

# THE IMPACT OF MACROECONOMIC FACTORS ON NON-PERFORMING LOANS IN THE REPUBLIC OF MOLDOVA

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## Abstract

The purpose of this research is to estimate the impact of several macroeconomic variables on *non-performing loans* (NPLs) in the banking sector of the Republic of Moldova recently affected by global crisis. Using econometric multivariate linear regression analysis, we conclude that banking NPLs are affected not only by distinctive features of the banking sector and the policy choices of each bank but also by macroeconomic environment: NPLs increase when GDP, exports, remittances decrease and when unemployment increases, however, our assumption about the relation between NPLs and private indebtedness has not been validated. We observed a substantial increase in the credit risk during the recent financial crisis period.

**Keywords:** macroeconomic factors, banking system, nonperforming loans.

**JEL Classification:** F41, G21, C51

## Introduction

NPLs ratio is one of the most relevant indicators of the financial soundness of the banking system (IMF, 2006, p. 85), which identifies problems with asset quality in the loan portfolio. The more deteriorated is the quality of the credit portfolio of the bank the more is that indicator. Thus lending activity implies credit risk which should be properly managed by banks. Country practice varies in defining nonperforming loans. Some use quantitative criteria such as the number of days overdue, others rely on qualitative norms such as the clients' financial status, management judgment about future payments. The approach stated in the regulations of the Capital Accord of Basel II states that non-performing loans as loans that are past due and unpaid for more than 90 days (usually equally to 3 dates of payment).

Although NPLs are a phenomenon that is permanently present in the balance sheets of banks, the recent global financial crisis caused a significant increase in non-performing loans almost within every European country. The reason for this increase is related to the deterioration of the borrowers' creditworthiness as a result of an economic decline. This phenomenon demonstrated that credit risk does not depend only on specific microeconomic factors, but also the macroeconomic factors have an impact on it.

The recent economic crisis highlighted the importance of investigating the credit risk in relation with the macroeconomic context. Several researchers explored the links between banking risks and macroeconomic developments at an aggregate level, such as Salas and Saurina, Jimenez and Saurina, Quagliariello, Jakubík, Aver, Bohachova, Bonfim, Kattai, Fainstein and Novikov, Festic et al., Nkusu, Louzis et al., Castro, Diaconășu et al.

According to the main findings the banking credit risk is significantly affected by the macroeconomic environment. A deterioration in the macroeconomic environment - proxied by slower growth, higher unemployment or falling asset prices - is associated with debt service problems, reflected into rising NPLs (Nkusu, 2011, p. 18).

According to Castro findings the credit risk increases when GDP growth and the share and housing price indices decrease and rises when the unemployment rate, interest rate, and credit growth increase. Thus during a growth cycle of the economy both consumers and firms face a better capability in loan repayment which contributes to a relatively lower level of NPLs (Castro, 2013, p. 672).

Periods of economic growth are sometimes accompanied by strong credit growth and there may be some tendency towards excessive risk-taking. And the imbalances created in such periods only become apparent when economic growth slows down and the loan losses increase (Bonfim, 2009,

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p. 281). Jimenez and Saurina, Bohachova explore the link between banking system and business cycle. In good times both borrowers and lenders are overconfident about investment projects and their ability to repay and to recoup their loans and the corresponding fees and interest rates. Banks' overoptimism about borrowers' future prospects, coupled with strong balance sheets and increasing competition, brings about more liberal credit policies with lower credit standards (Jimenez and Saurina, 2006, p. 66). As banks provide intermediary functions for the real economy, they are exposed to business cycle conditions that determine the aggregate health of the real economy. As economic conditions worsen during recession periods, the riskiness of intermediation tends to rise (Bohachova, 2008, p. 1). The procyclicality of banking sector performance and high economic activities growth is a signal of an economy overheating and therefore a slowdown in economic activity is likely to accelerate the growth of the NPL ratio (Festic et al., 2011, p. 310). Louzis finds that not only the real GDP growth rate, the unemployment rate and the lending rates have a strong effect on the level of NPLs, but also some bank-specific variables such as performance and efficiency indicators (Louzis et al., 2012, p. 1017).

The mentioned above studies explore the impact of different macroeconomic variables on NPLs dynamics such as: GDP growth rate, exchange rate fluctuations, terms of trade, interest rate changes, inflation, the rate of loan growth, public debt, housing price index, share price indices etc. None of the studies considered the impact of remittances and exports on NPLs dynamics, the most important drivers of economic growth in the Republic of Moldova. Thus, we additionally go beyond the existing work by asking whether NPLs dynamics in the banking system depends on the remittances and exports.

Taking into consideration that changes within macroeconomic environment translate themselves into changes in the quality of a loan portfolio, the purpose of our study is to identify the impact of several macroeconomic factors on NPLs specific for the economic development of the Republic of Moldova. In this regard we use the econometric multivariate linear regression analysis. The article reviews the existing literature on the determinants of the credit risk, describes the data and the hypotheses to test, explains the econometric model and presents the empirical results. The main findings are presented in the conclusion section.

### **Description of the problem and hypotheses to test**

The general effect of the recent financial crises on Moldovan banking system was felt especially *on the banks' asset side*. Sudden increase of credit risk during this period led banks to restrict lending and to significantly increase the allowances for loan losses. The effects of the crisis were felt indirectly by the banks, especially through the channel of *remittances* and *foreign trade*. These macroeconomic indicators diminished substantially as a result of economic decline in Europe, particular in 2009. The decline of private consumption in the euro area as a result of crisis has contributed to a sudden decrease in Moldovan exports to EU and of the volume of remittances in 2009 and 2012. The crisis events have negatively influenced creditworthiness of Moldovan borrowers and respectively the quality of local banks' loan portfolios.

Proceeding from the specific situation that exists on the Moldovan banking system, we have chosen 5 independent variables which we assume to have influence on the volume and the dynamic of banking sector's NPLs: GDP growth rate, export growth rate, remittances growth rate, unemployment rate and private indebtedness. There is an interdependence of macroeconomic factors which reinforces their individual influence on bank risk, but can also make an empirical assessment of their relative importance for bank risk difficult.

We developed the following hypotheses about the character of relationship between the macroeconomic variables and NPLs.

We assume that a drop in the growth rate of GDP will lead to an increase of the NPLs, i.e. in the banking credit risk. GDP growth rate is used as a broad measure of business cycle conditions. According to the findings of Bohachova, Festic *et al.*, Castro, etc. during a growth cycle of the economy (GDP growth) the total incomes raise, and in consequence both consumers and firms face a better capability in loan repayment, which contributes to a relatively lower share of NPLs to total loans. As the expansionary period continues, however, credit is extended to lower-quality debtors and subsequently, when the macroeconomic environment develops less favorably, non-performing loans and loan losses increase.

The export growth rate may provide additional information regarding the impact of economic conditions. A decline in exports should lead to a decline of firms' revenues, and in consequence firms face a lower capability in loan repayment, which contributes to a relatively higher share of NPLs to total loans.

Another major source of income of households and firms in the Republic of Moldova is remittances. A consequence of the migration of workers is a reverse flow of remittances to support dependent relatives, repayment of loans, investment and other purposes. Moldova's *dependence on remittances* is one of the highest in the world – with 24,5 percent of GDP Moldova ranks 5th in the world in 2012 at this aspect (World Bank, 2013, p. 3). It enhances the financial system vulnerability to potential volatility in these inflows. Remittances increase households' incomes and improve financial intermediation which can improve growth prospects for the country overall. A decline of this indicator will lead to a decline of households' incomes, and in consequence they face a lower capability in repayment of previous contracted loans, which contributes to a higher share of NPLs to total loans.

The relation between unemployment rate and NPLs has a positive nature, i.e. an increase in the unemployment rate will lead to a decline of households' incomes, which in its turn will increase the debt burden of households. On the other hand, a high unemployment rate means a drop in the effective demand and as a consequence it will decrease the production. Thus, the relation between unemployment rate and NPLs is directly proportional: an increase in the unemployment rate will lead to an increase in the rate of nonperforming loans.

Another independent variable we consider is private indebtedness, calculated as the ratio of total gross loans to GDP. High debt burdens make debtors more vulnerable to adverse shocks affecting their wealth or income, which raises the chances that they would run into debt servicing problems. Our assumption is that an increase of this indicator in Moldova's banking system has an influence on the vulnerability of borrowers to shocks and in its turn it will influence the future capability of loans repayment. Therefore, we assume a positive relation between the private indebtedness and the NPLs.

### Methodology and data sources

Linear regression is an approach for modeling the relationship between a scalar dependent variable  $y$  and one or more explanatory variables denoted  $X$ . The case of one explanatory variable is called *simple linear regression*. For more than one explanatory variable, the process is called *multiple linear regression*. This term should be distinguished from *multivariate linear regression*, where multiple correlated dependent variables are predicted. In our case, for the regression analysis, we used a *multivariate linear regression*. The formula for a multivariate regression line is (Formula 1):

$$y_i = a_0 + \sum_{i=1}^n a_i x_i + \varepsilon, \quad (1)$$

where  $y_i$  is the endogenous variable;  $a_i$  are parameters of regression, which show the average influence of individual fluctuation by exogenous variable  $x_i$  on the  $y$ ,  $i=1, \dots, n$ ;  $x_i$  are the exogenous variables influencing fluctuation of  $y$ ,  $i=1, \dots, n$ ;  $\varepsilon$  is casual or stochastic component.

The dataset consists of a panel of macroeconomic and banking annual data spanning the period from 2000 to 2013. Macroeconomic data used for empirical analysis of theoretical hypotheses come from Moldovan statistical database - all available online. NPLs is modeled at the macroeconomic level from the consolidated balance sheet of Moldova's banking sector. Banking data are taken from the database of the National Bank of Moldova and includes data on 14 Moldovan banks. The credit risk is measured as the ratio between the (aggregate) banks' nonperforming loans in their balance sheets and the total gross loans. This represents the dependent variable that will be used in our model. This variable is modeled at the aggregate level from the consolidated balance sheet of Moldova's banking sector.

Taking into account mentioned in the previous section macroeconomic variables, the resulting equation is as follows (Formula 2):

$$\text{NPL}(y_i) = a_0 + a_1 \times \text{gdp\_growth\_rate} + a_2 \times \text{export\_change} + a_3 \times \text{remittances\_change} + a_4 \times \text{unemployment\_rate} + a_5 \times \text{private\_indebtedness} \quad (2)$$

where the dependent variable is *NPL* and independent variables are the set of the factors influencing the *i*-th variable includes some macroeconomic indicators of the country.

$x_i$  are the macroeconomic indicators of the country: GDP growth rate (*gdp\_growth\_rate*); Export change (*export\_change*), the Remittances change (*remittances\_change*), the Unemployment rate (*unemployment\_rate*), the Private indebtedness (*private\_indebtedness*).

The resulting equation was calculated using the program Stata/SE 9.2 with the aforesaid factors. The results of the multivariate linear regression include coefficients of the model with their standard errors. Coefficients were calculated using the least squares approach. Statistical significance of the calculated coefficients is on the level of 5%.

### Results obtained

Estimations of the coefficients for our econometric model and their statistical significance are presented in the Table 1. Most of the coefficients which explain the impact of factors are expected and statistically significant.

**Table 1**

**Estimation of the impact of macroeconomic determinants on NPLs in Republic of Moldova**  
(dependent variable - NPLs)

Variable name	Variable interpretation	Coef.	Std. error
<i>gdp_growth_rate</i>	GDP growth rate	-0.6048626	0.6087085
<i>export_change</i>	Export growth rate	-0.0227912	0.1358579
<i>remittances_change</i>	Remittances growth rate	-0.0565172	0.1089813
<i>unemployment_rate</i>	Unemployment rate	0.8907301	1.785388
<i>private_indebtedness</i>	Private indebtedness rate	-0.0471661	0.3094421
<i>_cons</i>	Constant	10.21552	20.76098
<b>F statistic</b>		0.77	
<b>Prob&gt;F</b>		0.5952	
<b>R-squared</b>		0.3257	
<b>Root MSE</b>		5.3471	

- assessment of all coefficients is at 5% significance level
- Sources: authors' calculation according to the data base of National Bureau of Statistics of Republic of Moldova and National Bank of Moldova

The empirical results provide evidence that there is an inversely proportional relationship between GDP growth rate, export growth rate, remittances growth rate and the dependent variable - NPLs is validated for Republic of Moldova. The recent crisis events have negatively influenced the above mentioned macroeconomic variables which in their turn influenced NPLs.

Thus the results show that a drop in the GDP growth rate in its turn diminished the creditworthiness of Moldovan borrowers and the quality of local banks' loan portfolios by 60.48%.

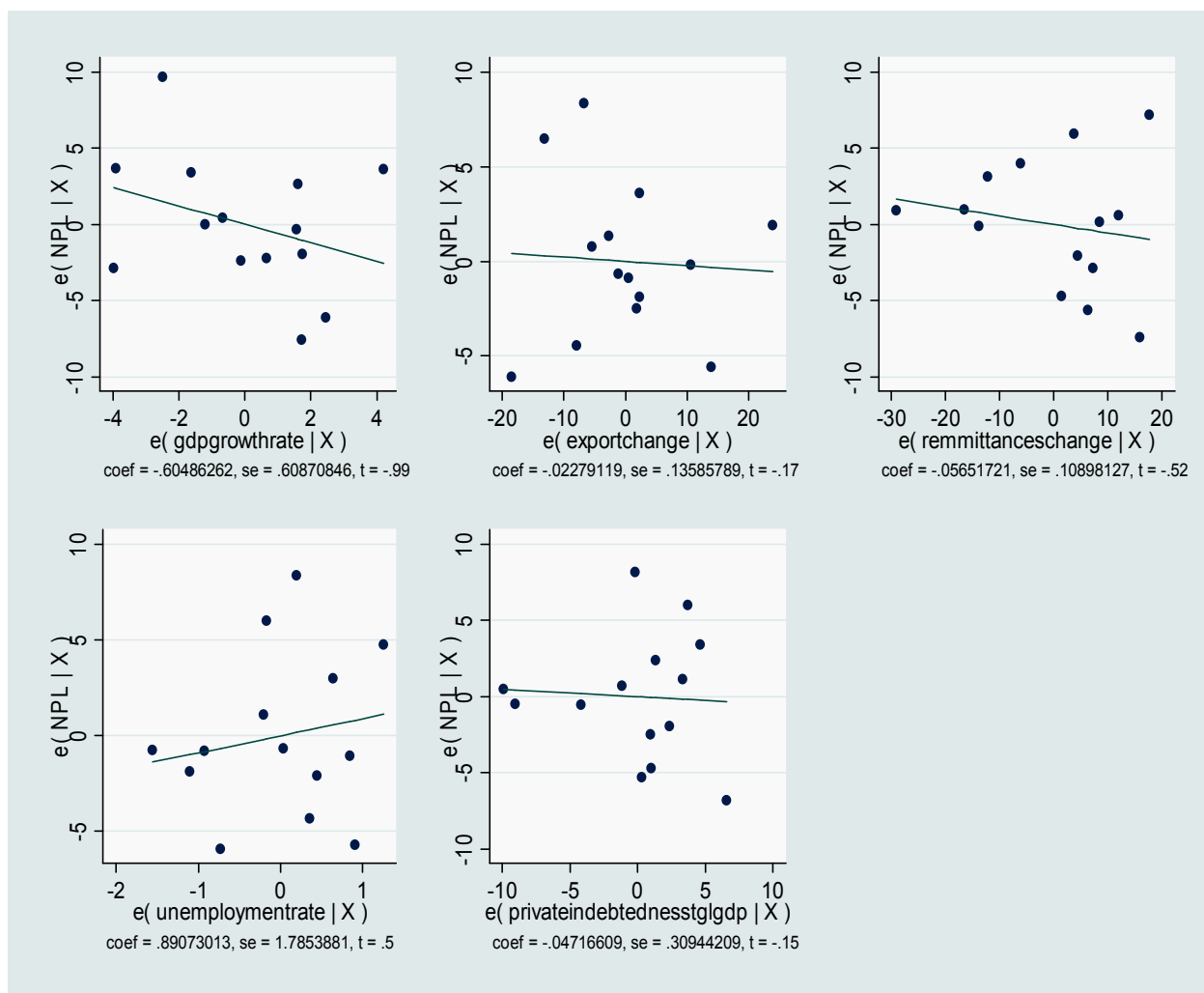
The export growth rate also negatively influenced the NPLs. Thus the results showed an inversely proportional relationship between export growth rate and NPLs. The analysis of estimations in the researched period revealed that the decrease of this independent variable influenced negatively NPLs by 2,27%.

An inversely proportional relationship was detected between remittances growth rate and NPLs. This variable diminished the creditworthiness of Moldovan borrowers and the quality of local banks' loan portfolios by 5,65%.

The empirical results provide evidence that there is a positive relationship between unemployment rate and NPLs, thus our assumption is validated and is according to the economic theory. This variable diminished the quality of local banks' loan portfolios by 5,65%.

Only the hypothesis about the influence of private indebtedness on dependent variable - NPLs is not validated by the model.

The model indicates that the most statistically significant influence on the evolution of NPLs has the unemployment rate. Fig. 1 illustrates the graphical correlation between key macroeconomic variables and non-performing loans in Moldovan banking sector.



**Figure 1. Non-performing loans and key macroeconomic variables correlation**  
Sources: authors' calculation according to the data base of NBS RM and NBM

## Conclusions

The recent economic crisis highlighted the importance of investigating the credit risk in relation with the macroeconomic context. The research hypotheses that there are several macroeconomic factors that have an influence on NPLs ratio were verified. The empirical results provide evidence that the inversely proportional relationship between GDP growth rate, export growth rate, remittances growth rate and the dependent variable - NPLs is validated for Republic of Moldova. The recent crisis events have negatively influenced the above mentioned macroeconomic variables which in their turn influenced NPLs. Only the hypothesis about the influence of private indebtedness on dependent variable - NPLs is not validated.

The research has policy implications results; this means that structural measures and policies are fundamental to stabilize the economy and the banking system. That can be achieved by promoting external competitiveness, increasing productivity, and supporting growth and employment in our country.

Further research could be focused on additional macroeconomic factors that could have an influence on NPLs ratio, because the chosen factors does not explain the total variation of the NPLs measure. Another direction of this research could be oriented on some bank-specific variables such as performance and efficiency indicators with an impact on NPLs ratio.

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