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WHAT DETERMINES THE NON-PERFORMING LOANS RATIO: EVIDENCE FROM TURKISH COMMERCIAL BANKS

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Abstract

In this paper I investigate the determinants of non-performing loans (NPLs) ratio for commercial banks in Turkey by incorporating bank specific and macroeconomic variables. I find that banks with a higher equity to total assets ratio and a higher net interest margin are expected to have a higher NPLs ratio whereas an increase in net loans to total assets ratio is expected to reduce the NPLs. The results also reveal that public banks and foreign banks are expected to have a higher NPLs ratio. In terms of macroeconomic variables GDP growth shows its effect on NPLs with a lag and a domestic currency depreciation is expected to deteriorate the loan portfolios of commercial banks.

JEL Codes: G21, E44

Keywords: Non-performing Loans, Turkish Banking Sector

1. Introduction

The 2001 economic crisis was an important turning point for Turkish banking sector. During 1990s the Turkish banking sector, surrounded by an unstable macroeconomic environment characterized by high inflation and large budget deficits, was unable to perform its fundamental business that is providing credit to the economy. Due to the high level of public sector borrowing requirement the main business of the banking sector was to finance these deficits. After the 2001 economic crisis macroeconomic environment changed significantly and the banking sector was subject to a large scale consolidation. Many insolvent banks were either liquidated or were subject to mergers and acquisitions. As shown in Figure 1 the fiscal discipline significantly decreased the public sector borrowing requirement and the reduced interest margins caused banks to focus on loans instead of keeping most of their assets in the form of government securities. Figure 2 shows that in 2001 only 20% of total assets is composed of loans whereas this number has increased to

more than 50% by the end of 2010. Loan-deposit ratio which was as low as 27% in 2001 increased to 80% by the end of 2010. The increase in the share of loans in total assets has been particularly remarkable after 2005. Despite the considerable increase in loans-assets ratio banks have been able to successfully manage the quality of loans and as can be seen in Figure 2 the NPLs ratio stayed at relatively low levels.

In this paper I investigate how the non-performing loans (NPLs) evolved in the banking sector during this period and analyze the bank specific and macroeconomic determinants of NPLs ratio for commercial banks. The paper takes the quarterly data for the 15 largest commercial banks²⁰ in terms of their share in total loans and investigates the determinants of NPLs ratio for the period from 2005q1 to 2010q4. In terms of bank specific determinants of NPLs ratio I look at the ratio of net loans to total assets, the ratio of equity to total assets, log of real assets, and net interest margin. I also put two dummies representing the public banks and foreign banks respectively to analyze whether there is a systematic difference in the loan quality of these banks. To see the effect of macroeconomic developments on NPLs ratio I put the GDP growth as an explanatory variable to sort out the influence of business cycles on NPLs. Also as some loans are indexed to foreign currency I put the log of foreign exchange rate to investigate whether it has a significant impact on loan quality.

I find that banks with a higher equity to total assets ratio and a higher net interest margin are expected to have a higher NPLs ratio whereas net loans to total assets ratio has a negative impact on NPLs. Public banks and foreign banks are found to have higher NPLs ratios while bank size does not seem to be an important bank specific variable. In terms of macroeconomic determinants GDP growth influences the NPLs ratio with a lag. Specifically a negative GDP growth leads to a deterioration in loans after two quarters. As some loans in the Turkish banking sector are indexed to foreign exchange the movements in domestic currency has an influence on loan quality. I find that a depreciation of domestic currency tends to increase the NPLs ratios of Turkish commercial banks.

The effect of macroeconomic and bank specific variables on loan quality has been a widely investigated subject of research for many economists and policy makers. Louzis, Vouldis, and Metaxas (2010) investigate the determinants of NPLs for Greek banking sector and find that macrofundamentals namely GDP, unemployment, and interest rates and management quality play an important role. They also analyze the influence of these factors for different loan segments and find that mortgages are the least responsive towards changes in macroeconomic variables. Quagliariello (2007) investigates the NPLs for Italian banking sector for the period 1985 to 2002 and find that the business cycle plays a significant role on NPLs ratio. Cifter et al (2009) investigated the Turkish banking sector for the period from January 2001 to November 2007 and find that industrial production has a negative impact on the number of NPLs but it shows its effect with a lag. Lawrence (1995) incorporates probability of default in a life-cycle consumption model and finds that the default rate is higher for borrowers with low incomes.

In terms of exploring the effect of bank specific variables on NPLs, Berger and DeYoung (1997) look for the relationship among loan quality, cost efficiency, and bank capital for U.S. commercial banks. They find that there is a negative relationship between cost efficiency and NPLs and low capitalization of banks leads to a higher NPLs ratio which they named as "moral hazard" hypothesis. Podpiera and Weill (2008) also investigate the relationship between cost efficiency and NPLs for Czech banks for the period from 1994 to 2005 and they find that managerial performance in the form of cost efficiency is important for loan quality. Ahmed, Takeda and Thomas (1999) find that there is a negative correlation between bank loan loss provisions and future earnings changes and stock returns.

The rest of the paper is organized as follows: Section II gives a brief description of the data and Section III presents the estimation results. Section IV concludes.

34 20) These banks account for more than 90% of the total loans in the industry.

2. Data

The data for bank specific variables is obtained from unconsolidated financial statements of commercial banks covering the period from 2005Q1 to 2010Q4. The ultimate data source is Banks Association of Turkey database. The data includes the largest 15 commercial banks in terms of their share in total loan market and these banks comprised more than 90% of the total loans in commercial banking industry.

The NPLs ratio is calculated as the amount of non-performing loans divided by total loans. The net interest margin is the difference between the interest rate on Turkish Lira denominated loans and the interest rate on Turkish Lira deposits. The real assets is calculated as nominal assets divided by the value of consumer price index for the respective period. The exchange rate is TRY/USD rate and an increase in the exchange rate implies a depreciation of domestic currency.

The cross-correlations among the bank specific variables namely NPLs ratio, the ratio of net loans to total assets (NLTA), the ratio of equity to total assets (ETA), net interest margin (INT), and log of real assets (LRA) are shown in Table 1. It can be seen that one does not need to worry about the multicollinearity problem as the correlation among the variables is not strong.

3. Estimation Results

3.1 Feasible Generalized Least Squares (FGLS) Estimation

In order to investigate the determinants of NPLs ratio for Turkish commercial banking industry the following equation is estimated using pooled feasible generalized least squares estimation:

$$NPL_{it} = \beta_0 + \beta_1' * BSV_{it} + \beta_2 * L_GDP_{it} + \beta_3 * LFX_{it} + \beta_4 * PD_{it} + \beta_5 * FD_{it} + \varepsilon_{it} \quad (1)$$

where BSV_{it} is a vector of bank specific variables which includes the ratio of net loans to total assets (NLTA), the ratio of equity to total assets (ETA), log of real assets (RLA), and net interest margin (INT). L_GDP stands for the lag of GDP growth and LFX is the log of TRY/USD exchange rate. PD_{it} and FD_{it} are the two dummy variables representing public banks and foreign banks respectively.

Table 2 shows the estimation results. I include the GDP growth and its first and second lags as an explanatory variable in different regressions. The results reveal that as the share of loans in total assets increases, the banks are expected to have reduced NPLs ratios. The argument behind this result is that as loans keep a higher share in total assets banks could have a better diversified loan portfolio which leads to a decline in non-performing loans. The positive sign for the ratio of equity to total assets implies that highly capitalized banks are expected to have a higher NPLs ratio. This finding is in contrast with the findings of Berger and DeYoung (1997) who claim that banks with a lower equity to total assets ratio have a higher NPLs ratio which they name as "moral hazard" hypothesis. Their argument for this hypothesis is that when the bank is lowly capitalized then the bank managers are more likely to extend loans to riskier customers which will generate higher NPLs ratios. For Turkish commercial banking industry the results show that the reverse is true that is highly capitalized banks tend to extend riskier loans and therefore have higher NPLs ratios.

The net interest margin (INT) has a positive sign meaning that banks with a higher net interest margin are expected to have a higher NPLs ratio. Banks with a higher interest margin generally charge a higher interest rate on loans and therefore these banks are more likely to attract riskier borrowers who are unable to borrow from other banks. Hence, it is quite normal to see that these banks are likely to have more non-performing loans.

The bank size does not seem to be a significant bank specific variable in determining the NPLs ratio. This is in contrast with the findings of Salas and Saurina (2002) who investigate the non-performing loans for Spanish commercial and saving banks and they find that larger banks tend to have lower NPLs ratios. Their

argument here is that larger banks have more opportunity in diversifying their loan portfolio and therefore they have fewer problematic loans.

The two dummies for public banks and foreign banks both have positive signs indicating that public banks and foreign banks tend to have a higher NPLs ratio.

In terms of macroeconomic determinants of non-performing loans I include the GDP growth rate and its first and second lags as an explanatory variable in separate regressions. I find that the GDP growth itself and its first lag are not statistically significant in explaining the non-performing loans ratio. It is seen that the GDP growth has a negative impact on loan quality but it shows its impact after two quarters. That is a slowdown in an economy will lead to a deterioration in banks' loan portfolios two quarters later.

The other macroeconomic variable that is included in the model is the log of foreign exchange rate which is measured as TRY/USD rate. The motivation behind including the exchange rate as an explanatory variable is that some loans in the banking industry are indexed to foreign exchange and a change in the exchange rate may affect the loan portfolio of commercial banks. The results reveal that an increase in exchange rate meaning a depreciation of Turkish Lira is expected to increase the NPLs ratio. A depreciated domestic currency increases the installments of the borrowers which leads to a decline in their loan payment ability and therefore an increase in the non-performing loans of commercial banks.

3.2 Dynamic Panel Data Estimation

Taking into account the persistence in non-performing loans of the banking industry an alternative estimation approach namely dynamic panel data estimation is also considered. In fact panel data estimation is commonly used in banking studies. Louzis, Vouldis, and Metaxas (2010) estimate the determinants of NPLs for Greek banks using dynamic panel data estimators. Salas and Saurina (2002) investigate the determinants of problem loans of commercial and savings banks for Spanish banking industry using dynamic panel data approach. Merkl and Stolz (2009) also use dynamic panel data regression in analyzing the effects of banks' regulatory capital on the transmission of monetary policy in a system of liquidity networks. Beck and Levin (2004) investigate the effect of stock markets and banks on economic growth using dynamic panel data models. The dynamic panel data model involves the inclusion of the lagged dependent variable as an independent variable along with other explanatory variables:

$$NPL_{it} = \alpha_i + \beta_1 * NPL_{it-1} + \beta_2 * BSV_{it} + \beta_3 * L_GDP_{it} + \beta_4 * LFX_{it} + \beta_5 * FD_{it} + \varepsilon_{it} \quad (2)$$

where NPL_{it-1} is the first lag of the dependent variable and α_i stands for the individual bank specific effects. The dummy variable for public banks, PD_{it} , is dropped in order to avoid the perfect multicollinearity problem. As the lagged dependent variable depends on α_i regardless of whether one treats α_i as fixed or random, the standard OLS estimation will give biased and inconsistent estimators. To solve this problem I use the GMM estimator proposed by Arellano and Bond (1991). The results are given in Table 3. As in FGLS estimation as the ratio of net loans to total assets increases in the banking industry the NPLs ratio is expected to decline. As banks increase the share of loans in total assets they have better opportunity to diversify their loan portfolios which leads to lower non-performing loans. In dynamic panel data estimation the ratio of equity to total assets is not a significant bank specific variable affecting the NPLs ratio whereas the net interest margin has a positive impact NPLs. That is banks with higher net interest margins are more likely to have more problematic loans as they attract riskier borrowers due to their high lending rates. In accordance with the results obtained in FGLS estimation bank size does not influence the loan quality of the commercial banking industry.

In terms of macroeconomic variables the GDP growth has a negative impact on NPLs but this time not only its second lag but the first lag is also statistically significant. That is if the economy slows down this will affect

the NPLs ratio of the banking industry for the next two quarters. As in FGLS estimation the results for dynamic panel data estimation reveal that the log of foreign exchange rate has a significant impact on loan quality. A depreciation in domestic currency tends to increase the problematic loans of Turkish commercial banking industry.

4. Conclusion

In this paper I investigate the determinants of NPLs for Turkish commercial banking industry. In terms of bank specific determinants of NPLs I include the ratio of net loans to total assets, the ratio of equity to total assets, log of real assets, net interest margin, and two dummies for public banks and foreign banks. I find that banks with a higher net loans to total assets ratio tend to have less problematic loans. The argument here is related with diversification as banks with a larger share of total assets occupied by loans have a better opportunity to diversify their loan portfolios. The results also reveal that well capitalized banks and banks with a higher interest margin are more likely to have higher NPLs ratios. The former finding is in contrast with the "moral hazard" hypothesis of Berger and DeYoung(1997) who claim that banks with poor capital tend to extend riskier loans and therefore have higher NPLs ratios. It is also seen that public banks and foreign banks tend to have more non-performing loans.

In terms of macroeconomic variables that could affect the NPLs ratio for the commercial banking industry I include the GDP growth in order to capture the business cycle implications of problematic loans. I find that GDP growth affects the NPLs ratio with a lag. In the FGLS estimation the results reveal that a negative GDP growth shows its effect on NPLs after two quarters. On the other hand, in the dynamic panel data estimation both the first and second lags of the GDP growth has a negative impact on loan quality. The log of the foreign exchange rate is also included as a macroeconomic variable. The argument here is that as some loans are indexed to foreign currency a change in the exchange rate could affect the loan payment ability of the borrowers and therefore can change the NPLs ratio. The results show that a depreciation in domestic currency tends to increase the non-performing loans of the commercial banking industry.

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Table 1: Cross-Correlations for the Bank-Specific Variables

	NPLs	NLTA	ETA	INT	LRA
NPLs	1.0000	-	-	-	-
NLTA	-0.2944	1.0000	-	-	-
ETA	0.1544	0.2990	1.0000	-	-
INT	0.3382	-0.3150	-0.0128	1.0000	-
LRA	-0.0009	-0.4652	-0.2063	0.2124	1.0000

Table 2: FGLS Estimation Results

Coefficients	NPLs	NPLs	NPLs
NLTA	- 0.070***	- 0.074***	- 0.076***
ETA	0.213***	0.214***	0.208***
INT	0.001***	0.001***	0.001***
LRA	- 0.001	- 0.001	- 0.002
PD	0.026***	0.026***	0.025***
FD	0.018***	0.017***	0.016***
GDP	0.000	-	-
L_GDP	-	- 0.000	-
L2_GDP	-	-	- 0.000***
FX	0.030***	0.026***	0.022***
const. 0.003	0.016	0.027	
#obs. 360	360	360	

Notes: In terms of the statistical significance of the coefficient estimates* denotes the significance at 10% level, ** denotes significance at the 5% level, and*** denotes significance at the 1% level. The regression equation also includes seasonal dummies which are not reported here.

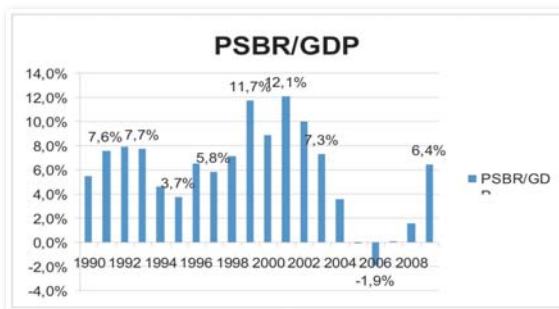
Table 3: Dynamic Panel Data Estimation Results

Coefficients	NPLs	NPLs
NPL(-1)	0.743***	0.719***
NLTA	-0.037***	-0.041***
ETA	0.030	0.020
INT	0.001***	0.001***
LRA	-0.002	-0.001
FD	0.004	0.004
L_GDP	-0.000***	-
L2_GDP	-	-0.000***
FX	0.010***	0.011***
const.	0.040	0.040
#obs.	330	330

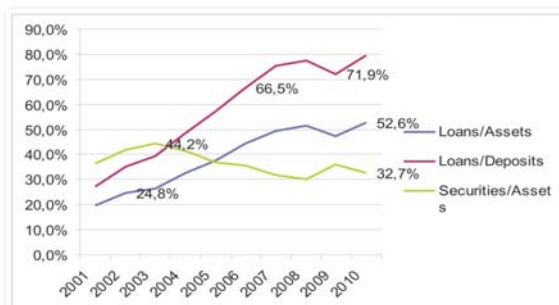
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Figure 1:

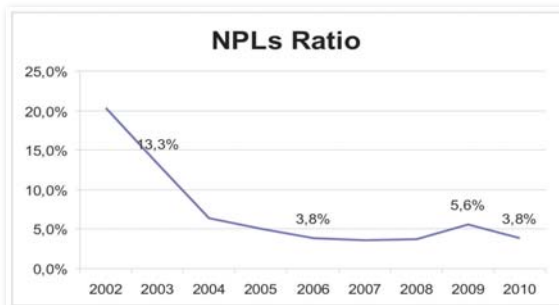
Public Sector Borrowing Requirement As a Percentage of GDP

**Figure 2:**

Some Selected Balance Sheet Ratios

**Figure 3:**

The Evolution of Non-Performing Loans Ratio



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