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Are the determinants of bank net interest margin and spread different? The case of North Cyprus

Abstract

This paper contributes to the banks interest margin literature by introducing two unique spread measures in addition to traditional net interest margin. For this purposes it employs bank level panel data of 24 commercial banks for the period of 2003-2009 from a small and closed bank market. In addition to traditional bank specific variables, a few new macroeconomic variables are also used to assess the distinctive features of the industry. Findings show that credit risk, market power and bank efficiency consistently have positive and significant effect on bank spreads and net interest margin. Lower liquidity risk, higher required reserve and ownership have positive and significant effect solely to the spread. Scale efficiency and lower capital risk have positive and, interest rates risk has negative effect to net interest margin. On the other hand, portfolio management has negative effect solely to banks spread. Among the macroeconomic variables, inflation rates and treasury securities take significant values in the net interest margin model. Implications of the study suggest that banks behave differently in the determination of net interest margin and spread and this has to be considered by researchers and policy makers.

Keywords: bank interest margins, spread, bank risks, bank lending, macroeconomic factors.
JEL Classification: G21, D40, P47.

Introduction

Banks play crucial role in modern economies through transferring funds from lenders to borrowers. Even in economies with well-developed and functioning financial markets, the intermediation role of banks is indispensable. Many studies have previously investigated the impact of banks on economic growth, directly or indirectly through the financial system (Rajan and Zingales, 1998; Levine et al., 2000; Levine, 2002). The effect of banks interest margins and spread, simply the intermediation cost, on economic growth is also documented in the literature (Jayaatne and Strahan, 1996; Beck et al., 2000). Although high interest margins have positive repercussions to bank profitability and capital, it may hinder the efficiency and competition, therefore, the economic growth. Besides economic conditions, regulatory conditions in the banking system are also important for the determination of interest margin. Therefore, understanding the determinants of interest margin is not solely important for banks, but also for the policy makers and regulators.

The main objectives of this study: (1) is to shed lights on the determinants of interest margin in North Cyprus where thousands of families have been facing social difficulties due to legal issues and (2) investigating that the determinants of margin and spread are different. For this purpose, it uses the extended version of the Ho and Sunders (1981) dealership model developed by the Angbazo (1997). The previous literature of interest margin mostly concentrated on the measure of net interest margin, which is a crude measure of total interest income and interest expenses relative to total assets (Angbazo, 1997; Saunders and Schumacher, 2000; Maudos and Fernandez de Guevara, 2004; Claeys and Vennet, 2008; Khediri and Khedhiri, 2011). Although some studies, such as Carbo and Rodriguez (2007), have attempted to use spread measures, they also considered total interest income. However, above measures aggregate all types of interest income (i.e., loans and securities) and expenses (i.e., deposit and non-deposit), thereby rendering weaknesses as an indicator of bank loans and deposit pricing policies. Yet, it is argued that use of loan interest income and deposit interest expenses allows us to understand the determinants of margin with respect to deposit and loan pricing. This is especially important for the developing countries banks, policy makers and regulators where, the financial markets are not developed and banks rely mainly to deposits as source of funds and loans as uses of funds.

This study contributes literature by introducing different spread measures and determinants. The reason of introducing new spread measures is related to the banks behavior and potential effects of determinants to net interest margin and spread. We argue that various determinants play different role in the determination of spread and net interest margin. Therefore, we expect our new spread measures to capture these differences. The new spread measures, which are detailed in methodology section, are derived directly from the loans interest income and deposits interest expenses. We suggest that, these measures are more useful and vital for the banks and policy makers for the developing countries where, banks are the sole providers of funds. In addition to these new dependent variables, our study also introduces new explanatory variables. For example, heavy debt burden of government to the banking system which is around 60% of the total credits is considered by using government debt to total debt ratio. Another feature of North Cyprus is

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about the currency in circulation. The legal tender in the North Cyprus economy is a foreign currency (Turkish Lira) hence, fluctuations in domestic interest rates and margins are expected to be sensitive to the changes in the foreign (Turkish) interest rates. The role of foreign interest rates in domestic margins that is not investigated in previous studies is also analyzed in this study. Central bank's reserve requirement policy is used as regulatory variable to evaluate the role of regulations. The political isolation of the country avoids domestic banks to access directly to the international financial markets for cheaper borrowing. This is also searched in the study. For the analysis, this study uses 24 commercial banks data for the period of 2003-2009.

The rest of the paper is organized as follows. The Section 1 reviews the literature. The data and methodology is described in Section 2. Section 3 gives the main results of the empirical study and the final section presents conclusion and policy implications.

1. Literature review

There is a plethora of studies regarding the determination of net interest margin and spread in the previous literature. Some of these studies, such as, Saunders and Schumacher (2000), Brock and Rojas Suarez (2000) and Jude (2005) are based on the basic two-step dealership model of Ho and Saunders (1981), which assumes banks are risk-averse intermediaries in the financial markets. Among others, Drakos (2003), Claeys and Vennet (2008), Kasman et al. (2010), Khediri and Khedhiri (2011) and Hussain (2012) have used the extended one-step model of Angbazo (1997) and Maudos and Fernandez de Guevara (2004).

Empirical researches carried out for different economies employing one-step and two-step estimation procedure have provided different results. Angbazo (1997), Saunders and Schumacher (2000), Maudos and Fernandez de Guevara (2004) and Claeys and Vennet (2008) found a positive and significant relationship between capital ratio and net interest margin (NIM) for developed economies. On the other hand, studies concerning the developing and emerging market countries provide interesting and different results. Brock and Rojas Suarez (2000), reported significant and insignificant positive relationship between capital-to-assets ratio and margin for Latin American economies and attribute this differences to the fictitious capital of banks. Drakos (2003) who studied the Former Soviet Union (FSU) and Central and East European (CEE) countries also found different results. Kasman et al. (2010) studied the relationship between NIM and capital ratio for the new European (CEE) member and candidate countries in the pre and post consolidation period. They stated that economic conditions are important, since results are different for pre and post consolidation periods.

Concerning the credit risk, results show differences. For example, Angbazo (1997), Maudos and Fernandez de Guevara (2004) have stated positive and significant effect of credit risk to net interest margin. However, significant results have disappeared when bank's differences are considered (Angbazo, 1997). Results of the cross country studies have also shown that country characteristics are important factor in credit risk (Brock and Rojas Suarez, 2000; Drakos, 2003; Claeys and Vennet, 2008). Concerning economic conditions, Kasman et al. (2010) showed that the credit risk can be affected by economic cycles. In addition to country and cycle effect, Beck and Hesse (2009) asserted that industrial differences in lending have also different impact on spread and NIM. Hussain (2012), who employed industrial growth as explanatory variable finds a positive and significant coefficient of this variable for Pakistani banks. Another crucial ingredient of the net interest margin is the efficiency of banks operations, since it can affect both deposit and loan pricing. Brock and Rojas Suarez (2000), Maudos and Fernandez de Guevara (2004), Beck and Hesse (2009) and Kasman et al. (2010) find a positive relationship between efficiency ratio and net interest margin. Claeys and Vennet (2008) approached this relationship considering *X*-Efficiency and Scale Efficiency concepts and found different results.

The implicit interest payment is another cost factor that is considered in net interest margin studies. Saunders and Schumacher (2000), Maudos and Fernandez de Guevara (2004), Zhou and Wong (2008), Kasman et al. (2010), Khediri and Khedhiri (2011), employed implicit interest payments and found a positive and significant relationship between this variable and NIM. These findings support the idea that banks consider implicit payments in loan and deposit pricing. The composition of assets and liabilities has also direct implications to net interest margin through changes in interest rates. Hence, some of the studies have used different variables to reflect the role of asset and liability composition. For example, Angbazo (1997) and Drakos (2003) found a negative and significant relationship between NIM and these variables. However, when the data is disaggregated on bank and country base, significance was lost. On the other hand, Claeys and Vennet (2008), Angbazo (1997), Saunders and Schumacher (2000) and Maudos and Fernandez de Guevara (2004) asserted a positive relationship between these variables and NIM, nevertheless some of the results were not significant. These findings imply that banks try to compensate for the forgone income of the portfolio by charging higher interest rates. An

attention has also been paid to identify the role of liquidity risk yet, results are mixed. For example, Angbazo (1997) and Drakos (2003) found a negative and significant relationship. Brock and Rojas Suarez (2000) stated positive but, significant and insignificant relationship for Latin American countries. On the other hand, Beck and Hesse (2009) found an insignificant relationship between liquidity, NIM and spread. Another important variable related to asset and liability composition is interest rate, Saunders and Schumacher (2000), Brock and Rojas Suarez (2000), and Maudos and Fernandez de Guevara (2004) showed that volatility of interest rates has a positive and significant effect on margin in different countries.

The conduct in the bank market, determined by the market structure, can influence pricing strategies. Hence, many studies have used different indicators to examine the role market structure in margin and spread. Using Lerner index, Maudos and Fernandez de Guevara (2004) and Kasman et al. (2010) found a positive and significant relationship between Lerner index and NIM. Claeys and Vennet (2008) showed that, while concentration ratio positively and significantly affects NIM, market share is insignificant for the Western and accession countries of the European Union. They also emphasized that CR has a greater impact on NIM for some countries. Beck and Hesse (2009) found a negative and significant relationship between market share of deposits and spread, and a positive relationship with net interest margin. They attributed a negative sign to a small financial system view and a positive one to market power hypothesis. In his study Angbazo (1997), used credit market growth and entry barriers for branching and found a positive relationship between credit market growth and NIM. The role of ownership is also considered in the literature (Drakos, 2003; Claeys and Vennet, 2008; Beck and Hesse, 2009; Fungacova and Poghosyan, 2011). Findings of these studies show differences in terms of significance and origin of the country.

In addition to bank specific variables, some macroeconomic variables, such as inflation, money supply and GDP growth rate, are also employed in NIM studies. Among others, Brock and Rojas Suarez (2000), Claeys and Vennet (2008), Beck and Hesse (2009), Kasman et al. (2010), and Horvath (2009) used GDP growth rate and inflation in their studies. Results are also mixed concerning the role of macroeconomic variables in net interest margin determination.

2. Methodology and data

The empirical literature of bank spreads and net interest margin is built on the Ho and Saunders (1981) dealership model. However, empirical methods used in estimations of this model are divided into two approaches. The first approach uses a two-step estimation procedure. Here, in the first step, net interest margin is regressed to bank specific explanatory variables. The constant term of the first step regression is the measure of "pure" spread. In the second step "pure" spread regressed to macroeconomic variables to estimate the effect of these variables to the net interest margin. The constant term of the second regression captures the possible impact of market structure. The second approach is the extended version of the first approach. In this approach, additional explanatory variables, such as, credit risk and cost inefficiencies are added to the first step model to explain the imperfections in the bank market (Angbazo, 1997; and Maudos and Fernandez de Guevara, 2004).

This study uses single-step regression approach to investigate spread and net interest margin determinants in the North Cyprus banking industry. For this purpose two basic models were built up. In the first model, solely bank specific variables are used and named as "Micro-Model". The second model which is the extended form of the first model, in addition to bank specific variables, it also contains macroeconomic variables. Thus, is named as "Macro-Model". To analyze the effect of independent variables to the different measures of margin, this study uses three dependent variables. We follow this approach to test our hypothesis where we argue that, effects of explanatory variables to spread and net interest margin will be different. It is also believed that this approach will be helpful to answers enduring debate concerning the reason(s) for the large differences of banks' deposit and loan rates in the North Cyprus bank market.

The first dependent variable NIM is a measure of net interest margin and calculated by dividing net interest income to total earning assets. Assuming that spread can be a better measure for the banks interest rate policy, we developed two new spread measures as dependent variable. To make a closer analysis of spread, which has not been performed in previous studies, spread calculation was directly linked to the loan interest income and deposit interest expenses. The first spread measure SPR1, is calculated as taking the difference of interest rate charged for loans (interest income from loans/total loans and receivables) and interest rate paid to depositors (interest expenses to deposits/total deposits). Nevertheless, since all deposits are not used as loans, it is proposed that banks adjust the loan and deposit rates by considering the conversion rate of deposits to the loans. Therefore, interest rate paid to depositors is multiplied by the ratio of loans-to-deposits in SPR1 calculation. To test the above idea we created SPR2 as our second spread measure. Here, nothing has been done for the adjustment purposes and solely the difference of interest rate charged for loans and interest rate paid to depositors are considered. The independent variables and their expected sign is summarized in the below Table 1.

Table 1. Variable description and expected impact on the bank margin and spread

Dependent variables	Description	Expected sign for NIM	Expected sign for SPREAD
Net interest margin (NIM)	Interest income minus interest expenses divided by total earning assets		
Spread1 (SPR1)	[Interest income from loans divided by total loans] minus [(interest expenses on deposits divided by total deposits) multiplied by loans divided by deposits]		
Spread2 (SPR2)	Interest income from loans divided by total loans minus interest expenses on deposits divided by total deposits		
Independent variables			
Credit risk (PLLTL)	Provision for loan losses divided by total loans	-	+
Liquidity risk (LIQ)	Cash and due from accounts divided by total assets	-	+
Capital risk (EQTA)	Total equity to total assets	+	+
Interest rate risk (INTRSK)	Sensitive assets minus sensitive liabilities divided by total equity	-	+
Lerner index (LERN)	Total revenue minus total cost to total revenue	+	+
Cost efficiency (EFF)	Total cost to total assets ratio	-	+
Implicit interest payments (IMPINT)	Non-interest expenses minus non-interest revenues to total earning assets	?	+
Managerial efficiency (TEATA)	Total earning assets to total assets ratio	+	-
Central bank's reserve policy (CBRTEA)	Required reserves at central bank to total earning assets	-	+
Scale efficiencies (MSL)	Size of bank loan divided by the market value of loans	+	-
Dummy variable (DUM)	One for domestic and zero for foreign banks	?	?
Public credits to total credits (KKTK)	The ratio of public credits to total credits	+	+
Treasury securities rate (DIBS)	Turkish treasury securities rate	+	+
Inflation rate (INF)	Annual inflation rate	+	+

As Table 1 shows, expected impact of the independent variables can be different for interest margin and spread variables. Credit risk measure was expected to have a negative impact to net interest margin, since increasing non-performing loans decreases interest income of banks. On the other hand, estimated coefficient of credit risk for the spread models was expected to take a positive value. Because, to recover the cost (loss) of non-performing loans bankers may intend to increase the loan rate and decrease deposit rates. Liquidity is good for the bank safety nevertheless, it is the opportunity cost for bank's profitability. Hence, liquid bank's net interest margin is expected to be lower, and these banks can cover part of their opportunity cost by increasing the spread between lending and borrowing rates. Equity financing is considered more costly than debt financing, however, especially in banking, this is compensated by safety. Therefore, positive values are expected for the capital ratio. In the period of analysis, there was a decreasing trend in interest rates. Therefore, banks with more sensitive assets are expected to incur losses from the net interest income. This hypothesis was captured by the negative expected value of interest rate risk for the NIM. Nevertheless, the maturity of loans relative to deposits is longer, and this gives better repricing opportunity for deposits. In other words, bank can lower deposit rates while it earns higher rate from loans. This may cause higher spread that is indicated by a positive sign. Since, leading banks have competitive power over the other banks, market power variable is expected to take positive value. As the total cost of operations increases, the banks' net income is expected to decrease. The negative value of cost efficiencies reflects this hypothesis for net interest margin. The positive expected sign of this variable under the spread model, explains the effort of the bank managers to minimize negative implications of costly operations by increasing the spread between loan and deposit rates. An indeterminate value was hypothesized for implicit interest rates, since it could have a positive or negative effect to the margin. The positive expected value of this variable in spread reflects the idea that banks can increase their spread to recover increasing non-interest expenses. Improvement in managerial efficiency is expected to have a positive effect on the net interest margin hence, a positive value was assigned for this variable under the NIM model. On the other hand, efficient management is expected to lower the spread and make banks more competitive. Then, a negative value is given to this variable in the SPREAD model. High required reserves kept in the central bank denote lower interest income for the banks. Therefore, CBRTEA was expected to have a negative impact on net interest. Similar to liquidity case, banks attempt to restore this cost by increasing loan rates that increase spread. Therefore, a positive sign was assigned to this variable in the SPREAD model. Generally in the literature, scale efficiencies are characterized by market share of assets, nevertheless, market share of loans (MSL) was favored in this study. It is argued

that scale efficiencies, lowers cost and increases the banks' margin, hence, a positive value was proposed in the NIM model. The negative value of MSL in the SPREAD model proposed that efficiently operating banks are expected to reduce their spread. DUM was expected to discriminate between domestic and foreign banks with respect to margin and spread, however a priori was not given to this variable given that both groups had advantages and disadvantages against each other, which could lead to positive or negative impact.

Macroeconomic variables play crucial role concerning the intermediation function of the banking system. Therefore, they are incorporated into the model since they have capacity to affect market interest rates, and hence banks' loan and deposit rates. The ratio of public credits to total credits is used to investigate the effect of public credits to margin. Given that government borrowings may cause interest rates to increase, it is expected to have a positive impact both on margin and spread. The Turkish treasury securities rates are also expected to affect net interest margin and spread positively[1]. Under the high securities rate, banks may not lend to the riskier private sector or lend at higher rates and earn high net interest margin and spread. To manage inflationary expectations, banks are expected to increase their interest rates, which cause both margin and spread to increase. As a result of this, a positive sign was given to the inflation variable in the both models.

Our regression model is specified as follows:

$$NIMTEA_{it},\ SPR\ (1,2)_{it} = \alpha_{it}+\beta_1 PLLTL_{it}+\beta_2 LIQ1_{it}+\beta_3 EQTA_{it}+\beta_4 INTRSK_{it}+\beta_5 LERN_{it}+\beta_6 EFF_{it}+ \\ + \beta_7 IMPINT_{it}+ \beta_8 TEATA_{it}+ \beta_9 CBRTEA_{it}+ \beta_{10} MSL_{it}+\beta_{11} DUM_{it}+ \beta_{12} KKTK_t+\beta_{13} DIBS_t+\beta_{14} INF_t, \quad (1)$$

where *i* stands for banks and *t* for time.

The Hausman (1978) specification test is conducted to compare the fixed-effect (FE) and random-effect (RE) models. Both of the NIM models favored to the RE model. On the other hand, Micro-Model of SPR1, SPR2 and macro-model of SPR1 estimated by the FE model. The macro-model of SPR2 favored to the RE model. As banks are operating in the same market, they are expected to reflect market implications to their balance sheet and income statement. This expectation required us to be cautious regarding the possible correlations of variables and error terms. Therefore, to avoid and minimize econometric issues, as suggested by Petersen (2009), clustered standard errors are used in estimations.

Data for the period of 2003 to 2009 is acquired from the North Cyprus Central Bank which publishes banks' balance sheet and income statement annually. The above variables are calculated by using the banks' balance sheet and income statement. Due to missing data for some banks in different years, some observations were dropped from the analysis. To avoid the selection bias, all 24 banks data operating in the market are used to create an unbalanced panel.

3. Results

This section of the study summarizes the empirical findings. Table 2 presents summary statistics of dependent and independent. Significant differences in standard deviation, min and max values of bank specific variables show that banks behave considerably different. Spread measures, SPR1 and SPR2, are also significantly different than the net interest margin measure NIM. This supports our previous hypothesis, where we argue banks behave differently in determination of margin and spread. The correlation matrix is obtained to check for the possible multicollinearity problem. Results show that this is not an important issue for the current variables. Finally, Table 4 presents the impact of the explanatory variables to the net interest margin and spread.

The results show that credit risk have a positive and significant effect on net interest margin. Although this is contradicting with our hypothesis, the negative impact can imply that, banks with more problem loans take necessary actions either to increase the loan rates or lower the deposit rates to achieve higher net interest margin. As will be seen in the following paragraph this idea is consistent with the spread results. This finding is also in line with Angbazo (1997), Maudos and Guevara (2004), Kasman et al. (2010) and Khediri and Khedhiri (2011).

[1] Since the Turkish Lira is the legal tender and Turkish Treasury Securities offer attractive interest rates, banks are investing in these securities in large volumes. Therefore, it is thought that it is important to add this variable into our model.

Table 2. Summary statistics

Variable	SPR1	SPR2	NIMTEA	PLLTL	LIQ1	EQTA	INTRSK	LERN	EFF1	IMPINT	TEATA	CBRTEA	MSL	DOM	INF	DIBS	KKTK
Obs.	160	160	162	160	162	162	162	162	162	162	162	162	162	162	162	162	162
Mean	0.071	0.092	0.056	0.531	0.362	0.148	-7.108	-0.073	0.245	0.065	0.959	0.078	0.043	0.642	0.108	0.215	0.37
Std. Dev.	0.326	0.094	0.047	6.044	0.253	0.221	13.9	0.742	0.507	0.097	0.091	0.052	0.09	0.481	0.051	0.091	0.062
Min	-2.458	-0.458	-0.081	0	0.007	-0.325	-63.7	-6.588	0.01	-0.173	0.496	0	0	0	0.027	0.124	0.325
Max	0.669	0.605	0.248	76.49	0.946	0.973	65.26	0.563	6.351	0.486	1.317	0.635	0.593	1	0.192	0.427	0.51

The positive but insignificant value of liquidity risk shows that liquidity does not affect the net interest margin. The reason for the insignificance may be related to the character of these accounts. As it is known cash accounts are idle balances and raise an opportunity cost that is expected to have a negative influence to the net interest margin. On the other hand, due from accounts may have some interest earnings, which may neutralize the negative effect of opportunity cost and resulting insignificant value. Although this finding is consistent with Cleassens, Demirguc-Kunt and Huzinga (2001), it's against the Drakos (2003) and Angbazo's (1997) negative and significant findings. The positive and significant coefficient of equity to total assets ratio supports two different views proposed for the role of equity. According to the first view, equity financing is costly and this can be recovered by charging higher interest from the borrowers. The second view based on the trust and safety role of the bank's equity and argues that safe and healthy banks deserve to pay lower deposit rates to depositors hence, lowering the cost and reaping higher margins. The positive and significant value of capital ratio supports the findings of Saunders and Schumacher (2000), Kasman et al. (2010) and Fungacova and Poghosyan (2011). Significant and positive coefficient of the Lerner index asserts that, market power of banks is an important determinant of the net interest margin. This result also shows that, banks with monopoly power possess price competitiveness and cost control. The positive and significant coefficient of efficiency implies that costly operating banks try to shift some costs to lenders and borrowers. The market power and efficiency EFF findings are also consistent with the literature (Maudos and Guevara, 2004; Carbo and Rodriguez, 2007; Kasman et al. 2010; Khediri and Khedhiri, 2011). Similar to Maudos and Guevara (2004), Kasman et al. (2010) and Khediri and Khedhiri (2011), implicit interest payments affect net interest margin positively and significantly. This indicates that banks paying high implicit interest are in an effort to recover it. The coefficient of interest rate risk is negative and significant at the 10% significance level. According to this result, asset sensitive banks net interest margin will be influenced negatively by the decreasing interest rates. This is also consistent with the study periods where interest rates were in declining trend. As it is suggested in methodology section, market share of loan is more appropriate measure of scale efficiencies in interest margin studies. Therefore, scale efficiency is investigated by using the market share of loans. In contrast to Hawtrey and Liang (2008) and Kasman et al. (2010) our result indicates positive impact of scale efficiency and it is in line with Fungacova and Poghosyan (2011) findings. The opportunity cost effect of reserves or the central bank's reserve policy on interest margin is investigated by using the ratio of required reserves to earning assets. The negative, but insignificant coefficient shows that net interest margin is not affected by the reserve policies. Managerial efficiency, measured by the ratio of total earning assets to total assets, takes a negative but insignificant value. Our result implies that managerial efficiency is not an important determinant of net interest margin. However, this is not consistent with Maudos and de Guevara (2004) and Kasman et al. (2010) who used cost to income ratio. The role of foreign and domestic ownership of banks is investigated by introducing a dummy variable to the model. In contrast to Drakos (2003) and Clayes and vander Vennet (2007), who found negative and significant coefficient for the foreign banks, our result is positive and insignificant. Concerning the significance of the coefficients, results suggest that credit risk, market power and efficiency are the most important determinants of the net interest margin in the North Cyprus bank market.

As it is argued in previous sections, spread determinants can be different than the net interest margin. Estimation results of spread models SPR1 and SPR2 are presented in Table 4. Similar to the NIM model, credit risk has positive and significant effect in both spread models. This shows that banks with higher credit risk increase spread for their customers. In contrast to the NIM model, the liquidity variable appeared significantly and positively in both spread models. This shows that, ignored opportunity cost of liquidity in net interest margin considered in loan and deposit rate determination. Remarkably, the value of the coefficient of this vari-

able is also significantly high in spread models. The insignificant coefficient of equity ratio asserts that capital is not an important determinant of the bank spreads. The interest rate risk variable kept its negative sign in the spread models. But it is insignificant for the SPR1 and significant at 10% in SPR2 model. This shows that loan to deposit ratio influence the interest rate risk of the banks operating in the North Cyprus. The market power and efficiency variables surprisingly lost their significance in the SPR1 model, where deposit interest expenses are weighted for loan to deposit ratio. In the SPR2 model, similar to the NIM model, both variables take positive and significant values. This shows that, market power and efficiency effects disappeared when the deposit to loan conversion rate is considered. These findings also suggest that banks determine their spread independently from their market power and efficiency. The positive, but the insignificant value of implicit interest payments in spread models is showing that this variable has not any explanatory power as a determinant of bank spreads. The managerial efficiency ratio kept its negative.

Sign becomes significant at 10% in the SPR1 and take positive but insignificant value in SPR2. This result implies that loan to deposit ratio affects managerial efficiency. Although the significance is low, negative coefficient suggests that increase in earning assets can lower spread. In contrast to the NIM model, required reserve variable, consistent with our hypothesis, takes significant and positive values in both spread models. Moreover, it is the most significant explanatory variable in the SPR1 model. This result reveals a positive relationship between central bank's reserve policies and banks spread. Positive, but insignificant value of market share of loans indicates that scale efficiencies do not affect the bank spreads.

3.1. Robustness check. In this part of the study, we extend the baseline regression models to test the robustness of the bank specific explanatory variables and investigate the effect of macroeconomic variables to the net interest margin and spread measures. The outcomes of the NIM model with macroeconomic variables are given under the NIMACRO column in Table 3. Most of the significant variables of the NIM model kept their significance in the NIMACRO model. Nevertheless, IMPINT and MSL lost their significance and CBRTEA became significant with a negative coefficient. This shows that the reserve required rate has a negative impact to net interest margin when it is considered with the macroeconomic factors. The ratio of public credits to total credits has a negative but insignificant effect to net interest margin. The Turkish government treasury security rates variable shows that banks investing in these securities increase their margins. This finding can also be interpreted as the effect of Turkish interest rates to North Cyprus banking system. Against Kasman et al. (2010) and Hussain (2012) findings, there is a negative association between net interest margin and inflation in North Cyprus bank. This can be attributed to the weaknesses in the asset and liability management.

Table 3. Clustered robust estimations

	NIM (RE)	SPR1 (FE)	SPR2 (FE)	NIMACRO (RE)	SPR1MACRO (FE)	SPR2MACRO (RE)
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
PLLTL	0.002* (3.02)	0.027* (3.12)	0.004* (5.22)	0.003* (3.32)	0.027* (3.52)	0.003* (3.0)
LIQ	0.004 (0.34)	0.535** (2.40)	0.270* (2.92)	-0.022 (-1.13)	0.627* (2.74)	0.131** (2.79)
EQTA	0.052*** (1.92)	-0.529 (-1.56)	0.012 (0.20)	0.062** (1.96)	-0.608 (-1.61)	0.026 (0.49)
INTRSK	-0.000*** (-1.87)	-0.001 (-1.18)	-0.001*** (-1.70)	-0.000** (-2.16)	0.000 (0.31)	0.000 (0.54)
LERN	0.043* (3.38)	0.268 (1.59)	0.064* (4.11)	0.044* (3.80)	0.271*** (1.84)	0.043* (2.45)
EFF	0.0112* (3.11)	0.020 (1.69)	0.015** (2.35)	0.012* (3.13)	0.028 (1.63)	0.024* (2.48)
IMPINT	0.179** (2.15)	0.854 (0.73)	0.177 (0.72)	0.154 (1.61)	1.017 (0.93)	0.128 (0.68)
TEATA	-0.067 (-0.10)	-0.591*** (-1.95)	0.069 (0.48)	0.072 (0.69)	-0.937** (-2.48)	0.177 (0.90)
CBRTEA	-0.050 (-1.42)	0.785** (2.43)	0.773* (8.72)	-0.113** (-2.95)	1.312* (3.13)	0.877* (7.09)
MSL	0.095** (2.13)	-0.286 (-0.59)	0.019 (0.08)	0.038 (1.11)	-0.301 (-0.59)	-0.044 (-0.67)
DUM	0.021 (1.56)	-	-	0.015 (1.29)	-	0.078* (3.50)

Table 3 (cont.). Clustered robust estimations

	NIM (RE)	SPR1 (FE)	SPR2 (FE)	NIMACRO (RE)	SPR1MACRO (FE)	SPR2MACRO (RE)
KKTK	-	-	-	-0.040 (-0.61)	-0.717 (-0.71)	0.006 (0.05)
DIBS	-	-	-	0.117** (2.41)	-0.217 (-0.48)	-0.042 (-0.26)
INF	-	-	-	-0.074** (-2.03)	0.152 (0.40)	-0.103 (-1.28)
CONS	0.025 (0.38)	.415 (1.46)	-.151 (-1.10)	-0.033 (-0.31)	0.977*** (1.84)	-0.239 (-1.23)
R-squared overall	0.34	0.31	0.10	0.44	0.31	0.38
No. of observations	160	160	160	160	160	160

Note: standard errors are corrected for the clustering of observations at the bank level. Heteroskedasticity-robust *t*-statistics is in parenthesis. ***, **, * indicate statistical significance at the 10%, 5% and 1% levels, respectively.

In the macro models of spread, SPR1MACRO and SPR2MACRO, introduction of the macroeconomic variables changed the significance of market power and ownership variables and make the required reserve most significant variable. This implies that central banks reserve policies play crucial role in spread determination. The market power, which was insignificant in SPR1, became significant with macro variables in the SPR1MACRO model. This suggests that market power role is enhanced with the macroeconomic variables. The insignificant coefficient of ownership (domestic vs. foreign) variable DUM in net interest margin models has become significant and positive in the SPR2MACRO model at 1% level. This shows that domestic banks' spread is higher than the foreign banks. Besides inefficiencies of the domestic banks, this can also be attributed to the political isolation of the country which prevents them to access cheaper international funds. In contrast to the NIMACRO model, results show that macro variables DIBS, KKTK and INF are not significant determinants of bank spreads in the North Cyprus bank market.

Conclusions and implications

This study investigated the determinants of NIM and spread in the North Cyprus banking system where the loan defaults are an important financial and social issue. Keeping this in mind, this study attempts to find out the reason for the high spreads and make some policy suggestions. Besides this, it also contributes to the literature by introducing new variables and stressing the difference of net interest margin and spread determinants.

Our results suggest a positive relationship between credit risk, net interest margin and spread measures. This finding recall prudential lending by bankers, and improvement in disclosure and transparency regulations by regulators. The liquidity variable, which has not significant effect on net interest margin has positive and significant effect on spread, requires bank managers to develop better liquidity management. This should also be a concern for the regulators, since regulations can affect banks liquidity. The capital risk and funding policy variable is positive and significant in NIM models; nevertheless it is not significant in spread models. These findings suggest that capital policies of banks are not significantly related to net interest margin and spread strategies. Similar to capital risk, interest rate risk is also appeared significantly in NIM models with negative coefficients. This requires bankers to emphasize their asset and liability management to protect themselves from the adverse changes in interest rates. The market power variable takes positive and significant values in all equations except for SPR1, revealing the positive impact of market power to margin. This finding may signal some competitiveness issue in the North Cyprus bank market and may urge regulators to take some corrective actions. The efficiency variable shows that increase in cost causes both net interest margin and spread to increase significantly. Therefore, some efforts should be devoted by bankers and policy makers to improve efficiency. According to the results, implicit interest payment is not a crucial determinant of interest rates. Another important determinant of NIM and spread is the Central Bank's reserve requirement policy. As it is expected this variable takes a positive and significant values in spread models and negative value in the NIM model. These findings entail policy makers to revise reserve policies since it may lead to disintermediation by raising credit rates in the banking system. Results of the scale efficiency variable imply, size is not an important factor in net interest margin and spread determination. This requires especially large banks managers to benefit from the scale efficiencies. The ownership variable DUM, that is solely significant in one spread model, shows that political and macroeconomic factors have different effect to foreign and domestic banks. Among the macroeconomic variables, treasury securities rate and inflation are significant. They have a positive and negative

impact to net interest margin, respectively. This indicates that banks are reaping the benefit of high interest rates of treasury securities, and cannot manage the negative implications of inflation on interest earnings. Public borrowing variable did not take a significant value in any of the equations.

In sum, results of the study have important implications for both academics and policy makers. Findings suggest that determinants and significance of the bank net interest margin and spread can be different. Therefore, empirical models should be chosen with cautious for academic and policy studies

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Appendix

Table 3. Correlation matrix

	SPR1	SPR2	NIMTEA	PLLTL	LIQ1	EQTA	INTRSK	LERN	EFF1	IMPINT	TEATA	CBRTEA	MSL	DOM	INF	DIBS	KKTK
SPR1	1																
SPR2	0.5765	1															
NIMTEA	0.0048	0.427	1														
PLLTL	-0.0341	-0.0623	-0.0401	1													
LIQ1	0.2464	0.1626	-0.214	-0.1104	1												
EQTA	-0.4562	-0.1055	0.2426	0.1375	-0.0634	1											
INTRSK	-0.0622	-0.0027	-0.1177	0.0423	0.2142	0.1997	1										
LERN	0.3796	0.2282	0.2394	-0.702	0.1631	-0.2966	-0.1599	1									
EFF1	0.0351	0.0925	0.1064	0.0012	0.1617	0.0466	0.0956	-0.0338	1								
IMPINT	-0.2924	-0.1241	0.067	0.2281	-0.1155	0.2713	0.0901	-0.5439	-0.0218	1							
TEATA	0.2071	0.1471	0.2225	-0.2431	0.0999	-0.248	-0.0399	0.4735	0.02	-0.3254	1						
CBRTEA	0.3146	0.4072	-0.1983	-0.0961	-0.0071	-0.3762	-0.1192	0.1472	-0.1154	-0.1629	-0.095	1					
MSL	0.0384	-0.0122	0.13	-0.0409	-0.1511	-0.214	-0.5677	0.1033	-0.0104	-0.0721	0.0414	0.0594	1				
DOM	-0.1075	0.1166	0.2695	0.0625	-0.6177	0.2205	-0.16	-0.1216	-0.0812	0.0697	-0.1184	-0.0301	0.1788	1			
INF	0.0141	-0.0174	-0.0261	0.0112	0.0137	-0.0096	0.0366	0.0167	0.0136	-0.034	0.0382	0.0523	0.0012	0.0166	1		
DIBS	-0.0455	0.1119	0.0633	0.0298	0.0306	-0.01	0.1801	-0.0436	0.0339	-0.0073	-0.1548	0.3066	0.0171	0.0618	0.2658	1	
KKTK	-0.0411	0.1237	0.0661	0.0544	0.0326	-0.0179	0.1737	-0.0527	0.0534	-0.0071	-0.1532	0.2933	0.0199	0.0635	0.0894	0.9484	1