The Impact of Macroeconomic and Banks-Specific Variables on Non-Performing Loans of the Banking System in Iran

Shahrzad Mousavi[1] and Saeed Daei-Karimzadeh[2]

[1]*Department of Economic, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran*
[2]*Corresponding Author: Department of Economic, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran*

ABSTRACT

Nowadays, non-performing loans (NPLs) and their receipt method are one of the basic problems of Iran banking system. In this situation, estimating a suitable economic model which used the past information will help better understanding of economic determinants which affecting NPLs. Therefore the aim of present study is analyzing the effect of macroeconomic variables including inflation, real interest rate, GDP growth, and banking internal variables including bank size and financial leverage, on non-performing loans of selected banks listed in Tehran stock exchange using Panel data method during 2008 to 2013. The results showed that inflation rate, real interest rate, bank size, and financial leverage had positive effect and economic growth had negative effect on non-performing loans.

Keywords: Non-performing loans, Macroeconomic variables, Financial leverage, Bank size, Panel data.

1. INTRODUCTION

One of the main challenges facing the Iran's banking system is the increasing volume of non-performing loans. Regarding to the Iran's bank-based economy and the maintenance of 90 percent of domestic liquidity in banks the issue has emerged as a national challenge and it would not be far-fetched for banks and credit institutions to a face widespread and extensive crisis during the coming years. Therefore, the diagnostics of the causes and the consequences of the non-performing loans issue is absolutely critical for Iran's economy because any fluctuations in the repayment of loans and banking credits will be certainly followed by negative and harmful socio-economic consequences.

The current paper was organized in five sections. After the introduction, the review of the theoretical and empirical literature will be presented in Section 2. Section 3 deals with the presentation of the model

and the results of the model estimation. Finally, the conclusions and the recommendations of the study were expressed in Section 4.

2. LITERATURE REVIEW

Non-performing loans are defined as the sum of past due, overdue and doubtful receivables. Past due receivables are those receivables which more than two months has been passed from the due date of the debt or the deadline of the repayment, although the delay time doesn't exceed 6 months. The second category of the non-current receivables is those which are called overdue receivables. Overdue receivables are those which more than 6 months but less than 18 months has been passed from the due date of the debt or the deadline of the repayments. Finally, doubtful receivables are considered as those receivables which more than 18 months have been passed from the due date or the deadline of the repayments. The difference between non-current receivables and bad debts is that the bad debts, regardless of the due date, due to certain reasons such as death or bankruptcy of the debtor or other reasons can't be received and are considered as bad debts.

The management of inter-organizational and intra-organizational factors that affect the non-performing loans is very essential to the economy. The current study attempted to investigate the effects of those economic variables which are not affected by the autonomic behavior of the bank customers on the non-performing loans of the banking system and determine their impacts in terms of the mentioned context. Therefore, the current study analyzed the effects of macroeconomic variables including inflation, real interest rates, GDP growth and bank-specific variables such as the bank size and the financial leverage on the non-performing loans in a selection of Iranian banks listed in Tehran stock exchange for the period from 2008 to 2013 using panel data approach.

It is expected that the improvement of the economic situations and the increase of the economic growth leads to the increase of the repayment ability and the reduction of the non-performing loans of the banking system. On the other hand, it is expected that the increase of the inflation rate and the real interest rate decrease the motivation and the ability to repay the loans and increase the volume of the non-performing loans in the banking sector. However, by the increase of the leverage ratio which is defined as the ratio of the total debt to the total assets of any bank, the bank risk increases and the repayments of the loans will face some fluctuations. Thus, the volume of the non-performing loans would increase and finally it is expected that the increase of the bank size decrease their efficiency and increase the volume of their non-performing loans as the result.

Heidari et. al., (2012) investigated the effects of the macroeconomic shocks on the non-performing receivables of the banks in Iran for the period from 2000 to 2008. The study used the VAR model in order to indicate the dynamic relationship between variables. On the other hand, the impulse response function and variance decomposition were used to analyze the reaction of the non-performing loans to the economic shocks. Based on the results of the estimated models, the shocks of inflation, non-oil GDP growth, liquidity volume and the loan interest rate had the greatest impacts on the non-performing loans of the banking system.

Kordbache and Nooshabadi (2011) investigated the determinants of creating non-performing loans for in Iran's banking industry which included both macroeconomic and bank-specific variables. The study

was conducted for a sample consisted of 12 Iranian banks during the period from 2002 to 2008 using dynamic panel data approach. The study concluded that the operational efficiency, precautionary behavior and the type of ownership were the main determinants in explaining the behavior of the non-performing loans in Iran's banking system. Also, the results of the estimation of various models indicated that the situation of the macroeconomic variables had a significant effect on the non-performing loans in Iranian banking industry.

Rostamian and Tabasi (2010) studied the factors affecting the creation of the non-performing loans in commercial banks of the Kish commercial-industrial free zone during the period from 2000 to 2007. The results of the study indicated that there was a significant relationship between the exchange rate fluctuations, type of economic activity, duration of the granted credits, the type of credit use, the type of collaterals received and the type of the granted credit.

Chaibi & Ftiti (2015) discussed the factors affecting the non-performing loans (NPLs) in commercial banks in Germany and France for the period from 2011 to 2015. The studied populations in the study were France as a representative of market based economy and Germany as a representative of banking system-based economy. The results of the study indicated that except for interest rate a set of macroeconomic variables including (GDP, interest rate, unemployment, and exchange rate) can affect non-performing loans so that GDP and exchange rate had negative effects on the non-performing loans and interest rate while unemployment rate had positive effects on the non-performing loans. Finally, the study concluded that France had a more sensitive situation than Germany with respect to bank-specific factors.

Washington (2014) studied the effects of macroeconomic variables on the credit risk in the commercial banks of the Kenya. The dependent variable was non-performing loans while the explanatory variables of the study included GDP, per capital, the interest rate, the exchange rate as the ratio of dollar to Kenyan Shilling, inflation rate and domestic credit granted to the private sector by the commercial banks. The period of the study included 1990 to 2013 and the Ordinary Least Square (OLS) and Error Correction Model (ECM) were used to estimate the model. The results of the study indicated that GDP per capital had a significant relationship with credit risk in the short run; however, all the explanatory variables were significant in explaining the effects of credit risk in the long run. On the other hand, the study found that the domestic credit granted to the private sector had a negative effect on the credit risk. Similarly, inflation had a negative effect on the credit risk. Moreover, the interest rate on loans had a positive effect on the credit risk.

Poudel (2013) studied the macroeconomic determinants of the non-performing loans in the banking industry of Nepal for the period from 2001 to 2011 using OLS econometric method. The results of the study indicated that macroeconomic variables like inflation, exchange rate had significant effect on the banking credit risk in Nepal.

Abid et. al., (2013) discussed the effects of macroeconomic factors and bank-specific variables on the non-performing loans of the households in Tunisia in 16 Tunisian banks for the period from 2003 to 2012 using panel data approach. The purpose of the study was to identify the factors affecting the non-performing loans of the households and explain the procedure through which macroeconomic and bank-specific variables can affect the quality of banking facilities. The results of the study showed that in addition to macroeconomic variables (GDP, inflation and interest rate) the quality management can affect the non-performing loans of the banks.

Louzis et. al., (2012) investigated the effects of macroeconomic variables and bank-specific variables on the non-performing loans in Greece. The study tested the hypothesis stated that the macroeconomic variables and bank-specific variables had various effects on the non-performing loans. The results of the study indicated that non-performing loans in the Greece banking system had been greatly affected by macroeconomic variables (including GDP, unemployment, interest rate and public debt) and quality management.

3. MODEL PRESENTATION

According to Chaibi & Ftiti (2015) and Washington (2014) the suggested model for investigating the effects of macroeconomic and bank-specific variables on the non-performing loans was as follows:

$$\text{NPL}_{it} = \alpha_0 + \alpha_i \text{Bank}_i + \beta_1 \text{INF}_{it} + \beta_2 \text{GGDP}_{it} + \beta_3 \text{R}_{it} + \beta_4 \text{Size}_{it} + \beta_5 \text{LEV}_{it} \tag{1}$$

Where NPL represents the non-performing loans which is calculated as the ratio of the non-performing loans to the total payable loans of the banks. On the other hand, GDP, INF, R were gross domestic product, inflation and real interest rate which was defined as the difference between the credit rate and inflation, respectively. SIZE shows the size of the bank which is obtained by calculating the taking logarithm from the real value of the bank assets. Finally, LEV is the leverage ratio which was defined as the ratio of the total debt to the total assets of the banks.

The corresponding data for macroeconomic variables were obtained from Iran's Statistic Center and bank-specific data were accessible from Rahavard Novin CD-ROM. The estimation method was panel data which included a selection of banks listed in Tehran Stock Exchange including Eqtesad Novin, Persian, Tejarat, Saman, Sarmaye, Sina, Saderat, Ghavamin, Kar Afarin and Melat commercial banks during the period from 2008 to 2013. The banks were selected based on the data availability. According to theoretical literature it was GDP growth was expected to have a negative effect on the non-performing loans and the effects of inflation, real interest rate, leverage ratio and the bank size on the non-performing loans were expected to be positive.

4. FINDINGS

A. Descriptive Statistics

The descriptive statistics of the variables in the model were presented in Table 25.1. The statistic included measures of central tendency like mean, median, minimum, maximum and also other criteria including standard deviation, skewness and kurtosis.

Table 25.1
Descriptive statistics of the variables

NPL	R	SIZE	GGDP	INF	LEV
1.250391	−9.854142	18.74070	1.768333	21.35414	0.665335
0.217522	−7.431845	18.63451	3.000000	18.93185	0.918301
16,21937	1.862853	20.66533	5.890000	39.26636	0.981588
0.012616	−28.26636	17.11261	−5.800000	10.13715	9.71E-10
3,321862	10.10936	1.054393	3.760411	9.758804	0.422629
3.204715	−0.707420	0.075891	−1.128848	0.735166	−0.949956
12.16945	2.320400	1.713293	3.101808	2.359733	1.919009

Source: Results of the study

B. Estimation of the Model

One of the main assumptions in estimation of the model using panel data approach is the independence of the residuals between cross sections. Not paying enough attention to the cross sectional dependence of the residuals in the estimation of the model can lead to the estimation of a spurious regression and can cause the results of the tests to be bias. Therefore, Pesaran's test of Cross-Sectional Independence is used to make sure about the unbiasedness of the results. The null hypothesis of the Pesaran's test of Cross-Sectional Independence is that there is no cross sectional dependence between residuals of the model. Based on the results which were presented in Table 25.2 the cross sectional dependence between the residuals of the model were confirmed.

Table 25.2
Pesaran's test of cross sectional independence

Test	Statistic	Prob	Result
Pesaran's test of cross sectional independence	3.489	0.0005	The existence of cross sectional dependence

Source: Results of the study

One of the main assumptions for the estimation of the model is the stationarity of the time series. If the time series were not stationary the conventional judgments based on the t, F and chi-square statistics will be reliable. On the other hand, of the time series in the model were not stationary the problem spurious regression would emerge. In this situation there may be no significant relationship between the variables of the model but the model has a high determination coefficient and causes the researcher to suggest wrong inferences about the relationship between the variables of the model. The Hadri stationary test was used to investigate the stationarity of the variables in the model. The results of the Hadri test can be seen in Table 25.3.

Table 25.3
The results of the stationary test

Variable	Sign	Prob	Statistic
Non-performing loans	NPL	0.7253	–0.5978
Inflation rate	INF	0.6111	–0.2821
GDP growth	GGDP	0.1815	0.9096
Real interest rate	R	0.6051	–0.2665
Bank size	SIZE	0.0558	1.5912
Bank leverage ration	LEV	0.1020	1.2701

Source: Results of the study

The null-hypothesis of the test stated that the corresponding time series was stationary. Therefore, based on the results of the Table 25.4 all the variables of the model were stationary in level.

Limer F-test is used in order to choose between panel and pooled data methods of estimation. According to the results of Table 25.4 as the Prob value was less than 0.05 it could be concluded that the null hypothesis of the test which referred to the pooled data method of estimation was rejected.

Table 25.4
Limer F-test

Test	Statistic	Prob	Results
F-test	2.38	0.0266	Panel data approach

Source: Results of the study

According to the results of the F-Limer test it is necessary to use Hausman test in order to determine whether to use fixed effects or random effects methods of estimation. As it can be seen in Table 25.5 the results of the Hausman test indicated that the random effect method of estimation should be used to estimate the model because the value of the test-statistic was less than 0.05. Therefore, the model of the estimated using panel data approach with random effects.

Table 25.5
The results of the Hausman test

Test	Statistic	Prob	Results
Hausman test	0.098	0.7204	Random effects method

Source: Results of the study

In the following, the Breusch-Pagan test was conducted to determine whether the Hausman test has identified the random effect pattern of the model or not. The null hypothesis of the test shows the existence of pooled data against the existence of random effect property. Based on the findings of Table 25.6 the null hypothesis of the Breusch-Pagan test was rejected. Therefore, the Hausman test has identified the random effect pattern correctly.

Table 25.6
The results of the Breusch-Pagan test

Test	Statistic	Prob
Breusch-Pagan	3.90	0.0241

Source: Results of the study

Two of the main issues that may emerge in estimating a model using panel data approach and lead to the estimation of a spurious regression are heteroskedasticity and serial correlation between the residuals of the model. Therefore, it is necessary to detect the existence of heteroskedasticity and serial correlation. To do so, the Likelihood Ratio (LR) was used for the detection of variance equality in panel data approach and the Wooldridge test was conducted in order to test the serial autocorrelation of the residuals. The results of the test were presented in Table 25.7 and as it can be seen from the table the model suffers from heteroskedasticity. On the other hand, we should make sure of the non-existence of serial correlation between the variables. The null hypothesis in the Wooldridge emphasizes on the non-existence of serial correlation between residuals. Therefore, the results of the test were shown in Table 25.8. As it can be seen in the table there was no autocorrelation between variables.

After the conduction of the necessary statistic tests the final results of the model estimation will be presented in the following. Based on the mentioned results, the model suffered from heteroskedasticity at 5% level of error. Therefore, the heteroskedasticity issue must be corrected. The results of the model estimation using Generalized Least Square (GLS) method were presented in Table 25.9.

Table 25.7
Likelihood ratio test

Test	Statistic	prob	Results
LR test	1460.18	0.0000	The existence of heteroskedasticity

Source: Results of the study

Table 25.8
The results of the autocorrelation test

Test	Statistic	Prob	Results
Wooldridge test	1.332	0.2782	Non-existence of autocorrelation

Source: Results of the study

Table 25.9
The results of the model estimation using GLS method

Variables	Sign	Coefficient	Standard error	Z-statistic	P-Value
Intercept	C	–1.38906	0.3883445	–3.99	0.000
Inflation rate	INF	0.0814515	0.01338681	5.87	0.000
GDP growth	GGDP	–0.0048888	0.0010871	–4.50	0.000
Real interest rate	R	0.0804039	0.0134066	6.00	0.000
Bank size	SIZE	0.0304309	0.0145049	2.10	0.036
Leverage ratio	LEV	0.0219254	0.007053	3.11	0.002
Wald Chi2 (5) = 152.34			Number of obs = 60		
Prob > chi2 = 0.0000			Number of groups = 10		

Source: Results of the study

As it can be observed in the table all the variables of the model were significant. The estimated coefficient for the inflation rate was equal to 0.081. Therefore, it can be concluded that a unit increase in the inflation rate would increase the non-performing loan by 0.081 unit. The value of the estimated coefficient for the economic growth was equal to 0.005 which shows that one percent increase in the economic growth rate will decrease the non-performing loans ratio by 0.005 unit. The value of the interest rate was equal to 0.08. In other words, it can be said that a unit increase in the real interest rate will increase the non-performing loans ' ratio by 0.08 unit. The estimated coefficient for the bank size was equal to 0.03 which means that 1 percent increase in the bank size will increase the ratio of non-performing loans by 0.03. Finally, the obtained value for the leverage ratio of the banks was equal to 0.22. Therefore, one percent increase in the leverage ratio will increase the ratio of non-performing loans by 0.22.

5. CONCLUSIONS AND RECOMMENDATIONS

The results of the study indicated that the inflation rate had a positive effect on the non-performing loans as the dependent variable of the model and showed that the increase of the inflation rate leads to the increase of the banking system risk and the reduction of bank customer repayment and finally can increase the ratio of the non-performing loans to the total payable loans. Therefore, it is suggested to the planners and policy makers to follow kind of policies which leads to the reduction of the inflation. Moreover, based on

the results of the current study economic growth rate had a negative effect on the non-performing loans of the banking system. Therefore, it can be concluded that the increase of the GDP growth index leads to the decrease of the risk in the banking system and the empowerment of the debtors to repay the loans and finally the reduction of the non-performing loans ratio to the total paid loans. Thus, focusing on the increase of the economic growth rate can reduce the volume of the non-performing loans in the banking system.

On the other hand, the results of the study indicated that the real interest rate had a positive effect on the non-performing loans of the banking system. So, the increase of the interest rate increases the repayment costs and the probability of facing with non-performing loans. Thus, it is recommended to planners and policy makers to determine the interest rate based on the perspective of the inflation rates. Finally, the results of the study indicated that the effects of the financial leverage on the non-performing loans was positive and significant which indicated that the banking system risk increases by the increase of the debt to assets ratio and the non-performing loans of the banks increases as well. Therefore, it is necessary to decrease the banks non-performing loans ratio by decreasing the bank leverage ratio.

References

Ahlem Selma Messai, Fathi Jouini .(2013), Micro and Macro Determinants of Non-performing Loan", International Journal of Economics and Financial Issues, Vol. 3, No. 4, 2013, pp. 852-860, ISSN: 2146-4138, www.econjournals.com.

Chaibia, H., Ftiti, Z., (2015), Credit risk determinants: Evidence from a cross-country study, Research in International Business and Finance 33 (2015) 1-16.

Dimitrios P. Louzis, Angelos T. Vouldis, Vasilios L. Metaxas., (2012), Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios, Journal of Banking & Finance 36 (2012) 1012-1027.

Gok han, Karabulut, Mehmet Huseyin Bilgin (2007), Sources of Non-Performing Loans In Turkish Banking System. Journal of Business & Economics Research, 5(10).

Gol dstein, Morris, Turner, Philip, Banking .1996. Crises in Emerging Economies: Origins and Policy Options.

Hansen, Bruce E, Sample Splitting't and Threshold Estimation, Econometrica, Vol. 68, No. 3, 2000, 575-603.

Hansen, Bruce E. (1998), Threshold Effects in Non-Dynamic Panels: Estimation, Testing and Inference, Boston College February 1998.

Heidari Zavaryan and Noor Bkhsh (2010), "Investigation of the Effects of Macroeconomic Indices on Non-Performing Loans. Journal of Money and the Economy. 4: 220-191. [in Persian]

Hou, Yixin. (2007), The Non-Performing Loans: Some Bank-level Evidences, Research Conference on Safety and Efficiency of the Financial System, August 2007.

Kordbacheh, H., & Pordel Nooshabadi, L. (2008), Explaining the effective factors on non-performing loans in Iran banking system. Journal of Iran economic research, 149, 117-150. [in Persian]

Lobna Abid, Med Nejib Ouertani, Sonia Zouari-Ghorbel., Macroeconomic and Bank-Specific Determinants of Household's Non-Performing Loans in Tunisia: a Dynamic Panel Data., 1st TSFS Finance Conference, TSFS 2013, 12-14 December 2013, Sousse, Tunisia, Procedia Economics and Finance 13 (2014) 58-68.

Lui S, Cortavaria, Claudia, Dziobek, Akihiro Kanaya, Inwon Song (2000), Loan Review, Provising, and Macroeconomic Linkages. IMF working Paper.

Mark Tracey, Hyginus Leon (2011), The Impact of Non-performing Loans on Loan Growth: an econometric case study of Jamaica and Trinidad and Tobago, Presented at the Bank of Jamaica Applied research Conference in Jamaica September.

Mohammad Shofiqul Islam, Nikhil Chandra Shil, MD. Abdul Mannan, Non performing loans - its causes, consequences and some learning MPRA Paper No. 7708, posted 12. March 2008 16:15 UTC.

Rostamian, F., & Tabassi, D. (2007), Investigating determinants affected non-performing loans of free trade zones banks (Research focuses on Mellat Bank of Kish Free Trade Zone). Bulletin of financial accounting and auditing, 6, 173-194. [in Persian]

Shingjergji. A, (2013), The Impact of Macroeconomic Variables on the Non Performing Loans in the Albanian Banking System during 2005-2012. Academic Journal of Interdisciplinary Studies, MCSER Publishing-Rome, Italy, (2). 9: 335-340.

Washington, G.K. (2014), Effects of macroeconomic variables on credit risk in the Kenyan banking system. International journal of business and commerce, 3(9), 1.