A Time Series Analysis of an Econometric Analysis of the Relationship between Non-Performing Loans and Micro and Macro Variables in Turkey

Nurayİslatince
Anadolu Üniversitesi, Faculty of Open Education, EconomicsAdministrativeSciencesProgramme, Postal Code 26470, Tepebaşı Turkey

ABSTRACT: *The significance of non-performing loans is big in terms of the role that the banking sector, which has a crucial position in the financial system, will play in financial crises. The continuity of the vital activities of banks is in direct proportion to the increase in their market shares and their gains. In this regard, banks aim to gain more profit by enhancing their efficiency in the market with the loans they offer. When the loans, which have an important place among the total assets of the banks which have a profit expectation, are not repaid due to internal (micro) or external (macroeconomic) factors that are bank-specific, they will pose a risk for not only the banking sector but also economy. Predicting non-performing loans in advance will make it possible to take necessary precautions before these risks appear. The important thing is the sufficiency of the banks in credit risk management, not what is to be done for non-performing loans. The identification of the risks that can be encountered in the loan giving process and determining which applications to use by making assessments in this directionmight prevent the occurrence of this problem. With this study, the relationship between the macroeconomic and bank-specificvariables, and non-performing loans over the period of 2004 Q1-2015 Q3 have been analyzed* using the Vector Error Correction Model and Granger causality impulse-response functions and the variance analysis methods.

Keywords: *Profitability, Deposit Banks, Risk,* Granger causality impulse-response functions, *Non-performing loans*

JEL Classification: G21, C23, C22

I. INTRODUCTION

The transformation in financial markets in the rapidly globalizing world made it compulsory for the institutions managing the financial flows to keep up with this change. As is known, banks are the most effective ones among these institutions. The efficiency of banks in global markets is directly proportional to their power of competitiveness. For this purpose, banks have increased the variety of products and customers in a short time. In this context, different opportunities have emerged for risky investments as well. Apart from the fact that every country is evaluated within its own financial structure, that banks seek alternative ways to make aprofit is their common ground. In order to gain more with similar expectations, the banking sector in Turkey aims to increase the efficiency and profitability in the market by giving more loans. Loans constitute more than half of the total assets in banks with a profit expectation. However, as a result of internal or external factors, the increase in the shares of non-performing loans among the grossloans may cause trouble in the sector. Even not directly, thebanking sector has an indirect effect on national economic contractions. The transformations in economy, in other words, the unpredictable changes in the profits of loaners in the process of expansion or contraction should be expected. Due to such issues, banks can be reluctant to give a loan. The reason is that the increase in non-performing loans means that banks set aside a bigger amount of money and the costs increase, which will affect the financial statements of banks negatively. Besides, the net active assets of the banks,the loan portfolios of which are ruined, will decrease. In order to prevent all these issues from occurring, it is vital to predict the potential non-performing loans beforehand. In this way, precautions can be taken for possible risks in advance, thanks to which undesirable situations in the banking sector and national economy can be avoided.

II. THE CONCEPT OF NON-PERFORMING LOAN

The loan is the amount of debt which will be repaid by fund claimers that consists of the deposits that banks collect to gain profit in an estimated term and with an estimated cost.

Banks expect the loan that is given to be paid back at due date. However, problems may arise in repayments for some reasons or there can be delays. Actually, no standard can be mentioned for the definition of non-performing loan throughout the world. However, loans are taken into close monitoringif the delays exceed 30 days.When the delay exceeds 90 days according to the payment plan determined for the debtor and if there occurs a situation in which the loan loses its worthiness orbecomes vulnerable, it is transferred to thenon-performing account.

The banking sector has an extremely significant place in a country's financial structure. Banks respond to the resource requirement of the reelsector. They perform these fund-providing duties despite the risks of interest rate, liquidity, and credit. If the loan given by the bank is not repaid at due date, it is a credit risk. When banks give loans, theydetermine the creditability degree based on the elements such asthe potential debtor's financial value, reputation in the market, interest accrual entries and risk status if the potential debtor has worked with a bank before and his previous credit scores.For this purpose, the bank investigates the person or the institution carefully after the loan application. While assessing the loan application information, it is a vital ability for the banks to decrease the additional costs which may arise due to the procedures such as the inquiry that will be done regarding the debtor and the verification of the information. However, there are still loans which are not paid at due datein spite of all these positive efforts of the banks.Banks are expected to protect the deposit holders' interests, be trustworthy in the financial system and contribute to the country's economy positively. For this reason, the public institutions which control and regulate the principles concerning the banks' establishment procedure, management, merger, liquidation and supervision have to make the credit system work effectively by monitoring the risks related to the loans given bythe banks.In a fragile situation which might emerge in the banking sector, if there occurs a delay in making new regulations or taking the precautions quickly, it is clear that the problem of non-performing loans will form a basis for the economic crises that have been faced before. Foreseeing the negative results that the growing non-performing loans can cause and taking precautions are of vital importance for banks. Therefore, the non-performing loan determinants and the relationship between them are important. There are many studies on this subject. Upon analyzing rather comprehensive empirical literature, the variables that affect the non-performing loan ratios, their relations, the regulations within countrieshave been investigated regarding the economic situation and the periods examined.

III.   LITERATURE REVIEW

There are numerous studies in the literature on the non-performing loans which have an important place in banks' survival.

One of the significant and early studies on the loan losses was carried out by Keeton andMoris (1987). In this paper, it is pointed out that macroeconomic variables have an effect on the non-performing loans. Furthermore,it is emphasized in the study that the banks' risk-taking behaviors lead to the increase in the loanloss rates.

In the studiesofSinkey and Greewalt (1991), which focuson the loan loss rates of deposit banks in the USA, it is indicated that both internal and external variables are related to non-performing loans. Overfinancing and interest rates are accepted as the main reasonsfor the high rates of non-performing loans in the banking sector in the USA.

Salas &Saurina (2002) made an analysis for the non-performing loans by combining the bank-specific variables and the macroeconomic variables andusing the data over the period of 1985-1997 of Spanish deposit banks. In this study, it is pointed out that unproductive management problem leads to the growth of the non-performing loan ratio. Furthermore, in the study, it is found out that the size of the bank is not related to the non-performing loan ratio. The bank-specificvariables cause bigger loan losses and increase the non-performing loan ratio.

In the study of Santos et al. (2003), it is concluded that the fundamental reason for the increase in non-performing loan ratio is linked to the interest rates and the weakness of Pezo.

In their study, Rajanand Dhal (2003)emphasize that both the macroeconomic variables and financial factors have an important influence on the non-performing loan ratio by using the regression analysis in regard to the Indian banks. Per capitareal income is included in the macroeconomic variables whereas the size of the bank, credit orientation, and credit conditions are included in the financial variables.

Skarica (2014) performed a panel data analysis for the period of 2007-2012 in the developing Middle and Eastern European countries. He has concludedthat the increase in real GDP, in which the unemployment rate and the inflation growth increase the non-performing loan ratios, has a negative impact on non-performing loans.

Worue (2013) has investigatedmacroeconomic and bank-specific variables inthe non-performing loan ratio of the commercial banks in Kenya. The result is that the effect of the interest rates on the non-performing loan ratio of the deposit banks is positive and significant.

Reis and Kötüoğlu (2016) have explainedthe Turkish banking Capital Adequacy behavior in their studies. In the period of 2009 Q1-2015 Q4, the relationship between the variables has been examined with the regression analysis and it has been concluded that profitability, liquidity and non-performing loan ratio have a positive effect on CAR.

Washington (2014)has indicated that internal and external variables affect the non-performing loan ratio in theories related to credit risk in the study on the effects of macroeconomic variables on the credit risk for the Central Bank, the management of the deposit banks and the investors to makeconscious decisions.

With the study of Arslan and Yapraklı (2008), in which the relationship between the bank loans and inflation has been examined covering the period of 1983-2007, it has been concluded that inflation affects bank loans negatively, and an increase in bank loans affects the inflation positively in the long term.

Badar and Javid (2013) havestated that there is a relationship between the variables in the long term using the Johansen and Juseliuscointegration test with the data from deposit banksfor the period of 2002 -2011 in Pakistan. With the Granger causality test, they have found out the inflation and exchange rate to be the Granger cause of non-performing loans. Using the Vector Error Correction Model, the short term relationshiphas been tested and the relationship between non-performing loans and the inflation and exchange ratehave turned out to be weak. As a consequence, macroeconomic variables have a strong impact on non-performing loan ratio.

IV. DATA AND VARIABLES

In this study, the relationships between macroeconomic and micro variables and non-performing loans over the period of first quarter of 2004 to third quarter of 2015 have been analyzed by using the Granger Causalitytets, impulse-response functionsand the variance decompositions within the Vector Error Correction Model (VECM)

For this purpose, we collect the the datafor the 34(deposit) commercial banksoperatingin the Turkeyfrom the 3-month reports of the Bank Supervision Committee (BSC) statistical data. The data for the macroeconomic variables has been extracted from the CBRT Electronic Data Transfer System (EDTS). Since the investment and development banks have a different status, they have not been included in the study. Birleşik Fon Bankası A.Ş., which has been handed over to SDIF, is excluded from the study.

In this study, the ratios of the Banks Association of Turkey have been taken as a basis for the micro variables.

V. MICRO VARIABLES

Non-performing Loans / Gross Loans; this ratio shows the creditability of the bank and how much of the gross loan the bank gives are non-performing. The higher the ratio, the lower the bank's creditability and subsequently its profitability.

5.1 *CAR*; Thenon-payment of the loans which compose an important part of the risks in the banking sector means the compensation capacity of the potential or unforeseen losses related to the institutional, operational risks and the credit and the market risks which the banks face.This rate is measured in order to assess to what extent the capital base of a bank meets risk-weighted assets. The functional meaning of this rate is closely related to a bank's risk-taking capacity.

5.2 *Liquidity ratio* shows the banks' ability to pay liabilities due and operate depending on the economic developments and under the unexpected market conditions. The sources of banks' liquidity are the securities available for sale, properties for trading and short-term loans. A rise in non-performing loans increases the need for the liquidity of a bank. As a result, the cash flows and creditability will be affected negatively.

5.3 *Interests on loans/Gross Loans* shows the general pricing policy of the bank. Good management of the credit risk is crucial in the banking sector. Asymmetric informationbetween the parties during the extension process might emerge as an adverse selection and moral hazard. Adverse selection is a problem which emerges when all the qualities of the debtor are not specified by the bank before the loan agreement. Namely, it means preferringthe bad loan customer instead of the potential good loan customers. In such case, the high risky/risk-freecustomers cannot be distinguished. If the bank meets the demands of high-risk customers, the non-performing loan ratio in the gross loan will increase.

5.4 *Net interest margin;* it is the difference between the income madefrom the bank loans and the interest expenses paid to the deposit. The most important duty of the banks in the financial system is toperform financial intermediation. Therefore, the net interest margin is the basic element in measuring the intermediary costs they bear.The net interest margin is a significant variable to be used while assessing the efficacy of the banking sector.The policies determined by considering the elements which define the net interest margin play a positive role in reducing the banks' intermediary costs. The net interest margin is an important criterion in loan pricing. At the same time, it is used in planning. The high ratio of the net interest margin is an indicator that the income (profit) gained through the process of using the deposits collected as loans is high. The net interest margin of the banks with a strong capital is high.

VI. MACROECONOMIC VARIABLES

The stability of the banking sector will have a positive effect on reducing non-performing loans. In terms of the credit risk measurement and ensuring continuity, it is of vital importance that the sectorcanmake accurate predictions for non-performing loans. In this way, identifying and analyzing the macroeconomic parameters that affect non-performing loans will be able to contribute a lot to the banking sector.

6.1 Inflation; This variable can affect both thecosts and profitabilityof the banks. In the financial intermediary operations, banks use financial tools that are easily affected by the general price changes and which lose their purchasing power value. Price changes create an ambiguity related to the income expectations. This means the increase of the risks that banks will encounter while operating. Capitals are the most important indicator of banks' durability and reliability. The effect of inflation creates a negative impact in terms of the banks' equitycapital. A bank the equity capital of which is rapidly melting will be inadequate in meeting non-performing loans.

6.2 Growth Rate(GDP); An economic growth rate is a measure of economic growth from one period to another in percentage terms. In practice, it is a measure of the rate of change that a nation's gross domestic product (GDP) goes through from one year to another.The growth rate may affect banks' deposits and the amount of loan they think of providing.A decrease in GDP during periods when the economic growth is negative or slow for a certain period of time will increase the loan risk of banks. On the contrary, if growth is in question, banks will be willing to provide aloan. Therefore, the net interest margin will increase and accordingly, profitability will increase as well. For this reason, growth is included into the macroeconomic variables to determine the effect of growthonnonperforming loans.

6.3 Term Deposit Interest Rates; the risk taken regarding the loans given is very significant for the banking sector. It might be said that the high rates of interest on the deposits will increase the bank expenses. Depending on the increase in deposit interest rates, banks will increase loan interest rates. The high interest might cause the adverse selection and moral hazard related to asymmetric information. Apart from the customers who do not want to take loans with the high-interest rates, the high risk and low creditability potential customers may ask for loans. In this case, the relationship between the interest rates and non-performing loans can be expected to be positive.
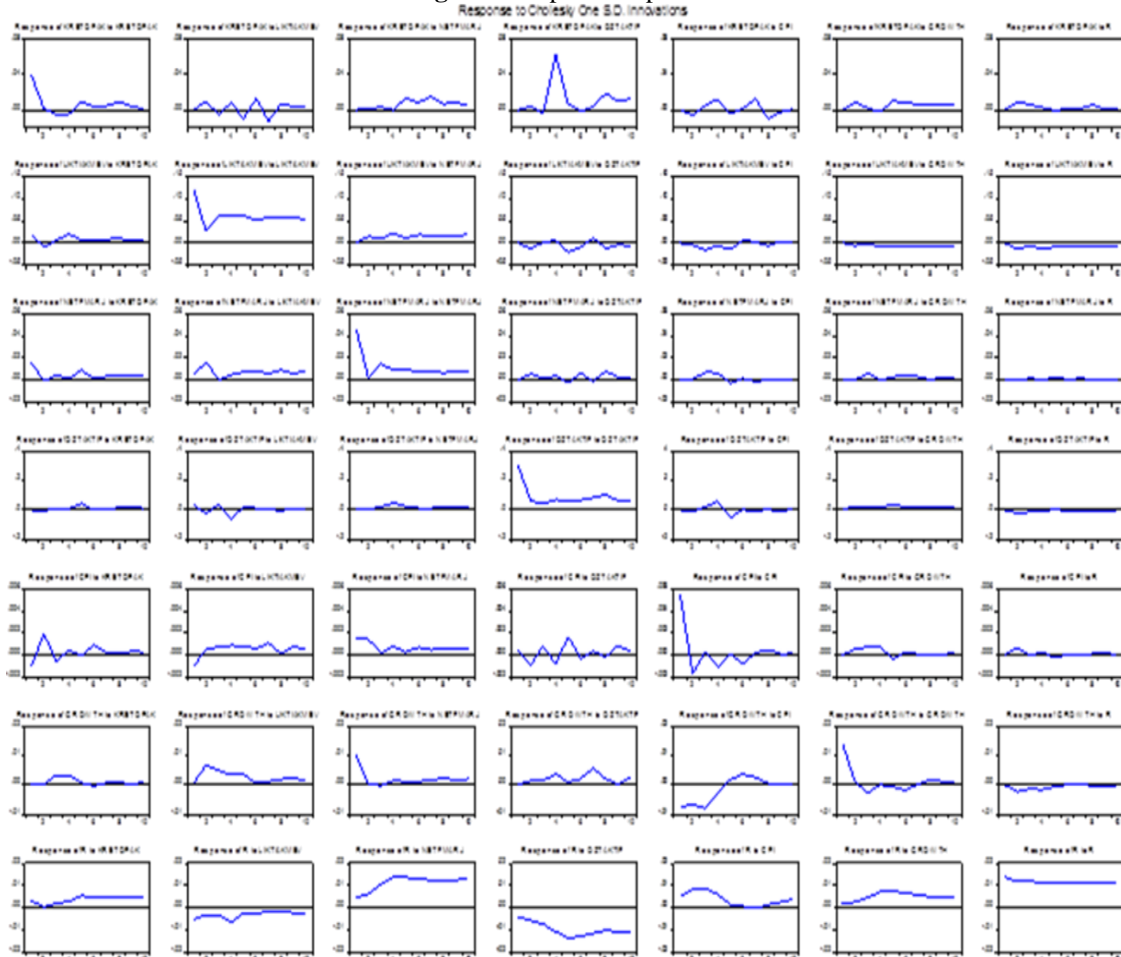
VII. EMPIRICAL RESULTS

In this study, I tried to analyze the dynamic relations between non-performing loans and macroeconomic and bank-specific variables over the period of non-performing loans by using Granger causality,impulse-responsefunctionsand the variance decomposition analysis within the VECM. For this purpose,first, the time series properties of each variable are investigated by using unit root tests with structural breaks. Based on the results of the unit root tests, which indicate that all series under consideration are first difference stationary, that is I(1); the existence of cointegration between variables are investigated by using Johansen cointegration test. After finding a cointegration between variables, a VECM is formed and GrangerCausality tests, the impulse response analysis, and variance decomposition analysis are carried out. Table1presents the results of Granger causality tests.

Table 1: Granger causality test results

Uzun dönem		Kısa dönem	
Sıfır hipotez	Test istatistik (t-testi)	Null hypothesis	Test istatistik* ( )
D(LIKTIAKMEV), D(NETFMARJ), D(OZTAKTIF), D(CPI), D(GROWTH), D(TKO), and D(R) does not Granger cause D(KRETOPAK).	-6.58108 (0.24293)*	D(LIKTIAKMEV) does not Granger cause D(KRETOPAK).	1.13 (0.57)
		D(NETFMARJ) does not Granger cause D(KRETOPAK).	4.24 (0.12)
		D(OZTAKTIF) does not Granger cause D(KRETOPAK).	162.49 (0.00)
		D(CPI) does not Granger cause D(KRETOPAK).	3.48 (0.18)
		D(GROWTH) does not Granger cause D(KRETOPAK).	0.57 (0.75)
		D(TKO) does not Granger cause D(KRETOPAK).	21.46 (0.00)
		D(R) does not Granger cause D(KRETOPAK).	4.93 (0.85)
*Probability value of test statistics			

Based on the results of the Granger Causality test, it can be concluded that all variables are the Granger causes of non-performing loans in the long-run. On the other hand, in the short-run, CAR, general pricing policy of the bank and interest rates are the Granger causes of the non-performing loans of the deposit banks in Turkey. Unlike the expectations, there is no causal relationship between some bank-specific variables such as net interest margin and liquidity and fundamental macroeconomic variables such as inflation rate and growth (GDP). To see the sign of the causality between variables, the impulse-responseanalysis is carried out. The impulse-response functions are shown in Figure 1.
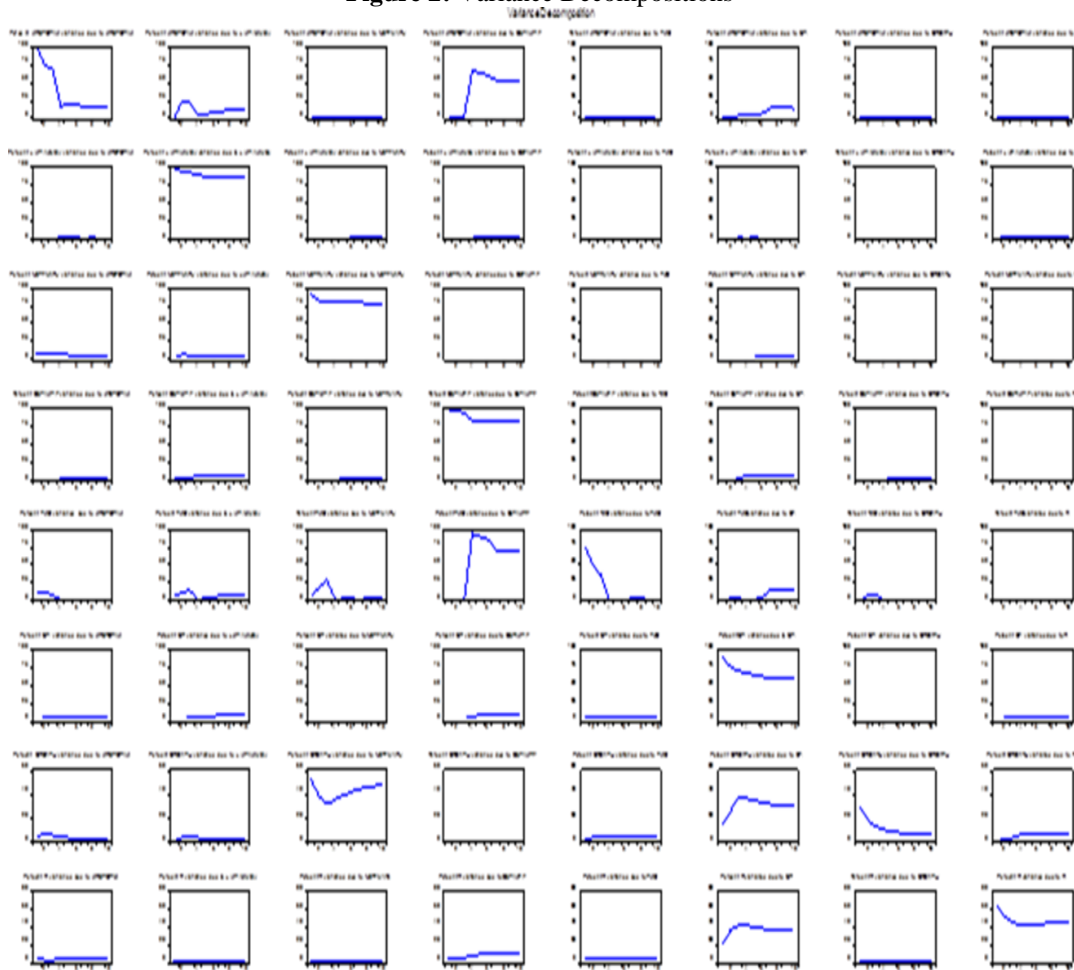
Figure 1: ImpulseResponses

The results of the impulse response analysis show that the shocks caused by the net interest margin, CAR, growth and inflation rate create an increasing effect on non-performing loans. As is seen in third impulse response in the 1st row of Figure1, the changes in the net interest margin increase the non-performing loan ratio at the end of the first year. The response of non-performing loans to shock generated by CAR has been increasing and reachesmaximum at the end of the first year.The most important item that consumes the equity capital of a bank is the loans given. The equity capital needs to be increased for the loans to increase. The Turkish banking sector adds the operational income to the equity capital and reuses the increased equity capitals as a resource for loans. Deposit banks the equity capital structure of which is weak give loans taking high risks with a high expectation of gain into account, which will increase the non-performing loan ratio in banks.A high net interest margin of a bank is an indicator of the high income (profit) which is gained through the use of collected deposits as a loan. Banks with strong capitals have high net interest margins. Therefore, they are reluctant to take risks while giving loans. The non-performing loan ratio is low in these banks. The net interest margin is the basic element in measuring the intermediary costs banks bear.Cost-effectiveness will be weak in poorly managed banks. Poor managers who cannot establish the correct relationship between the incomes gained from loans and interest expenses paidwill lead to the increase in loan ratios. Other variables (liquidity and inflation) do not have a significant effect on non-performing loans.

To get an idea whether established Grange causality holds beyond the sample period, the results of variance decompositions are used. The results are shown in Figure 2.

Figure 2: Variance Decompositions

The results of the Variance Decompositionsanalysis show that the change in non-performing loans is mostly (at the end of the 10[th]quarter) explained with CAR. At the end of 2.5 years, in the 10[th]quarter, 52.92% of the change in non-performing loans can be explained with CAR. Non-performing loans itself explain 15%, liquidity explains 11% and inflation rate explains 14% of the changes.

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