

Estimation of Net Interest Margin Determinants of the Deposit Banks in Turkey through Static and Dynamic Panel Data Modeling

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ABSTRACT: Banks, which are the irreplaceable intermediaries of the financial system, are financial institutions that significantly contribute to economic development. The basic criterion that indicates the efficiency of the intermediation activities of banks is the net interest margins. These costs are assumed to be high for developing countries such as Turkey. The degree to which banks are willing to redeem the funds they collect as credit to the system is directly related to how low their intermediation costs will be. In this paper, it is aimed to estimate the net interest margin determinants of deposit banks in Turkey. Three different panel data models are used for this purpose. These are the Fixed and Random Static models and the GMM (Generalized Moment Models) Dynamic model.

Keywords: Bank Interest Margins, Operating Costs, Required Reserve Ratio, Panel Data

Gel Classification: D21, G15, G21

I. INTRODUCTION

The significance and efficiency of the banking sector in terms of economic developments have been discussed in many studies. Financial intermediation activities of a strong and profitable banking sector would contribute to economic development. The extent to which banks can be efficient when fulfilling their functions of intermediating the flow of funds in the financial system is related to how close the positive difference between the income they obtain from the funds they provide to the ones in need and the amount they pay for the funds they provide from the savers. Efficient working of the banks depends on their intermediation costs. Opening net interest margin may lead savers to tend for different investment alternatives rather than banks. This is an undesirable outcome which is negative for the financial system. Intermediation costs are high in developing countries such as Turkey. It shall be aimed to adopt policies that intend to decrease these costs. The basic criterion used for the efficiency or evaluation of the intermediation costs is the net interest margin. This is the only way to evaluate how the banks can be more efficient in delivering the deposits they have collected to the ones who need by means of providing loans. The banking sector can only continue its activities if it can ensure the best margin between the incomes it gains from the loans it provides and its funding costs. This also shows the profitability of the banking sector. That is; the margin between the income gained from the interest of loan and the deposit interest collected is the basic criterion for profitability. Estimation of the net interest margin determinants is crucial for the proper explanation of this relation.

II. BANKING SECTOR AND NET INTEREST MARGIN

One of the key instruments used to measure the efficiency of the intermediation costs of banks is net interest margins. Net interest margins are of great importance for the banking sector. Banks, which are expected to contribute to economic stability shall carry out their intermediation duties more efficiently and provide more funds to the real sector through credits. However, high intermediation costs have a detrimental effect on competition and this prevents the banks from working effectively in the system. The success of banks in offering funds to the real sector requires robust structure and profitability. Their eagerness to fulfill these functions will increase depending on how low their intermediation costs will be. In economies where outward-oriented policies are adopted due to financial liberalization, foreign capital inflows into the system are higher. The effect of this is seen in the sector as the reduction of intermediation. In the system, banks can provide the sustainability of their institutional assets by balancing the interests they gain from credits with the costs of interest paid on deposits. In this respect, it is also necessary to add that; the net interest margin is the most basic profitability indicator of banks. The efficiency of the monetary policy also depends on the level of development of the banking sector and the response of the banks to the monetary policy. The changes to be made by CBRT in the instruments of monetary policy will cause changes in net interest margins of banks. In a system where the real sector intends to continue its activities with the credits it is to receive from banks, the effect of the credit interest rates announced by the CBRT on the changes in net interest margin will influence the decision of the production companies

regarding the levels of employment and production. If the interest incomes have increased more than the interest expenses due to the market interest changes, the net interest income will also increase as a result and this will increase the net interest margin. Otherwise, the interest expenses will increase more than the interest incomes and thus, will decrease the net interest incomes. In this case, the net interest margin will decrease, as well. It is significant for the banks to make accurate estimations to be able to continue their activities. Possible changes in economy make up the core of such estimations. Interest rate risk is only one of these and it is important to determine the direction and amount of future changes in interest rates for short- and long-term assets. Only after estimating the future state of deposits and interest rates it can be possible to define the strategy to be followed by the bank. For example; if interest rates are expected to increase, the bank shall bind its assets in long-term and shall have the individuals benefit from short-term credits. In this case; the net interest income of the bank will increase. The importance of the effect of net interest margins on the banks, real sector and monetary policy attracts academic attention and many studies have been carried out on this issue. Contributions made in the literature in this respect are as follows.

III. LITERATURE

Ho, Saunders (1981) suggest in their work that, the size of bank spreads and margins directly fits to theoretical and empirical modeling, and based on the assumption that the financial intermediaries for high and variable interest rates are causing serious financial management problems, they claim that, interest mobility affects the bank's interest margins or spread. In their study, they used the comprehensive income and balance sheet data of major American banks provided by Keeffe, Bruyette and Woods, Inc. in estimating the interest margin or spread. In this paper, a risk-averse dealerinterest margin or spread model is developed. They further state that; Spread is based on four factors, which are; the managerial risk avoidance rate, the size of the bank's transactions, the bank's market structure, and the variance of interest rates.

In his study, Angbazo (1997) investigated the components of the net interest margin of US commercial banks taking into account the period 1989 - 2003. This article tests the hypothesis, whether banks with riskier loans and those with higher interest rate risk would choose loan and deposit interest rates to achieve high net interest margins. In his study, he used the debt equity ratio by considering the bankruptcy risk and management quality and found a positive and significant relationship between this ratio and net interest margin. He concluded that; the net interest margins of the commercial banks were influenced by variables such as the default risk, the opportunity costs of non-interest funds, the leverage and the bank's management activity.

In the study carried out by Barajas, Steiner and Salazar (1999); the effects of the financial liberalization in Columbia on net interest margins were examined. It was concluded that; although after the financial reforms in Colombia, the net interest margins of the banks declined, some other factors were also influential on the net interest margins.

In the study performed by Afanasieff, Lhacer and Nakane (2002), panel data regression techniques were used to explain the components of net interest margins for Brazilian banks. A two-stage analysis was conducted to explain the effects of micro and macroeconomic determinants. As a result, macroeconomic determinants were shown to better explain the profitability and performance of Brazilian banks.

Saunders, Schumacher (2000); took 614 banks in Europe and the US in the 1988-1995 period as model and made a study on the determinants of bank net interest margins where they used the model in the study of Ho and Saunders conducted in 1981. In their study they found that; as the decline in margins in the European banking system was in contrast with the reduction of the interest rate risk, credit risk and operational costs, it was found to be in line with the softening of the conditions of competition (improved market strength and concentration). In conclusion; regulatory factors such as deposits and required reserves have a significant effect on the net interest margins of banks. It was revealed out that; among the three variables they had determined, the implicit interest rate was the one with the strongest influence and that;this variable had a very significant positive effect on the net interest margin for almost all countries. That is, in order to finance implicit interest payments, banks shall increase their net interest margins (for example, by increasing loan interest rates or by lowering deposit rates). Regarding the required reserve ratio opportunity costs, the coefficients were found to be positive and significant in most countries and years, as expected.

Entrop, Memmel et al. (2012) analyzed how the interest margin and other risk factors were priced in bank margins. In contrary to previous studies, they studied the incomes and expenses as well as the net interest income. The main finding was that; prepayments related to interest rate risk was priced both for interest incomes and expenses after the control of the gains that arise from the bank's term structure of interest rates. They also found that; private commercial banks with direct access to capital markets had incurred higher profit share payments and costs as a result of the volatility of interbank interest rates only. So it was concluded that; the banks presented through Ho and Saunders' original model were sensitive to the refunded interest rate risk.

In his study where Kaya (2001) carried out an econometric analysis in order to find the determinants of net interest margins for Turkey, he calculated the net interest margin by two methods as ex ante and ex post. In

the study, which aimed for the evaluation of the interest margins in the Turkish banking system through an analytical perspective, it was found that; despite the relative deepening and diversification of the banking system and the improvements in technology and human resources, interest margins were higher than the examples in the world and that, while they affected the efficiency of the financial system adversely, they increased the profit margins.

In the study conducted by Atasoy (2007), the relationship between the Turkish banking sector, asset profitability and net interest margin were examined. For the net interest margin, the share of credits among the current assets were found to have statistically significant correlations at the level of 5 for all variables except for the Herfindahlindex and the foreign share in banking sector. The ratio of non-interest expenses to assets, the share of equity capital and deposits in total balance sheet and the inflation rate were found to be significant variables affecting the net interest margin.

In his study where Kumari (2014) made panel regression, he concluded that; operating costs, credit risk, risk aversion rate (ratio of total equity to total current assets), implicit interest (fees and commissions) and capital adequacies were important for the explanation of the net interest margins of the local licensed commercial banks in Sri Lanka.

IV. DATA SET AND VARIABLES

There are many theoretical and empirical studies focused on net interest margins of banks. Ho and Saunders (1981) suggested that a model for the intermediation costs in the banking system and this model became a reference for most of the empirical analyzes of the determinants of net interest margins. Due to the increase in the non-traditional activities in total bank revenues, Interest margins constitute only part of the issue. For this reason, analysis can be carried out from a broader perspective by defining and combining bank-specific and other variables. In this study, it was aimed to estimate the variables that determine the net interest margin by using the panel data model, as independent variables can be changed in two dimensions instead of one dimension and panel data based estimators often give more accurate results than others and the estimators obtained are more efficient. Bank-based, monetary policy and macroeconomic variables were used for this purpose. The financial ratios of 29 deposit banks operating in the Turkish banking sector in the period 2005-2015 were calculated with the help of the statistical reports from the bank and sector information data provided by the Turkish Banking Association. CBRT Electronic Data Distribution System (EDDS) was used to create the data set belonging to macroeconomic variables. Due to the states of the Investment and Development banks, these were not included in the calculations as they were not considered to serve for the purpose. SDIF transferred Combined Fund Bank Inc. Co. was also excluded from the study. In addition, some deposit banks which were not adequate for the dataset for which the activity periods were created in the sector or some deposit banks which had withdrawn from the sector were not included in the model. This study is based on the ratios of the Union Municipalities of Turkey for bank-specific variables (www.tbb.org.tr).

V. BANK-BASED VARIABLES

Net Interest Margin (nim): The net interest margin is the interest income obtained for a unit asset. It is a key indicator in measuring the bank's effectiveness in the sector. It also expresses the bank's profitability when the net interest margin of the bank is high. Therefore; the net interest margin can be considered as a criterion related to both profitability and managerial effectiveness. As the banking sector plays an important role in the development of the economy, depending on the changes in the net interest margin, the ones with the surplus of funds will develop or decline their tendency to save or to invest. Opening of the net interest margin will restrict banks' fund procurement. This is because investors will not be willing to go to the bank. In this case, the financial sector will not develop or will be adversely affected. The net interest margin is calculated by the proportion of the difference between interest incomes and interest expenses to total current assets.

Operational Costs (oc): Operational costs have a significant impact on the determination of the level of net interest margins for the banks to be able to cover their operational costs with the interest incomes (Kumari 2014). Klein (1971) stated that; operational costs were important in the process of determining bank credit and deposit interest rates. In literature, operational costs were frequently used in studies investigating the determinants of net interest margins. High operational costs may lead to serious losses due to NIM of the interest risk and credit risk for banks' estimated credit risk and the specified market level. Banks are service providers. Lerner (1981) criticized Ho and Saunders' model and claimed that; due to their production function qualities, banks should be included in models in operational costs when testing net interest margin determinants. In the study, operational were calculated by the proportioning to the bank's total assets.

Credit risk (cr): The credit risk indicates the variability of the default ratio within the framework of the multiplication of the expected value of a credit by the degree of loss in case of default. High credit interest rates

mean that; credit demand decreases for sound and sensitive businesses, investment declines and growth slows down. This is a sign of increased risk premium and credit risk for banks. For this reason; the banks are worried about the increase of interest rates because they fear that the loans will not be returned on time and in full. The problem of credit risk will arise if the beneficiaries of credits fail to pay the credit back. Should there be a default risk on the loans, the bank should either increase the credit risk premium or increase the loan fees and costs. Banks expect to receive an income that is above the cost of the credit funding. Despite the credit risk, banks should work with a high net interest margin. In the study, credit risk is explained as the ratio of gross non-performing loans to total credits. The highness of this ratio is associated with low credit quality and high credit risk. Banks should bear high net interest margins in order to maintain credit reserves and to compensate for the issuance of risky credits.

Risk avoidance (ra): The uncertainties arising as a result of the bank's shifting to different instruments due to increased competition in the banking sector can be considered as the reason for the emergence of risks. Many institutional and functional developments and innovations in the financial system increase the uncertainties the banks will face. The emergent risky environment can directly affect economies. The factors that stimulate the risks the Turkish banking sector is facing today are; the increasing competition, variability of the exchange rate and the great differences in liquidity positions. In the study, risk avoidance is explained by the proportion of equity capitals to total current assets. The highness of this ratio indicates that, banks are more likely to avoid risk. In fact, the expected sign of this variable is uncertain. Because, on one hand, banks with high asset quality will have high paying power, as well; thus, their funding costs will be low and the net interest margins will be high. On the other hand, banks that highly tend to avoid risk will be willing to invest their resources in less risky assets, which will lower net interest margins.

Credit intensification (ci): This the most serious risk that banks face. As banks have the function to fund the sector, the risk of intensification is often associated with credit risk. However, the risk of intensification is not limited solely to the risks associated with credits granted to individuals or companies, but it may also be associated with other significant risks related to active and passive items that could threaten the bank's financial rigidity due to deterioration in certain markets, sectors, countries or areas of activity. In intensification risk management, banks must follow a holistic approach where all risk intensifications are defined and assessed. This is because even a single risky process or activity can lead to losses or negative consequences in multiple risk categories. In order to determine the risk of concentration of a bank, it is not enough to analyze the individual risk types only, but it is also necessary to analyze the risk of concentration among risk types. The risk of concentration may be arising from factors that cannot be understood or determined without carrying out a practice that cover all processes including the determination, management, monitoring and reporting of that risk. Therefore; risk intensifications should be prevented through a proactive approach before these appear and are identified by internal control/audit staff (BRSA 2016). The increase in intensification leads to an increase in net interest margins. In the study, it is explained by the proportion of the credits to the total current assets.

Deposit Intensification (my): Deposits can be said to have more intensification compared to current assets and credits. Deposit is the result of a multifaceted monetary and economic process. It is the basic intermediation instrument for banks. Moreover, it is one of the key players of the monetary policy and the monetary transmission system. Deposit, which is the most preferred instrument in making good use of savings, is the most vital financing resource for banks. Deposit has a great share among a bank's balance sheet items and it can be influential on the liquidity management methods of bank. This may affect the net interest margin. In the study, it is explained by the proportion of total deposits to total current assets.

VI. MACROECONOMIC VARIABLES

Growth (growthgdp): The growth rate can affect the deposits of the banks and the amount of credits they intend to grant. In periods where economic growth is negative or slow for a certain period of time, the decline in GDP will increase banks' credit risk. If on the contrary, there is growth banks will be willing to grant credits. Therefore, net interest margins will increase. It can further be said that; GDP has impact on the demand side of total credits and this could affect the credit interest rates. It is generally accepted that; the tendency of saving and capital accumulation is important for stable investment financing, growth and development in the economy. In this respect; the impact of GDP on total savings and the size of deposits of banks, it is thought that there is a significant relationship between net interest margin and GDP.

Inflation (inf): High inflation and high level of uncertainty affect market prices and economic activities adversely, causing the market to move away from activity. The prices in the economy can be effective in constant and significant price increases in general, the credit and deposit interest rates, and hence the

determination of the net interest margin. In an inflationist context, the purchasing power of the currency is reduced and thus; the real value of savings of households is reduced due the inflation tax. This situation demotivates the people to hold other assets defined through money and currency. Basic funding resources of banks will affect deposit rates and credit rates and, consequently, they may have impact on the net interest margin. Credit demands of households will thus change in such an environment and the net interest margins of banks will be affected, as well.

Required reserve ratio (Constant): Banks block a certain amount of the deposits they have collected within the specified rates on the basis of the Central Bank of the Republic of Turkey. So; banks can fulfill their duties without facing the bankruptcy risk as they will have available resources when sudden liquid output is needed. This procedure is one of the instruments of the CBRT's monetary policy. As all banking sector is subject to this same procedure, it is an effective monetary policy tool. Reducing the required reserve ratios will result in the decrease of credit interest rates as it will cause higher interest payments by the banks on deposits or the reduction of credit costs. Since the interest margins will narrow this case, the intermediation costs of the banks will also decrease.

CBRT average interest rate (CBRTair): As the last source of liquidity in the economy, the Central Bank can lend money to or borrow money from banks. It is aimed to keep annual credit growth rates at reasonable levels by keeping borrowing rate of interest at constant level and lowering the interest rate of lending by CBRT and with the effects of this strict monetary policy and the macro precautionary measures taken. CBRT determines interest rates in order to influence the markets. In times of rapid credit growth, banks can operate with low net interest margins in order to increase their market share. In the study, the average of the borrowing and lending rates of CBRT was taken.

VII. EMPIRICAL RESULTS

Three different panel data models are used in the study to estimate the net interest margin determinants of the deposit banks in Turkey in order to obtain parameter estimates with higher reliability, higher degree of freedom and lower multi-linear bonds among the explanatory variables, i.e., in order to obtain more efficient econometric estimates. Fixed effect and Random effect models are used as static panel data model, and GMM (Generalized Moment Method), which defines the one period of delay of the dependent variable, is used as the dynamic panel data model. The whole model is significant according to the test statistic.

Table 1: Results of Estimation for Net Interest Margin Determinants

| VARIABLES | (1) | (2) | (3) |
|--------------------------------|---------------------|---------------------|----------------------|
| nim | nim | nim | nim |
| L.nim | | | 0.249*** (0.056) |
| cr | 0.052** (0.021) | 0.052*** (0.018) | 0.045** (0.022) |
| ci | 0.047** (0.021) | 0.018 (0.013) | 0.045** (0.022) |
| di | -0.303 (0.431) | -0.934** (0.417) | 0.801* (0.468) |
| oc | 0.027 (0.110) | 0.275*** (0.078) | 0.018 (0.118) |
| ra | 0.051* (0.030) | -0.008 (0.022) | 0.121*** (0.033) |
| CBRTair | -0.070 (0.047) | -0.084* (0.049) | -0.019 (0.038) |
| inf | -0.004 (0.006) | 0.001 (0.006) | -0.007 (0.005) |
| growthgdp | -0.096** (0.044) | -0.094** (0.045) | -0.121*** (0.035) |
| Constant | 2.938* (1.722) | 3.803** (1.691) | 0.061 (1.557) |
| Observations | 297 | 297 | 238 |
| R-squared | 0.104 | | |
| Number of bankcode | 32 | 32 | 27 |
| Standard errors in parentheses | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | |

When NIM was given the previous value in the model, a positive and statistically significant result was obtained. This result implies that; the NIM value of a bank in this period will be the same as the value it had in the previous period. In other words, if it was high in the previous period, it will also be high in this period. However, this positivity decreasingly grows because the coefficient value is found to be between zero and one and it is statistically significant. Analysis result for bank-based variables which the banks can control with effective management shows that; the biggest risk that can be mentioned for credits which make up a large part of the assets of the banks is the default or the failure of the repayment of the credit. In this case, the banks may agree to work with high interest margins in order to tolerate the sudden and unexpected credit risks they think they may encounter. As expected, the results of analysis revealed out a positive correlation between CR and NIM in all 3 models and statistically significant coefficients at 5% level. So we can say that; when the credit risks of banks increase, their NFMs increase, as well. We reached at different results in 3 models related to CI. Whereas the random coefficient was not statistically significant, the coefficients were found to be significant in Fixed and GMM models. When estimated by the GMM method, we can say that the result will be extremely strong and robust. So, assuming that the random effect model is significant as well, we can say there is a positive correlation between them, meaning that the NIMs of banks will increase if CI increases. Banks are willing to sell more credits in order to gain more incomes during their growth period. However, in this case, the competition in the credit market will gain speed, as well. This means, particularly the foreign deposit banks will obtain sources from abroad with lower costs and grant these through credits using a pricing policy that resembles that of the local banks and thus, they will perform their activities with higher NIMs. The funding resources total deposit amount deemed as certain by the banks have a great impact on liquidity management of banks due to their size and significance in the balance sheet. This can also affect NIMs. With regard to DI, different results were achieved in three models. While the result was negative and statistically significant in the random effect model, it was found to be positive and statistically significant in the GMM model, and in the fixed effect model, it was negative and statistically insignificant. So it was observed that; while DI decreased NIM in random effect model, it increased NIM in GMM model. This can be explained by the fact that, some of the effects are attributed to the delayed and the dependent variable. If banks bear high operational costs when carrying out their intermediation activities (deposit and credit transactions), they work with high NIMs. So, if operational costs increase more than the bank's revenues, high NFMs exist. In the analysis, OC was positive in all three models. It was not statistically significant in fixed and GMM but it was statistically significant in random model. In the analysis, different result was reached at for all three models in terms of RA. This is because, whereas it was positive and statistically significant for fixed and GMM models, it was negative and statistically insignificant in random model. By ignoring the random effect model and relying on the literature, it can be said that; banks that tend to avoid risk would prefer to bear equity costs instead of providing external funding, and thus; the need for higher NIM would emerge and there should be a positive correlation between NIM and RA variables.

According to the analysis results for macroeconomic variables where the general environmental and economic conditions are effective and which cannot be directed by banks; contrary to expectations, there is an inverse, i.e. a negative correlation between the rates of CBRTair and NIM in all models. It was found to be statistically significant in random model only, while it was statistically insignificant in the other two models. No statistically significant relation with inflation was found in models. So, the effect of inflation on NIM can be stated to be ambiguous. During high inflation periods, banks followed current assets policy by covering most of the fund needed by the society instead of lending credits as required by their function intermediation. Since lending credits for this period increased the operational costs of the banks, they limited their credit supplies. The increase in the cost of credits increased NIM, as well. However, this ambiguity can be explained by the fact that; for the periods when inflation is under control, the society becomes less indebted and the intermediation activities of the banks increase. As expected, there was a strong correlation between GNP and NIM. It was found to be statistically significant in all models. In the GMM, it was 1% and in fixed and random effect models it was 5%. The correlation between them was negative. That is, NIM decreased when GNP increased. If inflation exceeded the target, TRY would depreciate in real terms. In this case, measures can be taken to tighten the liquidity in the monetary policy in order to achieve an improvement, but interest rates may increase with the effect of this tightening. This can cause the banks to face credit risk. If Turkish economy performs successfully and continues its growth, it will help the increase of the saving rate and it will encourage the banks to improve their intermediation activities. The required reserve ratios are expected to have an impact on NIM; whereas in analysis it was found to be positive, it was statistically significant in fixed and random models and statistically insignificant in GMM. Finally we can say that; monetary policy decisions may have an impact on banks' net interest margins and credit demands.

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