\$)
2008	-1,21	-1,19	0,81	-0,32	1,26
2009	-0,62	-0,94	0,11	1,39	-0,61
2010	-0,52	-0,47	-0,38	-1,14	-0,04
2011	-0,55	-0,64	-0,49	-1,10	0,76
2012	-0,44	-0,75	-1,04	0,14	1,13
2013	-0,66	-0,23	-1,10	-0,75	1,36
2014	-0,29	-0,66	-0,18	-0,21	-0,17
2015	0,26	1,37	2,56	1,88	-1,40
2016	0,41	1,27	-0,04	0,56	-1,32
2017	1,87	1,20	-0,00	-0,88	-0,76
2018	1,77	1,05	-0,26	0,45	-0,20

Source: development of authors

Table 6. Data standardization for India

Period	Indicator Name				
	Bank unrecovered loans to total total loans (%)	Bank cash reserves to bank assets ratio (%)	Inflation of consumer prices (annual %)	Lending interest rate (%)	GDP (mln US\$)
2008	-0,88	2,03	0,21	2,18	-1,59
2009	-0,88	0,82	1,05	1,36	-1,29
2010	-0,88	0,62	1,42	-1,48	-0,59
2011	-0,81	0,00	0,38	-0,12	-0,28
2012	-0,58	-0,35	0,53	0,19	-0,27
2013	-0,36	-0,99	1,06	-0,04	-0,21
2014	-0,25	-0,59	-0,45	-0,07	0,17
2015	0,25	-0,66	-0,61	-0,24	0,31
2016	1,34	1,04	-0,92	-0,49	0,70
2017	1,60	-0,93	-1,73	-0,61	1,46
2018	1,43	-0,99	-0,94	-0,69	1,60

Source: development of authors

Table 7. Regression Summary for Dependent Variable: Bank unrecovered loans to total loans for Ukraine

N=14	Regression Summary for Dependent Variable: Var1 (Spreadsheet1) R= 0,86644142 R ² =0 ,75072074 Adjusted R ² = 0,58453457 F (4, 6) = 4,5173 p<,05038 Std.Error of estimate: 0,64457					
	b*	Std. Err. of b*	b	Std. Err. of b	t (9)	p-value
Intercept			0,000000	0,194344	0,000000	1,000000
Bank cash reserves to bank assets ratio (%)	0,852114	0,294866	0,852114	0,294866	2,889832	0,027700
Inflation of consumer prices (annual %)	-0,263144	0,274661	-0,263144	0,274661	-0,958068	0,375025
Lending interest rate (%)	-0,081272	0,280435	-0,081272	0,280435	-0,289808	0,781718
GDP (mln US\$)	-0,139297	0,345605	-0,139297	0,345605	-0,403051	0,700880

Source: development of authors

Table 8. Regression Summary for Dependent Variable: Bank unrecovered loans to total loans for India

N=14	Regression Summary for Dependent Variable: Var1 (Spreadsheet1) R= 0,97689152 R ² =0,95431704 Adjusted R ² = 0,92386174 F (4, 6) = 31,335 p<0,00037 Std. Error of estimate: 0,27593					
	b*	Std. Err. of b*	b	Std. Err. of b	t(9)	p-value
Intercept			-0,000000	0,083197	-0,000000	1,000000
Bank cash reserves to bank assets ratio (%)	0,404689	0,147131	0,404689	0,147131	2,750543	0,033268
Inflation of consumer prices (annual %)	0,087744	0,248951	0,087744	0,248951	0,352454	0,736548
Lending interest rate (%)	0,296129	0,180540	0,296129	0,180540	1,640247	0,152064
GDP (mln US\$)	1,457859	0,371780	1,457859	0,371780	3,921295	0,007790

Source: development of authors

The column b in the Regression Summary table - contains the values of the parameters: $b_1 = 0,852114$, $b_2 = - 0,263144$, $b_3 = 0,087744$, $b_4 = - 0,139297$ (Ukraine); $b_1 = 0, 404689$, $b_2 = 0,087744$, $b_3 = 0,296129$, $b_4 = 1,457859$ (India). To test the significance of the coefficients (b), the observation values of the Student's t test for each coefficient are used. These values are in column t (9) of the Regression Summary table: $t_{observ}(b_1) = 2,889832$, $t_{observ}(b_2) = -0,958068$, $t_{observ}(b_3) = -0,289808$, $t_{observ}(b_4) = - 0,403051$ (Ukraine); $t_{observ}(b_1) = 2,750543$, $t_{observ}(b_2) = 0,352454$, $t_{observ}(b_3) = 1,640247$, $t_{observ}(b_4) = 3,921295$ (India).

It is appropriate to test the linear model for adequacy using the Fisher test. The critical value of the Fisher criterion with the level of significance $\alpha = 0.05$ was obtained $F(1,9) = 3,249836$. Fisher's observation value $F_{observ} = 4,5173$ (Ukraine) and $F_{observ} = 31,335$ (India) greater than the critical value $F(1,9) = 3,249836$, then the linear models are adequate.

The next step in the study is to analyze the presence of a pair correlation between the factors attributes included in the regression model, using the correlation matrix (tables 9, 10).

Table 9. Correlation matrix for Ukraine

	Bank cash reserves to bank assets ratio	Inflation of consumer prices	Lending interest rate	GDP	Bank unrecovered loans to total total loans
Bank cash reserves to bank assets ratio	1,000000	0,375767	0,322199	-0,714818	0,826604
Inflation of consumer prices	0,375767	1,000000	0,625819	-0,551969	0,084363
Lending interest rate	0,322199	0,625819	1,000000	-0,565735	0,108702
GDP	-0,714818	-0,551969	-0,565735	1,000000	-0,556550
Bank unrecovered loans to total total loans	0,826604	0,084363	0,108702	-0,556550	1,000000

Source: development of authors

On the basis of the data presented in Table 9, a very strong relationship between factor signs bank unrecovered loans to total loans and bank cash reserves to bank assets ratio is observed, since the pair correlation coefficient between them is 0,827. Between signs lending interest rate and inflation of consumer prices also between GDP and lending interest rate the relationship is moderate. Signs of bank unrecovered loans to total loans and lending interest rate are independent among themselves.

Correlation matrix in table 10 confirms a very strong relationship between factor signs bank unrecovered loans to total loans and GDP, Bank unrecovered loans to total loans and Inflation of consumer prices is observed, since the pair correlation coefficient between them is 0,91 and 0,87. Between signs lending interest rate and GDP also between Bank cash reserves to bank assets ratio and GDP, inflation of consumer prices and GDP the relationship is moderate. The remaining signs are not characterized by the presence of a significant relationship between each other.

Table 10. Correlation matrix for India

	Bank cash reserves to bank assets ratio	Inflation of consumer prices	Lending interest rate	GDP	Bank unrecovered loans to total total loans
Bank cash reserves to bank assets ratio	1,000000	0,318360	0,554051	-0,685635	-0,402959
Inflation of consumer prices	0,318360	1,000000	0,212900	-0,791725	-0,874889
Lending interest rate	0,554051	0,212900	1,000000	-0,676789	-0,448083
GDP	-0,685635	-0,791725	-0,676789	1,000000	0,910373
Bank unrecovered loans to total total loans	-0,402959	-0,874889	-0,448083	0,910373	1,000000

Source: development of authors

The graph of the normal probability of the results is presented in Fig. 1, 2.

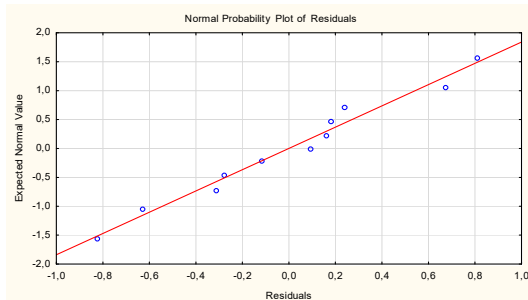


Figure 1. Normal probability plot of results for Ukraine
Source: development of authors

The residuals lie well in the straight line, which indicates the adequacy of the model.

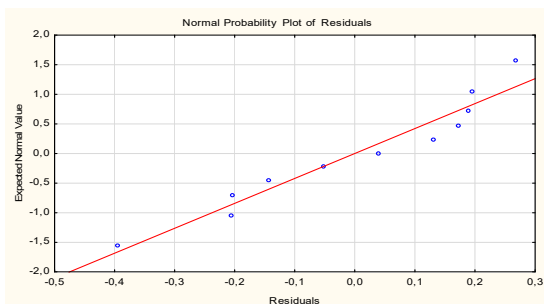


Figure 2. Normal probability plot of results for India
Source: development of authors

This results show that the coefficient of inflation, consumer prices, lending interest rate, GDP in the equation where NPL is the dependent variable is negative and statistically significant at the 0,05 % level.

4. Conclusions

A comparative analysis of unrecovered loan in Ukraine and India indicates a significantly higher growth rate in Ukraine, which as a result leads to deflation and then to high inflation and an increase in interest rates on loans and, as a result, hinders economic development entrepreneurship. The banking sector in India is characterized by small inflationary fluctuations and lower lending rates, which contributes to the development of the Indian economy.

The main factors affecting bank unrecovered loan for the total amount of loans are: for Ukraine – the ratio of cash reserves to bank assets and GDP; for India – consumer price inflation and GDP. Therefore, when improving a bank management strategy, unrecovered loan should take into account the influence of these factors.

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