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Research Article

Macroeconomic and Bank-Level Factors Impact on NPL Ratio

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ABSTRACT

The paper is aimed at analyzing and assessing the impact of macroeconomic and bank-level factors of non-performing loans. Those factors are very important and have become increasingly popular. The non-performing loan ratio is one of the most important tools used to reflect the stability of the banks. The main reason of this study about is to examine which macroeconomic and bank-level components influence the NPL of Armenian banks. The study focused on Armenian banks also provides comparisons with the US banking sector. The linear regression models and correlations analysis methodology was used to decide and assess the critical relationship between the periods from January 2013 to December 2020. The main results of this study could be useful for bank stability and loan portfolio management, and shown that capital adequacy ratio, return on assets, liquidity ratio, return on equity from bank-level factors and yield curves, national currency from macroeconomic factors has no significant effect on explaining the NPL ratio in a multidimensional perspective. On the other hand, the consumer price index, the economic activity index and non-residents loans ratio have a negative impact on the NPL ratio. Unemployment rate, operating efficiency, USD/AMD exchange and fuel price have a positive effect on the NPL ratio.

Keywords: NPL Ratio, Bank`s Loan Portfolio, Economic Activity Index, Consumer Price Index, Factors Impact, Autocorrelation.

Introduction

According to the data of the World Bank for the years 2013-2020 (World Bank, 2022), Armenia has lagged behind the large economies in the large number of non-performing loans (NPLs). These countries were selected for analyzing NPLs likely based on their economic significance, diverse geographical locations, or relevance to a specific research or comparative analysis. The period 2013-2020 was chosen for NPL analysis to capture the post-financial crisis recovery and evaluate the long-term impact of economic policies and reforms on the prevalence of NPL. The United States and the United Kingdom demonstrated remarkable improvements in loan quality, with their NPL ratios decreasing by 1.435 and 1.839 percentage points, respectively. Conversely, China and India experienced substantial increases in NPL ratios, indicating heightened credit risk with China's NPL ratio rising by 1.840 points and India's by 3.939 points during this period. Similarly, Armenia's NPL ratio also saw a notable increase over the same period, with a rise of 2.055 percentage points. This suggests an increase in credit risk within Armenia's banking sector between 2013 and 2020 (Table 1).

As can be seen in the Figure 1, an increasing trend in NPLs can be seen in these countries in recent years, with the exception of US and UK, although the last two have been declining since 2019. From the NPL index of Armenian banks on a monthly basis (Figure 2), we can see that the index of non-performing loans reached its peak in the first quarter of 2016 (10.5%), then there is a downward trend, reaching 4.8% in the fourth quarter of 2018. From 2018, growth is observed, which becomes more noticeable from the second quarter of 2020,

amounting to 6.55% in the fourth quarter of 2020.
The issue is widely discussed by various researchers in different countries, which speaks to the urgency of the topic,

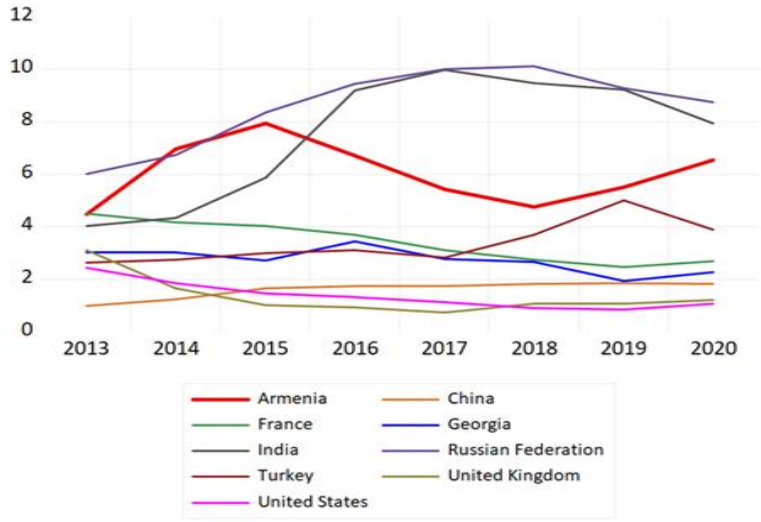


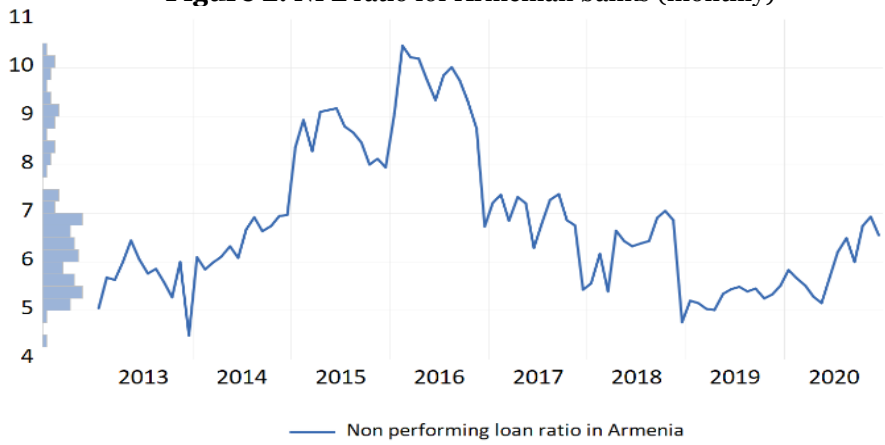
Figure 1. Banks non-performing loans to total gross loans in 2013-2020, %

Table 1. Banks non-performing loans to total gross loans in percent

Country	2013	2020	Difference
United States	2.500	1.065	1.435
United Kingdom	3.100	1.261	1.839
China	1.000	2.84	-1.840
France	4.500	2.705	1.795
India	4.000	7.939	-3.939
Armenia	4.500	6.555	-2.055
Georgia	3.000	2.267	0.733
Turkey	2.600	3.89	-1.290
Hongkong	0.500	0.902	-0.402

and we have used a variety of professional publications, and the main ones are listed in the literature. Bernanke and Gertler (1989) and Carlstrom et al (2016), Bernanke et al. (1998), who developed the concept of financial accelerators believe that credit markets are cyclical and asymmetried information between creditors and debtors can amplify and propagate shocks in credit markets. The Kiyotaki and Moore (1997) model suggests that relatively small shocks may be sufficient to explain business cycle volatility if credit markets are imperfect. Several studies examined the causes of non-performing and problem loans (eg, Espinoza & Prasad (2010), Fernandez L. et al. (2000), Boudriga et al. (2009)).

Figure 2. NPL ratio for Armenian banks (monthly)



There is a growing recognition that the number or percentage of NPLs is related to bank failures and country's financial health. Particularly after the 2007-2009 global financial crisis started in the United States

and spread worldwide due to the rapid rise in the default rate of mortgages, the problem of NPLs has received increasing attention. The decision to analyze and compare NPLs in Armenia and the USA arises from the aim of comprehending the approaches employed by these nations, which embody distinct economic and financial landscapes, in addressing credit risk and assessing the overall robustness of their banking systems. This endeavor is driven by the goal of yielding pertinent insights that hold relevance for rigorous financial analysis and the formulation of consequential policy recommendations. In the realm of academic research on NPLs, this paper stands as a distinctive and noteworthy contribution, characterized by a narrative approach that sets it apart from the broader scholarly landscape. This narrative approach enriches the paper by adding depth, context, and a compelling storyline to the discussion, making it an invaluable asset to the field of NPL research.

One of the prominent features that elevate this paper is its unique comparative approach, which centers on the examination of NPLs in both Armenia and the United States. In contrast to many research papers that focus solely on individual countries or regions included Armenia (Hambardzumyan, A., & Mesropyan, M., 2022), this paper embarks on a comparative journey. Through this approach, readers are offered a rich tapestry of insights into how different economic contexts and policy strategies can exert distinct influences on credit risk and loan quality. Furthermore, this paper extends its analytical lens over a substantial period, concentrating on the years spanning from 2013 to 2020. This extended temporal frame facilitates the capture of the post-financial crisis recovery period and facilitates an in-depth exploration of the enduring impacts of economic policies and reforms on the prevalence of NPLs. By doing so, this paper not only presents a snapshot but also unravels a comprehensive narrative of the evolving dynamics within the NPL landscape. A fundamental strength of this authors' paper lies in its meticulous focus on the myriad factors that underpin NPLs. The paper conducts a thorough examination of variables such as loans to non-residents, the consumer price index, GDP, and more. This exhaustive exploration enhances the richness of the analysis, offering readers a panoramic view of the multifaceted factors contributing to NPL dynamics. Moreover, this paper excels in its capacity to differentiate the factors that impact NPLs in both Armenia and the United States. By emphasizing both the shared characteristics and the intriguing distinctions between these two economic contexts, this paper infuses nuance into the analysis. This comparative aspect enables readers to develop a nuanced understanding of how various factors manifest in divergent economic landscapes.

Incorporating this narrative approach into this paper transcends the confines of traditional academic research. It transforms the work into a compelling and insightful exploration of the intricate world of NPLs, bridging the gap between scholarly inquiry and the tangible realities of economic dynamics. Through this narrative lens, this authors' paper emerges as a significant and pertinent contribution that promises to resonate with researchers and practitioners alike, offering a more engaging and meaningful perspective on the complexities of NPLs.

2. Methodology

As mentioned earlier, the main objective of this research is to discover the micro and bank-level factors that influence the ratio of non-performing loans to banks in Armenia. Particularly, we run linear regression models and correlation analyses using a time-series dataset covering the period from January 2013 to December 2020 to find significant and long-term relationships between the NPL ratio and several specific factors (96 observations). The same models and analysis were run for comparisons with US NPLs using US bank-level indicators (32 observations (the quarterly period between January 2013 and December 2020)). In this study, we take into consideration 6 bank specific factors (International Monetary Fund, 2022) and 10 macroeconomic factors (table 2 & table 3) (Statistical Committee of the Republic of Armenia, 2022), (Trading Economics. Armenia Indicators, 2022) (Trading Economics. United States Households Debt To GDP, 2022), (Trading Economics. United States Indicators, 2022).

The model chosen to investigate the effect of the selected variable on the non-performing loan rate is a multiple regression model presented in Equation 1. The parameter estimation in the regression model equation adopts the least square method (Aldrich J., 1998):

$$Y_i = \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi} + u_i \quad (1)$$

where i = 1, ... n, y_i represents the values of the explained variable Y, and x_{1i}, x_{2i}, ... x_{pi} are the values of the independent variables x_1, ... x_p. The coefficients β_1, β_2, ... β_p are the parameters of the regression model, and u_i are the values of the residual variable. There are many variables from table 2 and table 3 that have been removed from the regression as they were not significant in chosen significance level. The regression model also includes a constant variable which corresponds to the impact of other exogenous variables that affect NPLs not considered in this analysis.

In addition to the above method, it is also possible to analize with other alternative methods of linear regression such as quantile regression and median regression (Beyaztas, U., & Shang, H. L., 2022).

3. Results

The obtained values also represent the coefficients and test results of the variables in the regression model, as shown in table 4 and table 5.

Table 2. Macroeconomic Factors

Macroeconomic Factors	Definitions
Consumer price index	The price of an average market basket of consumer goods and services
USD	USD / AMD Rate
Economic activity index	GDP index of a given month
Fuel price	The average price of gasoline, oil and electricity
Real estate price	The average price of residential estates
Unemployment rate	The number of unemployment people
Household debt	The combined debt of all people in a household
Long-term yield curves	The average rate of long-term yield curves
Gross domestic product	The quarterly sum of GDP of USA
National Currency	The average money supply

Table 3. Bank Specific Factors

Bank level factors	Definitions
Nonresidents loans ratio	Nonresidents loans to all loans, %
Return on assets	Net Income / Average Total Assets
Return on equity	Net Income / Shareholders' equity
Operating efficiency	Noninterest expenses / net income
Capital adequacy ratio	Capital / Risk Weighted Assets
Liquidity ratio	Liquid assets / Total assets

The author's prognostications pertaining to the directional trajectories of these factors, denoting whether they are anticipated to exhibit an increase or decrease, are delineated as follows:

- Consumer Price Index (CPI): Anticipated to experience an upward trajectory, signifying a propensity toward inflationary pressures driven by market dynamics.
- USD / AMD Exchange Rate: Expected to exhibit fluctuations contingent upon a complex interplay of economic, geopolitical, and monetary policy determinants.
- Economic Activity Index: Foreseen to manifest fluctuations corresponding to the cyclical nature of economic expansions and contractions, thereby reflecting fluctuations in GDP.
- Fuel Price: Projected to display variability in response to global oil price trends, demand-supply dynamics, and geopolitical factors.
- Real Estate Price: Envisaged to be influenced by regional housing market conditions, with potential for both upward and downward movements contingent on local economic factors.
- Unemployment Rate: Intended to show a downward trend, indicative of enhanced labor market conditions and economic vitality.
- Household Debt: Expected to be influenced by borrowing patterns and economic conditions, displaying fluctuations in response to macroeconomic variables.
- Long-Term Yield Curves: Envisioned to reflect changes in expectations of future interest rates and economic conditions, with potential for both upward and downward shifts.
- Gross Domestic Product (GDP): Anticipated to demonstrate an overall upward trajectory, representing economic expansion and growth over time.
- National Currency Value: Foreseen to be susceptible to depreciation due to inflationary factors and economic instability, with potential fluctuations in response to monetary policy and external factors.
- Nonresidents Loans Ratio: This ratio represents the proportion of loans extended to nonresidents in relation to the total outstanding loans, and its direction may depend on international economic and financial conditions.
- Return on Assets (ROA): Anticipated to vary based on a company's financial performance, with fluctuations contingent on its ability to generate income from its assets.
- Return on Equity (ROE): Expected to fluctuate in response to a company's profitability and financial leverage.
- Operating Efficiency: Foreseen to change based on a company's ability to manage its expenses efficiently in relation to its profitability.
- Capital Adequacy Ratio: Anticipated to reflect changes in a bank's capital strength, influenced by

regulatory requirements and risk factors.
- Liquidity Ratio: Expected to exhibit changes based on the availability of liquid assets and the composition of a company's total assets.

According to Fisher's criterion, this model is adequate, since the significance level of the model is less than 0.00001.
We see there is a significance level of 1%. The four coefficients are positive, and three coefficients are negative regarding to Armenia. If each of the components with positive coefficients increases, non-performing loans will also increase, and vice versa. In this regression we got the Adjusted R-squared with the value of 89.2%, which means that the NPL ratio is explained by the selected variables in 89.2%. Table 4 shows the linear relationship between non-performing loans and their explanatory factors. In table 3, we have the coefficients of the condition of the relapse demonstrate. The Variable column reveals the names of the factors to which the coefficient compares. Each parameter evaluated in this way measures the commitment of the autonomous variable to the subordinate
By using EViews 12 program, we perform regression analysis according to Equation 1. According to the estimated normal least squares result, p-values of nonresidents loans ratio, USD, Economic activity index, Operating efficiency, Consumer price index, Unemployment rate, Fuel price are all within an acceptable range and are significant at 1% significance level. On the other hand, the remaining variables are not significant at 1% level of significance. Therefore, we ignore those insignificance variables in those modes. By ignoring them, we obtain the following results for Equation 1. Hence, the regression equation is

$$NPL = -0,32 * \mathrm{NLT} - 0,13 * \mathrm{EAI} - 0,24 * \mathrm{CPI} + 1,48 * \mathrm{UR} + 0,48 * \mathrm{USD}_{\mathrm{AMD}} + 0,08 * \mathrm{OE} + 0,49 * \mathrm{FP} + 9,46 \quad (2)$$

In table 5 we see that there are five variables regarding US dependent variable of NPL. The three coefficients are positive and two coefficients are negative. All the factors considered put the level of NPLs at 97.79 %. By ignoring non-significance variables, we obtain the following estimated ordinary least square results for Equation 1.

$$NPL = 0,92 * \mathrm{HD} + 1,92 * \mathrm{GDP} - 0,98 * \mathrm{CPI} + 0,08 * \mathrm{OE} - 0,95 * \mathrm{REP} + 1,56 \quad (3)$$

Coefficient Confidence Intervals

Verifying the reliability of regression parameters is represented by the confidence interval method. The confidence intervals are shown in table 6 and table 7. There are intervals with 90%, 95%, and 99% confidence factors. So, with 99% confidence you can see that if the unemployment rate increases by 1%, bad debts will increase from 1.27% to 1.69%.

Table 4. Estimations results for Armenia

Dependent Variable: NPL
Method: Least Squares
Sample: 2013M01-2020M12
Included observations: 96

Variable	Coefficient	Std.Error	t-Statistic	Prob.
Nonresidential loans ratio	-0.32386	0.036306	-8.920195	0.0000
Fuel price	0.494613	0.120805	4.094287	0.0001
Economic activity index	-0.133997	0.022033	-6.081491	0.0000
Consumer price index	-0.246271	0.048319	-5.096763	0.0000
Operating efficiency	0.080082	0.017042	4.698915	0.0000
Unemployment rate	1.481732	0.080203	18.47464	0.0000
USD / AMD exchange rate	0.483615	0.093020	5.198993	0.0000
C	9.466803	0.188656	50.18013	0.0000

R-squared	0.899939	Mean dependent var	6.822306
Adjusted R-squared	0.891980	S.D. dependent var	1.482753
S.E. of regression	0.487326	Akaike info criterion	1.479889
Sum squared resid.	20.89885	Schwarz criterion	1.693585
Log likelihood	-63.03471	Hannan-Quinn criter	1.566269
F-statistic	113.0674	Durbin-Watson stat	1.649894
Prob(F-statistic)	0.000000		

Table 5. Estimations results for USA

Dependent Variable:

NPL
Method: Least Squares
Sample: 2013Q1-2020Q4
Included observations: 32

Variable	Coefficient	Std.Error	t-Statistic	Prob.
Household debt	0.927635	0.139002	6.673521	0.0000
GDP	1.924024	0.422438	4.554567	0.0001
Consumer price index	-0.985875	0.301122	-3.274002	0.0030
Operating efficiency	0.086097	0.022952	3.751082	0.0009
Real estate price	-0.954696	0.085958	-11.10646	0.0000
C	1.564062	0.020521	76.21862	0.0000

R-squared	0.977984	Mean dependent var	1.5640625
Adjusted R-squared	0.973750	S.D. dependent var	0.716492
S.E. of regression	0.116082	Akaike info criterion	-1.301664
Sum squared resid	0.350355	Schwarz criterion	-1.026839
Log likelihood	26.82663	Hannan-Quinn criter	-1.210568
F-statistic	230.9990	Durbin-Watson stat	1.519512
Prob(F-statistic)	0.000000		

Let's check the residuals for autocorrelation. For this reason we write the values of the Durbin-Watson statistics out from table 4 and table 5.

$$DW_{Armenia} = 1,649894$$
$$DW_{USA} = 1,519512 \quad (4)$$

According to the table Durbin-Watson (Real Statistics Using Excel, 2022), we determine the significant points d_L and d_U for 1% significance level. For k = 7 and n = 96, d_L is equal to 1,381 and d_U is equal to 1,690. For k = 5 and n = 32, d_L is equal to 0,917 and d_U is equal to 1,597. As $d_L < DW < d_U$. We can neither accept nor deny the null hypothesis of the absence of autocorrelation.
To check for similar autocorrelations, we use the

Table 6. The confidence intervals for Armenia

Coefficient Confidence Intervals
Sample: 2013M01-2020M12
Included observations: 96

		90% CI		95% CI		99% CI	
Variable	**Coefficient**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Nonresidential loans ratio	-0.32386	-0.38421	-0.26350	-0.39601	-0.25171	-0.41945	-0.22827
Fuel price	0.49461	0.29379	0.69543	0.25453	0.73469	0.17654	0.81267
Economic activity index	-0.13399	-0.17062	-0.09736	-0.17778	-0.09021	-0.19201	-0.07598
Consumer price index	-0.24627	-0.32659	-0.16594	-0.34229	-0.15024	-0.37348	-0.11905
Operating efficiency	0.08008	0.05175	0.10841	0.04621	0.11395	0.03521	0.12495
Unemployment rate	1.48173	1.34840	1.61505	1.32234	1.64112	1.27056	1.69289
USD / AMD exchange rate	0.48361	0.32898	0.63824	0.29875	0.66847	0.23870	0.72852
C	9.46680	9.15318	9.78041	9.09188	9.84171	8.97009	9.96350

Table 7. The confidence intervals for USA

Coefficient Confidence Intervals
Sample: 2013Q1-2020Q4
Included observations: 32

		90% CI		95% CI		99% CI	
Variable	**Coefficient**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Household debt	0.92763	0.69055	1.16472	0.64191	1.21335	0.541387	1.31388
GDP	1.92402	1.20350	2.64454	1.05568	2.79235	0.75018	3.09785
Consumer price index	-0.98587	-1.49947	-0.47227	-1.60484	-0.36690	-1.82260	-0.14914
Operating efficiency	0.08609	0.04694	0.12524	0.03891	0.13327	0.02231	0.14987
Real estate price	-0.95469	-1.10130	-0.80808	-1.13138	-0.77800	-1.19355	-0.71584
C	1.56406	1.52906	1.59906	1.52188	1.60624	1.50704	1.62108

Table 8. the Breusch-Godfrey serial correlation test results for Armenia

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.534753	Prob. F(2,86)		0.2213
Obs*R-squared	3.308344	Prob. Chi-Square(2)		0.1912
Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob.**
Nonresidential loans ratio	-0.007028	0.036592	-0.192069	0.8481
Fuel price	-0.054323	0.126353	-0.429935	0.6683
Economic activity index	0.007600	0.022707	0.334718	0.7386
Consumer price index	0.026884	0.052436	0.512703	0.6094
Operating efficiency	-0.005049	0.017463	-0.289115	0.7731
Unemployment rate	0.012745	0.080355	0.158609	0.8743
USD / AMD exchange rate	-0.037513	0.096058	-0.390528	0.6971
C	-0.006271	0.187560	-0.033437	0.9734
RESID(-1)	0.201074	0.114774	1.751908	0.0833
RESID(-2)	-0.008038	0.114249	-0.070361	0.9441

Breusch-Godfrey serial correlation tests (table 8 and table 9). We can focus on the values of P-probabilities for the residual lag coefficients in the auxiliary model, which also indicate their significance, therefore, the presence of a serial correlation in the model that needs to be adjusted. In our case, the coefficients at RESID (-1) and RESID (-2) are not significant in 1% significance level. This confirms the absence of the autocorrelation of the 1st and 2nd order correlation.
With the Glejser test of heteroscedasticity, we accept the null hypothesis of the presence of homoscedasticity with

Table 9. the Breusch-Godfrey serial correlation test results for USA

Breusch-Godfrey Serial Correlation LM Test:				
Null hypothesis: No serial correlation at up to 2 lags				
F-statistic	0.336588	Prob. F(2,86)		0.7175
Obs*R-squared	0.873079	Prob. Chi-Square(2)		0.6462
Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Prob.**
Household debt	-0.013956	0.146177	-0.095478	0.9247
GDP	-0.043340	0.445256	-0.097338	0.9233
Consumer price index	0.023826	0.313165	0.076081	0.9400
Operating efficiency	0.001642	0.023662	0.069419	0.9452
Real estate price	0.011158	0.093136	0.119803	0.9056
C	0.000525	0.021075	0.024950	0.9803
RESID(-1)	0.172302	0.210764	0.817509	0.4217
RESID(-2)	-0.011663	0.220092	-0.052992	0.9582

the P values of 0.5284 and 0.3199. (table 10 and table 11).
We can also approve the presence of homoscedasticity with the White test of heteroscedasticity (table 13 and table 14).
Thus, the constructed regression Equation 1 has a high coefficient of determination and significant F-statistics; all regression coefficients are statistically significant. It can be used for practical purposes, since it does not have the following drawbacks: there is no autocorrelation of residuals of random deviations, we accept the null hypothesis of the presence of homoscedasticity and all factors are seasonally adjusted.
The results of this analysis will assist the Central Bank of Armenia in conducting concurrent stress testing to promote safety and soundness of banks. According to the Basel Range of Practices paper (Basel Committee on Banking Supervision, 2017) concurrent stress test results are primarily used by supervisory authorities for reviewing and validating the Internal Capital Adequacy Assessment Process of banks and their liquidity adequacy assessments. CBA can use the results to set capital requirements in a wide variety of ways – e.g., by setting capital add-ons or assessing the quality of a bank's capital planning processes. For example, in the US, several dividend pay-outs and share repurchases were rejected because they failed the stress tests and their capital levels were found to be inadequate under stressful scenarios (BBC, 2014).

4. Conclusion

In conclusion let's look at the factors that affect Equation 2.
The first factor refers to loans to non-residents. A decrease of one point leads to a 0.32% increase in the NPL. This is explained by the fact that non-resident entities and individuals are creditworthy and their creditworthiness is not affected by the factors affecting the Armenian economy.
The consumer price index has a negative effect on the NPL: one point decrease of CPI leads to 0.24% increase in the NPL. This is explained by two factors. The first is the devaluation of foreign currency, through which loans are repaid. The second, inflation is expected to have a negative impact on non-performing loans, as sharp rises in prices exacerbate market friction and force banks to pay attention to lending.

Particularly, it is unlikely that you will repay a loan you borrowed due to the lack of income, and unemployment allowances are low.
USD / AMD exchange rates and fuel prices significantly reduce the income of the population and the factual credit repayment ability during the analysis period. Rising exchange rates lead to cyclical increases in credit rates,

Table 10. the results of Glejser test of heteroskedasticity for Armenia

Heteroskedasticity Test: Glejser			
Null hypothesis: Homoskedasticity			
F-statistic	0.852694	Prob. F(7,88)	0.5471
Obs*R-squared	6.097877	Prob. Chi-Square(7)	0.5284
Scaled explained SS	6.241380	Prob. Chi-Square(7)	0.5119

Table 11. the results of Glejser test of heteroskedasticity for USA

Heteroskedasticity Test: Glejser			
Null hypothesis: Homoskedasticity			
F-statistic	1.166141	Prob. F(5,26)	0.3522
Obs*R-squared	5.861719	Prob. Chi-Square(5)	0.3199
Scaled explained SS	4.757203	Prob. Chi-Square(5)	0.4462

Table 12. the results of White test of heteroskedasticity for Armenia

Heteroskedasticity Test: Glejser			
Null hypothesis: Homoskedasticity			
F-statistic	1.228098	Prob. F(35,60)	0.2384
Obs*R-squared	40.06868	Prob. Chi-Square(35)	0.2554
Scaled explained SS	37.84859	Prob. Chi-Square(35)	0.3406

Table 13. the results of White test of heteroskedasticity for USA

Heteroskedasticity Test: Glejser			
Null hypothesis: Homoskedasticity			
F-statistic	2.682874	Prob. F(20,11)	0.0516
Obs*R-squared	26.55592	Prob. Chi-Square(20)	0.1482
Scaled explained SS	15.75042	Prob. Chi-Square(20)	0.7320

a situation that prevents individuals from repaying their debts to banks. Operating efficiency is directly proportional to NPL, as the increase in operating costs and the decrease in net profit mainly depends on the improper repayment of loans.
In Equation 3 we see what affects the NPLs of USA.
A very interesting picture emerged in connection with the GDP factor. An increase of GDP leads to an increase of 1.92% NPL. This can be explained by the fact that GDP growth stimulates the country's economy, therefore, the demand for loans increases in order for SMEs and individuals to expand their own business. Due to the increase in demand, and in order to stimulate lending, financial companies are lowering their credit rating criteria, which leads to the following picture.
The index of the average price of residential estates prices has a negative effect on the NPL. One reason is that borrowers are reluctant to repay loans where the collateral has become worthless.
Comparing the factors affecting both the US and Armenian NPLs, we see that both are influenced by three factors: Consumer Price Index, Operating efficiency and GDP (the Economic Activity Index is the same GDP index of Armenia of a given by month). Two factors are related to NPLs in the same way: Consumer Price Index has a negative effect and Operating efficiency is directly proportional to NPL. The GDP has a negative effect in the model analysed for Armenia, although the result of the coefficient of GDP index analysed for USA is the opposite. Capital adequacy ratio, return on equity, liquidity ratio and return on assets from bank-level factors and long-term yield curves, national currency from macroeconomic factors have been removed from both regression models as they are not significant in chosen significance level.
Let's discuss the factors that affect only one model. Unemployment rate, non-residents loans ratio, USD / AMD exchange rate and fuel price have a significant effect on the first model calculated for Armenian NPLs. They have a huge impact, as the Armenian economy directly depends on the dollar and fuel prices. The manufacturing sector has a predominant role in the GDP of RA. Raw materials are mostly imported from abroad hence being paid in dollars. As well as rising fuel prices such as gasoline, oil and electricity and unemployment rate affects borrowers' creditworthiness too. The average non-residents loans ratio in the Armenian bank sector is 4,65 percent (The Global Economy, 2022) thereby it affects the NPLs.
Household debts and real estate prices influence only US NPLs' model. Household debt to GDP for the United States in December 2020 was 79,6 percent. That is why it has a significant influence on NPLs.

The findings of this analysis hold profound implications for both policymakers and researchers operating within the vast realm of economics and finance.

For policymakers, the key takeaways are clear:

They need to keep a vigilant eye on non-resident loans, as these loans have demonstrated a significant influence on Non-Performing Loans (NPLs) in Armenia. Prudent lending standards for such loans can go a long way in mitigating credit risk. Additionally, the negative relationship between the Consumer Price Index (CPI) and NPLs underscores the importance of sustained efforts to control inflation. Stable prices alleviate financial burdens on borrowers and bolster their capacity to meet their loan obligations. While policymakers aim to foster economic growth, often reflected in rising GDP figures, they must tread carefully. Rapid GDP growth can potentially lead to increased NPLs. Therefore, meticulous oversight of lending criteria during these growth spurts is vital for effectively managing credit risk. Furthermore, policymakers should consider measures to maintain stability in the real estate market. The fluctuations in real estate prices can significantly impact borrowers' ability to repay their loans.

For researchers, the implications are equally intriguing:

They may find value in conducting comparative studies on NPL determinants across various countries. Such analyses can yield insights into shared factors and unique characteristics affecting credit risk. Future research endeavors can delve deeper into the intricate relationships between NPLs and macroeconomic factors, exploring how variables like exchange rates and fuel prices influence borrowers' creditworthiness. Researchers can also contribute by assessing the effectiveness of specific policy measures in mitigating NPLs. Their evidence-based insights can inform policymakers' decisions and strategies.

However, it's essential to acknowledge the limitations of this analysis:

The findings are based on available data, which may have inherent limitations or gaps that could affect the precision of the results. The analysis assumes linear relationships between variables, which may not fully encapsulate the complexity of real-world interactions. These findings pertain specifically to the contexts of Armenia and the United States and may not be directly applicable to countries with different economic structures. The analysis does not account for potential time lags or dynamic effects that may influence NPLs over extended periods. While the study identifies relationships between variables, it does not establish causality. Simplifications and omissions in the regression models may limit the depth of analysis.

In conclusion, researchers and policymakers should consider these limitations when interpreting and applying the results to their specific contexts. Continued research and data refinement can enhance the robustness of future analyses in this intriguing area of study.

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