ORIGINAL ARTICLE

The Determinants of The Non-Performing Loans: The Case of Turkish Banking Sector

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Abstract

The objective of this study is to investigate the determinants of non-performing loans (NPLs) in the Turkish banking sector during the 2010-2019 period. The pooled OLS (POLS), the fixed effects (FE) and the system GMM (SGMM) were used for the analyses. Empirical results show that capital adequacy ratio and GDP growth rate have a statistically significant negative effect on the NPLs ratio. The operating efficiency, the income diversification, the first lagged NPLs ratio and the inflation are positively associated with the NPLs ratio. The negative relation between the capital adequacy ratio and the nonperforming loans ratio supports the moral hazard hypothesis. The positive relation between the other operating expenses to total assets ratio and nonperforming loans ratio supports the bad management hypothesis.

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1. INTRODUCTION

Banks play an important role in the economy and financial system. The most important function of banks is to allocate funds from savers to borrowers. Banks are one of the most important financial intermediaries. They take customers' deposits and then employ the deposits to lend them to the other customers as loans. However, while performing this function, banks are exposed to credit risk. Credit risk is the possibility that borrowers will fail to meet its obligations arising from loan contracts. Non-performing loans (NPLs) is an important indicator of credit risk. NPLs sometimes arise due to economic problems experienced by individuals and firms, moral hazard or mistakes made by banks in the credit process. Sometimes, it may occur due to macroeconomic problems and the negative reflections of external factors on the economy, as in the Covid-19 pandemic. There is an increase in NPLs, especially during periods of economic crisis and recession, and the share of NPLs in total loans increases.

NPLs can lead to many problems in the banking and economy. The increase in NPLs may lead to deterioration in asset quality, deterioration of cash flows and thus the emergence of liquidity problems, narrowing of new credit facilities and increase in capital requirement. In addition, losses arising from non-repayment of loans and provisions for NPLs negatively affect the profitability of banks.

These problems, which arise due to NPLs, adversely affect not only the banks, but also the financial system and the real sector. The increase in NPLs can lead banks to bankruptcy, as well as causing a crisis in the banking system, even in the financial system and the economy. Moreover, as in the 2008 global crisis, it can cause a crisis in the global financial system with the contagion effect. For this reason, it is extremely important to monitor and manage the credit risk and determine the factors that cause NPLs by both banks and regulatory and supervisory authorities.

The purpose of this study is to examine the determinants of NPLs in the Turkish banking sector. The POLS, FE, and SGMM methods are employed to determine the influence of the factors on the NPL for the period of 2010-2019. The results suggest that capital adequacy ratio and GDP growth rate negatively affect the NPLs ratio. Operating inefficiency, income diversification and inflation have a negative impact on the NPLs ratio. In the study, empirical evidence was found, supporting the moral hazard hypothesis and the bad management hypothesis.

Our study makes two contributions to the banking literature. Firstly, within our knowledge, this study is the first to investigate the NPL determinants of Turkish commercial banks after the 2008 global financial crisis. Secondly, on methodological grounds, the NPL determinants are modelled with a panel two-step SGMM estimation model owing to the shortcoming of the static panel approach (e.g. endogeneity issues). Empirical findings have important implications for policy makers and banks facing high NPLs. It is important to consider moral hazard problems and managerial performance in reducing NPLs.

This paper is organized as follows: after the introduction, Section 2 reviews the empirical literature on the determinants of NPLs. Section 3 presents data and methodology. Section 4 discusses the empirical results. Section 5 presents concluding remarks, policy recommendation and proposes future research direction.

2. LITERATURE REVIEW

There are many studies in the literature investigating which macroeconomic and bank-specific factors are effective on NPLs. Salas and Saurina (2002) show that GDP growth rate, branch growth rate, bank size have a negative effect on the NPLs in Spanish commercial banks in the period 1985-1997. Based on a sample of 46 banks from 12 countries in the MENA region during 2002-2006, Boudriga, Taktak and Jellouli (2010) use a panel dataset from 2002 to 2006 for 46 banks and 12 countries and find that foreign participation from developed countries, high credit growth and loan loss provisions reduce the non-performing loan level. Furthermore, highly capitalized banks experience a high level of credit exposure.

Using dynamic panel data methods, Louzis, Vouldis and Metaxas (2012) investigate the impact of macroeconomic and bank-specific factors on the NPLs in the Greek banking system and provide empirical evidence that NPLs can be explained mainly by macroeconomic factors (GDP, unemployment, interest rates, public debt) and management quality.

Jakubik and Reininger (2013) analysed the determinants of NPLs in 9 Central, Eastern and Southe-

astern European countries for the period of 2004-2012. Their empirical results show that the depreciation of a national currency can have a sizeable negative effect on the quality of banks' assets and domestic economic activity plays a key role for nonperforming loans. Also, there is a lagged effect of stock prices on NPLs.

Messai and Jouini (2013) use a panel dataset from 2004 to 2008 for 85 banks in Italy, Greece and Spain, and find GDP growth and bank profitability reduce NPLs while the loan loss reserves to total loans, unemployment rates, and real interest rates to positively impact on the NPLs by using the

Klein (2013) shows that unemployment rate, exchange rate depreciation, inflation, GDP growth, global risk aversion (VIX), equity-to-asset ratio and return on equity have a significant effect on NPLs, in 16 Central, Eastern and South-Eastern European nations.

Castro (2013) employs dynamic panel data approaches and empirically examines the association between the banking credit risk and the macroeconomic variables in Italy, Ireland, Portugal, Spain, and Greece between 1997-2011. The results show that the credit risk increases when the share and housing price indices and GDP growth decrease and rises when the real exchange rate, credit growth, interest rate, and the unemployment rate increase.

Curak, Pepur and Poposki (2013) examine the determinants of NPLs in the banking industry of Southeastern Europe (69 banks from 10 different countries) during 2003-2010.The results of GMM estimations show that the ratio of NPLs is affected by bank size, profitability and bank capital. In addition, higher interest rate, higher inflation, and lower economic growth are directly linked to higher NPLs.

Skarica (2014) examines the determinant of the changes in the non-performing loan in Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Romania and Slovakia for the period of 2007-2012. The results show that the main reason for the high level of NPLs is the economic slowdown.

Roy (2014) found that GDP growth rate for the current period and with one period lag, change in real effective exchange rate and change in CBOE Volatility Index have an inverse relationship with non-performing asset level in the Indian banking sector for the period of 1995-2011.

Ghosh (2015) examines the determinants of NPLs in 50 US states and the District of Columbia over the period 1984–2013 by employing FE and GMM estimators. The author reports that cost inefficiency, capitalization, poor credit quality, banking industry size, and liquidity risk enhance NPLs, while greater bank profitability lowers NPLs. Real GDP and real personal income growth rates decrease NPLs, while inflation, unemployment rates, and US public debt increase NPLs.

Bardhan and Mukherjee (2016) analyse the influence of the bank-specific factors on the NPLs in India for the period of 1995-2011. They find that bank size, nominal effective exchange rate and inflation have a positive impact on the NPLs. Furthermore, they find a negative effect of bank size and profitability on the NPLs.

In the literature, it is seen that there are several studies exploring the determinants of NPLs in the Turkish banking industry. Küçüközmen and Yüksel (2006) find that most of the changes in NPLs can be explained by using macroeconomic variables. But, the dependence level and the explanatory macroeconomic variables may change for different sectors. In the study, NPLs are grouped into eight broad sectors and non-performing loan ratios are calculated separately for each sector for the period of 1999-2005.

Using the ordinary least square estimation approach for the period of 2007-2013, Vatansever and Hepşen (2013) report that the NPL ratio of Turkish banks is significantly affected by the variables such as industrial production index, ISE 100 Index, inefficiency ratio negatively, capital adequacy ratio, return on equity, unemployment rate.

Yurdakul (2014) examines the relationship between credit risk and macroeconomic factors during the 1998 and 2012 period. In the study, The General-to-Specific Modelling method developed by Hendry (1980) is used to investigate short-term dynamic relations. Engle-Granger (1987) and Gregory-Hansen (1996) methodology are used to investigate long-term relations. The results show that an increase in GDP growth rate and the ISE 100 index leads to decrease credit risk, an increase in inflation rate, exchange rate, unemployment rate, money supply, and interest rate increase credit risk.

Yagcilar and Demir (2015) investigate the effect of the macroeconomic and bank-level determinants on the NPLs over the period 2002-2013. Their empirical results show that listed status, size, capital adequacy ratio, liquidity level, the ratio of credit to deposit, return over assets, economic growth, and interest rates are the main determinants of the NPLs.

Employing System-GMM and Difference GMM methods, Abdioglu and Aytekin (2016) conclude that

interests applied to loans, inefficiency, loans/ deposits ratio, and operating efficiency have positive effects on NPLs. But, first lagged of NPLs, capital adequacy, net interest margin and solvency ratio have negative impact on NPLs.

Using static panel data regression analysis, Isik and Bolat (2016) investigate the determinants of NPLs of 19 Turkish deposit banks during the 2006 and 2012 period. The empirical results suggest that solvency and loan loss provisions have a negative effect on the non-performing loan, profitability, revenue diversification and economic growth have a positive effect on NPLs.

Yüksel (2016) reports that increase in USD exchange rate is positively related to NPLs whereas interest incomes and GDP growth are negatively associated with NPLs for the period between 1988 and 2014.

Demirel (2016) employs Vector Autoregression (VAR) model, Johansen Cointegration test and Error Correction Model over the period 2003–2014. The findings of the study show that GDP growth rate and industrial production index have inverse relation with NPLs. Current account deficit, VIX Index and 2-year bond yields in the U.S. are positively associated with NPLs.

Us (2016) analyses the determinants of NPLs of Turkish commercial banks before and after the global crisis. It has been determined that the determinants of NPLs have changed after the crisis. While NPLs were largely determined by bank-specific variables in the pre-crisis period, the effects of these variables decreased in the post-crisis period.

Cetinkaya (2019) found that asset profitability, bank size, net interest margin and gross domestic product ratio have a positive effect on the NPLs in the banking sector. On the other hand, capital adequacy ratio, return on equity and liquidity risk have a negative effect on the NPLs. The analysis was performed by method of panel data regression and covers the period of 2004-2017.

Using regression analysis methodology within the period of 2005-2016, Kabatas and Karamustafa (2019) find a negative relationship between the variables of total equity/total assets ratio, growth, unemployment and non-performing consumer loan ratios, within the period of 2005-2016. However, the effects of return on assets, total loans to total deposits ratio, inflation, real effective exchange rate, interest rate in consumer loans on non-performing consumer loan ratios is statistically insignificant. Least Squares methodology was used in the study and it covers the period of 2005-2016.

Kuzu and Celik (2019) investigate the bank-specific and macroeconomic determinants of NPLs, by using panel data analysis for the period 2008-2018. It is determined that there is an inverse association between NPLs with GDP and asset size, and a positive linkage with the exchange rate basket, unemployment rate, real interest rates, inflation and capital adequacy ratio.

Torun and Altay (2019) examine the effect of the micro and macro determinants of NPLs by employing a balanced static panel data analysis method for the period between 2008 and 2015. The findings show that the NPLs ratio is significantly associated with the macro factors like inflation, unemployment rate, real exchange rate, the growth rate of GNP, the growth rate of GNP in the Eurozone, and the composite index of BIST. As for the micro factors, this ratio is affected by the variables such as real effective interest rate, loans to deposits ratio, the share of consumer loans in total loans, personal expenditure to assets ratio, capital adequacy ratio, and the size indicator.

3. METHODOLOGY

3.1. Data

The sample employed in the study comprises 22 Turkish commercial banks over the period 2010-2019, after the 2008 global financial crisis and it is worthy to note that we use the annual dataset of a balanced panel of commercial banks. While the bank-specific data, used in our study, are taken from The Banks Association of Turkey Database, the macroeconomic factors are obtained from The Central Bank of the Republic of Turkey Database.

3.2. Model Specification and Variables

There is a growing literature which suggests that NPLs may be explained by macroeconomic and bank-specific factors. Six bank-specific factors and two macroeconomic factors were considered in this study.

Following the recent literature on the NPLs (Louzis et al., 2012; Messai and Jouini, 2013; Roy, 2014; Ghosh, 2015; Isik and Bolat, 2017; Singh et al., 2021), we adopt a dynamic approach to account for the time persistence in the NPL structure. The following NPL model is applied to reveal the determinants of NLP in Turkish banking sector:

$$NPL_{it} = \beta_0 + \beta_1 NPL_{it-1} + \beta_2 BLV_{it} + \beta_3 MEV_t + year\ dummies + \mu_i + \epsilon_{it} \qquad (1)$$

In this specification, i represents commercial banks and t represents the time, respectively. NPL_{it} is the dependent variable measuring the ratio of NPLs to total loans; β_0 refers to the intercept; NPL_{it-1} is the first lagged dependent variable which captures the persistence in the NPL over time; BLV_{it} is the matrix of bank-level variables; MEV_t is the matrix of macroeconomic variables; μi represents unobserved time-invariant firm effects and ϵ_{it} is a random error term. β_0, β_1, β_2 and β_3 are coefficients to be estimated employing pooled OLS, fixed effects and system generalized method of moments (SGMM) estimators. Explanations for all the variables are provided in Table 1.

Table 1
Definition of the Variables

Variables	Notation	Calculation
Dependent Variable		
Non-performing loans	NPL	The ratio of non-performing loans to total loans
Explanatory Factors		
Bank specific factors		
Bank size	SIZE	Logarithm of total assets
Capital adequacy ratio	CAR	Ratio of total capital to risk weighted assets
Operating efficiency	OE	Ratio of other operating expenses to total assets
Income diversification	ID	Ratio of non-interest income to total assets
Return on equity	ROE	The ratio of net income to total equity
Total loan to total deposit	TL/TD	Ratio of total loans to total deposits
Macroeconomic factors		
GDP growth	GDP	Annual real GDP growth rate
Inflation	INF	Annual percentage change in the consumer price index

3.3. Estimation Method

Using the static estimators, such as POLS and FE for estimating Eq. (1), we may have biased estimates which are inconsistent because of the endogeneity issues (Schultz, Tan and Walsh, 2010; Wooldridge, 2012). However, this study makes use of SGMM that applies instrumental variables to tackle the endogeneity problems among regressors. As suggested by Bond (2002), the POLS and the FE estimates provide the upper and lower bounds for a consistent SGMM estimate of the coefficient of NPL_{it-1} Bond, 2002; Roodman, 2009; Hoque, Islam and Azam, 2013; Nguyen, Locke and Reddy, 2014).

For the consistency of the SGMM estimates, several specification tests are suggested by Arellano and Bover (1995) and Blundell and Bond (1998). While the first of the specification tests is the Hansen test used for the validity of the instruments, the second is the serial correlation tests using the AR1 and AR2 statistics. For the Hansen test, the null hypothesis is that instrumental variables are valid. In addition, AR1 and AR2 test statistics measure the absence of first and second order auto-correlated disturbances in the first differences equations. In addition, we use Windmeijer (2005) finite sample corrected standard errors in the two-step SGMM estimates.

3.4. Summary Statistics

Table 2 shows the descriptive statistics of the dependent and independent variables. Table 2 shows that the average NPLs, bank size, capital adequacy ratio, operating efficiency, income diversification, return on equity, total loans to total deposits ratio, GDP growth rate and inflation are 4.5 per cent, 10.5 per cent, 16.8 per cent, 2.5 per cent, 1.4 per cent, 5.8 per cent, 101.4 per cent, 5.9 per cent, and 9.8 per cent, respectively. Since the standard deviation of the NPL variable is above the mean, we can say that it is considerably volatile. As for the other variables, volatility is found not to be very high, owing to the fact that their standard deviations are under the respective means.

Table 2
Summary Statistics for Entire Sample and Sub-Samples

	NPL	SIZE	CAR	OE	ID	ROE	TL/TD	GDP	INF
Mean	4.4566	10.45515	16.82003	2.533098	1.349338	5.84936	101.421	5.84936	9.837714
Median	3.713083	10.44522	16.08077	2.357546	1.268018	5.626289	103.8095	5.626289	8.710508
Std. Dev.	4.557412	1.672376	3.233648	1.085488	.7052917	2.954346	24.9653	2.954346	3.195508
Min.	.6033413	6.797678	12.57037	.5033298	.0267113	.8774335	34.86692	.8774335	6.471879
Max.	48.58791	13.38435	32.0857	7.148823	3.597558	11.1135	227.1639	11.1135	16.33246

3.5. Correlation Matrix

To check for multicollinearity among all the determinants, this study has firstly applied the Pearson correlation. Secondly, it has also performed variance inflation factor (VIF). The results of Pearson's pair-wise correlation matrix between NPL and independent variables used in Eq. (1) is shown in Table 3. The correlation coefficient calculated for the one-year lagged NPL variable and the current NLP variable is 0.74. This coefficient indicates that past NPL is strongly and positively correlated with current NPL. Therefore, this result supports that the dynamic model used in the study is an appropriate empirical model. The fact that the correlation coefficients calculated, between the independent variable pairs, are not greater than 0.80 revealing that multicollinearity is not a significant problem for the variables used in the NPL model (Gujarati and Porter, 2010). In addition, the fact that the calculated VIF values for the independent variables are not greater than 5 supports the results obtained from the correlation analysis.
*Note: * denotes significance at 1 percent.*

Table 3
Correlation Matrix

	NPL	SIZE	CAR	OE	ID	ROE	TL/TD	GDP	INF	NPL_{it-1}	VIF
NPL	1.00										
SIZE	0.05	1.00									1.53
CAR	0.09*	-0.19*	1.00								1.47
OE	0.08	-0.45*	-0.17*	1.00							2.53
ID	0.19*	0.05	0.03	0.15*	1.00						1.42
ROE	-0.06	0.41*	0.02	-0.30*	0.29*	1.00					2.90
TL/TD	-0.01	0.25*	-0.29*	0.06	-0.22*	-0.15*	1.00				1.26
GDP	-0.36*	-0.13*	-0.32*	0.43*	-0.04	-0.11*	0.07*	1.00			1.92
INF	0.34*	0.15*	0.38*	-0.47*	-0.10*	0.18*	-0.05*	-0.62*	1.00		2.67
NPL_{it-1}	0.74*	-0.03	0.02	0.27*	0.22*	-0.09	0.01	-0.09	0.08	1.00	3.26

4. EMPIRICAL RESULTS

Although we used three different estimators, like POLS, FE and SGMM in estimation of Eq. (1), only the results obtained from SGMM estimations are interpreted. Table 1 reports the results of estimation of Eq. (1) employing the NPL as dependent variable. As presented in Table 4, the coefficient of NPL_{it-1} equals 0.3025. This autoregressive coefficient lies between the ones from POLS estimator (0.6938) and FE estimator (0.0470). This result demonstrates the consistency of SGMM estimates.

Empirical results show that capital adequacy ratio, first lagged NPLs ratio, operating efficiency, income diversification, inflation and GDP growth have a statistically significant effect on NPLs ratio. On the other hand, the variables such as return on equity, total loans to total deposits ratio and bank size are not statistically associated with NPLs.

The capital adequacy ratio is used to control the excessive risk taking of banks and to prevent them from being insolvent through recapitalization (Boudriga, Taktak and Jellouli, 2010: 4).The effect of capital adequacy ratio on NPLs can be ambiguous (Ghosh, 2015: 95). According to the moral hazard hypothesis, banks with relatively low capital respond to moral hazard incentives by increasing the riskiness of their loan portfolio, which, in the future, results in higher NPLs on average Therefore, under the moral hazard hypothesis, it can be expected an inverse relation between NPLs and capital adequacy ratio (Berger and DeYoung, 1997: 854). On the other hand, managers in the highly capitalized banks may resort to a liberal credit policy implying a positive relationship between capital and NPLs (Ghosh, 2015: 95). The results showed a negative association between capital adequacy ratio and NPLs, which supports the moral hazard hypothesis. Berger and DeYoung (1997), Salas and Saurina (2002), Klein (2013), Abdioglu and Aytekin (2016) and Cetinkaya (2019) also find the negative link between the capital ratio and NPLs.

Table 4
Estimation Results

	Pooled OLS	Fixed Effects	Two-Step System GMM
NPL_{it-1}	.6938*** (6.70)	.0470 (1.56)	.3025*** (3.17)
Bank size	-.2641* (-1.76)	-.3271 (-1.60)	-.2585 (-1.57)
Capital Adequacy Ratio	-.2797*** (-3.51)	-.2600* (1.69)	-.2317* (-1.83)
Operating efficiency	.6502* (1.90)	.2102 (0.98)	.0298* (1.76)
Income diversification	-.0117 (-0.03)	-.1818 (-0.35)	.5438** (2.62)
Return on equity	.0470* (1.78)	.1890*** (3.69)	.0754 (1.66)
Total loan to total deposit	-.0431 (-1.36)	-.1105* (-1.97)	.0761 (1.43)
GDP growth	-.1104 (0.92)	-.1503** (-2.09)	-.1328*** (-3.06)
Inflation	.4610*** (4.15)	.6234*** (3.46)	.1945* (1.88)
Intercept	4.5230 (1.40)	2.5625 (1.24)	3.8223 (1.15)
Diagnostic tests			
Year dummies	Yes	Yes	Yes
Bank fixed-effects	No	Yes	Yes
R-squared	0.6856	0.4503	0.1585
F-test	25.73***	798.28***	113.28***
AR1 (*p-value*)			0.033
AR2 (*p-value*)			0.267
Hansen (*p-value*)			0.151
Number of instruments			19
Observations	193	193	193
Banks in sample	22	22	22

*Notes: Robust t-statistics for respective coefficients are in parentheses. *, ** and *** denote significance at 10, 5 and 1 percent.*

Operating efficiency is measured by other operating expenses to total assets, in a way similar to Ghosh (2015) and Us (2016). According to the skimping hypothesis, the amount of resources allocated to underwriting and monitoring loans, influences cost efficiency and loan quality. Here, the critical decision of the bank lies in the tradeoff between short run operating costs and future loan performance problems. For maximizing long term profits, banks may prefer to have lower costs in the short run by skimping on the resources devoted to screening loan customers, appraising collateral, and monitoring and controlling borrowers after loans. Because of this, banks appear to be more cost efficient in the short term, but the number of NPLs will +increase in the long-run (Berger and DeYoung, 1997: 853). According to the bad management hypothesis by Berger and DeYoung (1997), low measured cost efficiency (allocate more resources for monitoring, controlling, etc.) is a signal of poor senior management practices. In contrast to the almost immediate reduction in measured cost efficiency, poor underwriting and monitoring practices of managers lead to high numbers of nonperforming loans in future. Therefore, it can be said that under the bad management hypothesis, low cost efficiency is expected to increase NPLs.

A high ratio of other operating expenses to total assets means low-cost efficiency for banks, and it can be expected to reduce NPLs. However, despite the high ratio of other operating expenses to total assets, the high NPL can be considered as an indicator of bad management and greater operational inefficiency. The findings of this study supported the bad management hypothesis because the other operating expenses to total assets ratio positively affect NPLs. Louzis, Vouldis and Metaxas (2012), Ghosh (2015) and Us (2016) also found a positive impact.

The return from loans is a bank's main source of revenue. Banks sometimes have to accept some risky loans because of the pressure to create income. If banks can successfully diversify income, then they should be able to alleviate the pressure for revenues from loans and thus effectively decrease the rate of NPLs (Hu, Li and Chiu, 2004: 414). Therefore, it can be expected to have a negative relationship between NPLs and income diversification. Isik and Bolat (2016) find a negative relationship. But, Hu, Li and Chiu (2004), Boudriga, Taktak and Jellouli (2010) and Rachman, Kadarusman, Anggriono and Setiadi (2018) find that income diversification and NPLs have no relationship. The data set of the study by Hu, Li and Chiu (2004) indicates that the average revenue share resulting from loans is 97.78 percent. While the highest share is 99.22 percent, the lowest is 92.41 percent. Hence, authors suggest that diversification of revenue source cannot effectively decrease NPLs ratio. On the other hand, the results of this study suggest that higher income diversification (non-interest income to total assets) is positively related with NPLs ratio, consistent with Micco, Panizza and Yanez (2004).

GDP growth rate and inflation were used as macroeconomic determinants of NPLs in this study. GDP is highly informative on the other relevant macroeconomics factors, such as changes in unemployment, real wages and real interest rates. When GDP growth slows or even turns negative, income and cash inflow of firms and households reduce and it is difficult for them to pay the interest and principal on bank loans. For this reason, lower economic growth is associated with higher NPLs (Salas and Saurina, 2002: 208). Empirical findings suggest that GDP growth rate influence negatively the NPLs, in line with Salas and Saurina (2002), Messai and Jouini (2013), Curak, Pepur and Poposki (2013), Skarica (2014), Roy (2014), Yurdakul (2014), Ghosh (2015), Kasman and Kasman (2015), Kuzu and Celik (2019), Isik and Bolat (2016), Torun and Altay (2019). It demonstrates that increases of the GDP growth decrease the NPLs in the Turkish banking system.

The effect of inflation on NPLs can be positive or negative. High inflation can increase borrowers' capacity to repay the loans by reducing the real value of debt. However, it can also reduce their real income and thus weaken borrowers' capacity to repay the loans (Castro, 2013: 675). The results show that inflation has a positive effect on NPLs, consistent with Klein (2013), Curak, Pepur and Poposki (2013), Yurdakul (2014), Ghosh (2015), Bardhan and Mukherjee (2016), Kuzu and Celik (2019), Torun and Altay (2019) and Singh (2021). It is found that first lagged NPLs ratio has a positive impact on NPLs ratio. This result is in line with previous findings by Klein (2013), Castro (2013), Curak, Pepur and Poposki (2013), Yurdagül (2014), Kasman and Kasman (2015) and Us (2016).

Large banks may increase their leverage too much and give loans to lower-quality debtors. Larger banks can often tend to resort to excessive risk-taking owing to the fact that it is difficult to impose market discipline by regulators and banks expect the government to protect them if they fail. (see Stern and Feldman, 2004). Therefore, NPLs may be positively impacted by the bank size (Ghosh, 2015: 95). But, the finding reveals that there is no significant relationship between bank size and NPLs, consistent with

Abdioglu and Aytekin (2016) and Isik and Bolat (2016).

According to the procyclical credit policy hypothesis, return on equity is positively related to future increases in NPLs, as it reflects liberal credit policy on the part of the bank (i.e. negative NPV extension of credit) (Louzis, Vouldis and Metaxas, 2012: 1016). High-profit banks have fewer incentives to engage in high-risk activities. Therefore, profitability may be inversely associated with NPLs based on the bad management hypothesis (Ghosh, 2015: 95). The empirical finding shows that return on equity is not statistically associated with NPLs. This finding is in accordance with previous findings by Abdioglu and Aytekin (2016), Kuzu and Celik (2019) and Us (2016). An increase in the loan-to-deposit ratio reveals a risk preference and is expected to lead to higher NPLs (Dimitrios, Helen and Mike, 2016: 117). However, it is not found a statistically significant effect, in line with Kabatas and Karamustafa (2019).

5. CONCLUSION

In recent years there has been a significant increase in NPLs in Turkey. The increase in NPL may adversely affect not only the banks, but also the financial system and the real sector. NPLs is one of the most important reasons for problems in the banking system and financial crises. For this reason, it is extremely important to determine the factors that cause NPLs and monitor and manage the credit risk by both banks and regulatory and supervisory authorities.

In this study, the determinants of the NPLs were investigated in the Turkish banking sector during 2010-2019 period, taking into account both macroeconomic and bank-specific factors. NPLs ratio was employed as a dependent variable, capital adequacy ratio, first lagged NPLs ratio, operating efficiency, income diversification, return on equity, total loans to total deposits ratio, bank size, GDP growth rate and inflation were employed as independent variables.

The results of the two-step SGMM method suggest that, capital adequacy ratio, first lagged NPLs ratio, operating efficiency, income diversification, inflation and GDP growth rate have a statistically significant impact on the NPLs of commercial banks. On the other hand, return on equity, total loans to total deposits ratio and bank size do not have a statistically significant impact on the NPLs ratio. More clearly, while the increase in capital adequacy ratio and GDP growth reduce NPLs, the increase in operating inefficiency, income diversification and inflation increase NPLs ratio of commercial banks in Turkey.

This study suggests to policy makers that banks should be supported with policies that will reduce NPLs in periods of increasing inflation and slowing economic growth. Capital adequacy ratio, operating efficiency, income diversification, GDP growth rate and inflation should be taken into account in the determination of NPLs. In addition, considering the managerial performance will help to reduce NPLs and NPLs can be used to determine the moral hazard problem. In the future research can be used on different econometric models and different bank-specific, macroeconomic variables and global risk indicators. It can be investigated whether the sectoral differences create a change in the factors affecting the NPLs.

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