DETERMINANTS OF NON-PERFORMING CONSUMER LOANS FOR TURKEY: ARDL BOUNDS TESTING APPROACH

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Abstract. *Purpose* – the aim of this study is to specify the factors affecting the non-performing consumer loans in deposit banks operating in Turkey. Besides the internal factors specific to banks, the effect of macroeconomic factors is also investigated.

Research methodology – monthly data of deposit banks operating in Turkey and data on macroeconomic indicators for the period 2005:1–2021:12 is used is the study. With these data, ARDL bound testing approach is applied. If there is cointegration relation between variables, the long and short run coefficients are estimated.

Findings – with the two different models created in the study, it has been specified that macroeconomic variables and internal variables have a cointegration relationship with non-performing loans. The rise in loan interest rates and unemployment rate increase the rate of non-performing consumer loans. Conversely, the increase in deposit interest rates and the dollar exchange rate decreases the rate of non-performing consumer loans. For internal factors, it is determined that the increase in the capital adequacy standard ratio and the return on assets decreases the ratio of non-performing consumer loans.

Research limitations – the major limitation of this study is to research only the factors affecting the non-performing consumer loans ratio for Turkey.

Practical implications – the results obtained in the study are valuable for bank managers and investors. Administrative decisions and investment decisions by considering the factors affecting the non-performing consumer loans ratio will increase the performance of both groups.

Originality/Value – studies in the literature generally consider non-performing loans for banks as a whole. However, determining the factors affecting the non-performing loans ratio on the basis of loan types will make a significant contribution to the literature. For this reason, the factors affecting the non-performing consumer loans for the Turkish market is investigated, thus contributing to the literature.

Keywords: non-performing loans, consumer loans, Turkish banking sector.

JEL Classification: G10, G21, G50.

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Introduction

Banks are the most important actors that transfer funds with their shares in the financial system. Banks have important mission in the expansion of the real economy by offering the funds they collect as loans to the real economy. Private sector loans have positive effects on economic growth (Fufa & Kim, 2018). In addition to economic growth, financial inclusion also has recuperative effects on poverty and income distribution (Omar & Inaba, 2020), intrinsically the importance of banks for financial base expansion is undeniable. In addition to the contributions of banks to the economy and individuals, it is known that the problems in the banking sector put a crimp in the real economy (Reinhart & Rogoff, 2011; Brůha & Kočenda, 2018; Huber, 2018; Iacovone et al., 2019; Zubair et al., 2020).

Banks should have a healthy financial structure in order to contribute to the economic system and, moreover, not to harm the economic activities in an economy. Among the factors affecting the sustainability of the banking sector, asset quality and profitability come to the fore (Tejo & Hanggraeni, 2020). Banks take the risk of non-repayment while using the funds they collect and own as loans. Although the loans are expected to be collected in maturity, this is not always possible. The inability to collect the loans in maturity decreases the asset quality of the banks and negatively affects the banks profitability due to the provisions (Panta, 2018). In the banking sector, loans that cannot be collected in a certain payment period are defined as non-performing loans.

Although many factors cause the non-performing loans, the main reason is an unpredictable reduce of the borrower's income due to internal or external reasons arising from the general economy (Yücememiş & Sözer, 2011). In addition, banks' management skills and risk preferences also have an impact on non-performing loans (Anastasiou et al., 2016). Although the methodologies used to measure the collection ability of loans are developed and used day by day, non-performing loans still remain as an important problem in the banking sector. Non-performing loans, which arise for different reasons, deteriorate the quality of assets in the banking sector, reduce profitability and cause liquidity risk for banks. Therefore, it is important to determine the factors that cause non-performing loans to be reduced, and this issue is frequently emphasized both in the literature and in practice.

When the legal legislation for the Turkish banking sector is examined, it is seen that it is regulated by the Banking Regulation and Supervision Agency with the Regulation on the Procedures and Principles Regarding the Classification of Loans and Provisions to be Set aside for These (Official Gazette: 29750). According to Article 5 of the Regulation, loans categorized in the third, fourth and fifth groups, in other words, non-performing loans are defined as collection of principals and/or interest are delayed more than ninety days from the due date. Non-performing loans differ between periods depending on the causative factors and this indicates the necessity of determining the causative factors.

The efforts to minimize the effects of non-performing loans on the banking system and thus on the real economy increase. Of course, in order to reduce non-performing loans, it is essential to determine the causative factors. In the literature, bank-specific factors and macroeconomic factors affecting the non-performing loans ratio have been frequently investigated both for the Turkish market and for different markets. However, it is seen that studies

generally focus on the total non-performing loans of banks. However, determining the factors affecting non-performing loans according to loan types will be a guide for economy management as well as for banking sector managers and investors.

The aim of this study is to determine the factors affecting the non-performing consumer loans in deposit banks operating in Turkey. Thus, this study differs significantly from the previous studies which review the non-performing loans as a whole and reveals valuable findings for practitioners. In the study, macroeconomic factors and banking sector-specific internal factors affecting non-performing consumer loans are examined separately. Thus, hypotheses expressing that macroeconomic factors and bank-specific endogenous factors affect non-performing consumer loans are tested in the study. In the study, the current situation is presented to the users by using the monthly data for the period 2005:1–2021:12. The results obtained in the study are valuable for bank managers and investors. Administrative decisions and investment decisions to be taken according to the factors affecting the non-performing consumer loans ratio will increase the performance of both groups.

In the following parts of the study, studies examining the factors affecting non-performing loans will be introduced, the data set and methodology of the study will be explained, then the findings will be interpreted.

1. Related literature about non-performing loans

Non-performing loans are closely monitored by the banking sector, because they affect the asset quality and profitability of banks directly. In addition, non-performing loans, especially the factors affecting non-performing loans have been frequently inquired for different markets in literature. Studies in the literature, some of which are summarized in Table 1, consider non-performing loans for banks as a whole. However, determining the factors affecting the non-performing loans ratio on the basis of loan types will make a remarkable contribution to the literature. For this reason, the factors affecting the non-performing consumer loans for the Turkish market is investigated, thus contributing to the literature.

Table 1. The related studies in the literature (source: compiled by the author)

Author(s)	Data Set	Methodology	Results
Messai and Jouini (2013)	Data of 85 banks operating in Italy, Greece and Spain for 2004–2008	Panel regression analysis	It was determined that the increase in GDP and return on assets decreased the NPLs ratio, while the rise in unemployment rate, loan loss provision and interest rate increased the NPLs ratio.
Makri, Tsagkanos and Bellas (2014)	14 countries' data in EURO region for 2000–2008	GMM	It has been determined that the ratio of bank capital and reserves to total assets in the previous period, ROE, growth rate of GDP affect NPLs ratio negatively, while the lagged value of non-performing loans, the lagged value of public debt ratio to GDP, the unemployment rate and the lagged value of the unemployment rate affect NPLs ratio positively.

Author(s)	Data Set	Methodology	Results
Yağcılar and Demir (2015)	26 commercial banks' data in Turkey for the period 2002:Q4–2013:Q1	Panel regression analysis	The increase in ROA, total assets, loan/deposit ratio and liquidity ratio decreased the NPLs ratio. In addition, trading in the stock market reduces NPLs ratio for banks. The increase in the economic growth, interest from loans/total loans and capital adequacy ratio increases NPLs ratio, while being a foreign bank affects NPLs ratio negatively.
Abdioğlu and Aytekin (2016)	Data of 22 deposit banks operating in Turkey for 2002–2014	Difference GMM and system GMM	Increases in net interest margin, capital adequacy ratio and equity/total assets decreases NPLs ratio, while the increases in interest applied to loans, loan/deposit, other operating expenses/total operating income and non-interest income/total assets increase NPLs ratio.
Genç and Şaşmaz (2016)	Data of Turkey for the period 2005Q4–2015Q2	Hatemi-J cointegration test, Dynamic Least Squares method	The rise of real exchange rate increases NPLs, while the increase of the BIST-100 index and the commercial loan interest rate decreases NPLs.
Yüksel (2016)	Annual data of the Turkish Banking Sector for 1988–2014	Multivariate adaptive regression splines	The rise of USD exchange rate increases NPLs ratio, while the increase in the interest income of banks and the growth rate of the country decreases NPLs ratio.
Kumar et al. (2018)	Data of five commercial banks and two non-bank financial institutions in Fiji from 2000–2013	Panel regression analysis	The results show that ROE, capital adequacy requirement, market share based on assets, unemployment and time have negative effect on NPLs, while the net interest margin affects NPLs positively.
Tekşen and Çelik (2018)	Data of 10 Turkish deposit banks between 2006 and 2016	Panel regression analysis	The increase in housing loans/consumer loans and commercial vehicle loans/commercial loans decreases NPLs ratio. The increase in vehicle loans/consumer loans, inflation, lagged value of NPLs and asset size increases NPLs ratio.
Umar and Son (2018)	Data from 197 banks of China for the period 2005–2014	System GMM estimation	The increase in GDP, effective interest rate and loan loss reserves/impaired loans decreases NPLs, while the increase in consumer price and renminbi exchange rate increases NPLs.
Bayar (2019)	23 emerging market economies data for 2000–2013	System GMM dynamic panel data estimator	Economic growth, inflation, institutional development, ROA, ROE, regulatory capital to risk-weighted assets and noninterest income to total income have a negative effect on nonperforming loans. Conversely, unemployment, public debt, credit growth, lagged values of nonperforming loans, cost to income ratio and financial crises have a positive effect on nonperforming loans.
Kara and Baş (2019)	Quarterly data of Turkish banking sector for 2005:Q4–2017:Q4	ARDL model	The increases in the banking sector loan volume increase NPLs in the long run.

Author(s)	Data Set	Methodology	Results
Kjosevski, Petkovski, and Naumovska (2019)	Data of The Republic of Macedonia banking sector for the period 2003Q4–2014Q4	ARDL model	The profitability of banks, the growth of loans, GDP growth affect NPLs negatively. Banks' solvency and unemployment affect NPLs positively. In addition, for enterprises, the exchange rate affects NPLs positively, while inflation affects NPLs negatively for households.
Kuzucu and Kuzucu (2019)	Data of 53 emerging and 30 advanced countries for the period 2001–2015	Dynamic panel regression	The increase in GDP decreases NPLs for both economies in the whole term. In the post-crisis period (2008–2015), current account balance affects NPLs negatively, foreign direct investment and exchange rate affect NPLs positively.
Poyraz and Arlı (2019)	Turkish Banking Sector' monthly data for January 2008–August 2018	Johansen cointegration test and Granger causality test	There is a cointegration relationship between USD/TL rate and NPLs. In addition, there is a causal relationship from USD/TL rate and GBP/TL rate to NPLs.
Ciukaj and Kil (2020)	Data of 629 banks operating in 7 Euro countries for 2011–2017	Panel regression analysis	For commercial banks, GDP growth and total assets of banks have a negative effect on NPLs, on the other hand unemployment rate, Herfindahl-Hirschman Index, house price indices and value of the loan portfolio affects non-performing loans positively.
Kozarić and Dželihodžić (2020)	Banking sector data of Bosnia and Herzegovina for period 2006–2017	Regression analysis	GDP growth affects NPLs negatively, though inflation and unemployment affect NPLs positively.
Zheng, Bhowmik, and Sarker (2020)	Data of 59 Bangladesh commercial banks for the period 1979–2018	ARDL and VEC models	Bank loan growth, net operating profit, deposit rates, GDP growth and unemployment affect NPLS negatively. Bank liquidity, lending rates, domestic credit and exchange rates affect NPLs positively.
Ayaydın, Pilatin, and Barut (2021)	21 Turkish banks' data for 2004–2017	Static and dynamic panel regression analysis	The increase in equity/total assets, provisions/total loans, interest rate and unemployment rate increase NPLs ratio, while the increase in total loans/total assets decreases NPLs ratio.
Erdas and Ezanoglu (2022)	Data of G20 countries between 1998 and 2017	Two-step GMM regression	The increase in operating expenses of a bank as a share of sum of net-interest revenue and other operating income, ratio of bank credit to bank deposits and lagged values of NPLs result to increase in NPLs. While increase in GDP growth, non-interest related activities as a percentage of total income, return on equity and ratio of bank capital and reserves to total assets results to decrease in NPLs.

When the studies in the literature are examined, it is seen that the increase in GDP, ROA and ROE reduces non-performing loans. On the other hand, unemployment and increases in exchange rates negatively affects non-performing loans. The ratio of non-performing loans in the previous period, loan growth and interest rates are also generally the factors that increase

non-performing loans. The growth of banks' assets decreases non-performing loans. The effect of capital adequacy ratio, loan/deposit ratio, non-interest income, economic growth rate factors on non-performing loans has differences for different economies and periods. Therefore, it is still important to determine the factors affecting non-performing loans. In addition, as in this study, determining the factors affecting different loan types will provide important contributions for practitioners.

2. Data and methodology

In this study, banks specific factors and macroeconomic factors that affect the NPLs ratio are investigated. For this purpose, monthly data of deposit banks in Turkey and data on macroeconomic indicators for 2005:1–2021:12 are used. Factors which have effects on the NPLs ratio are frequently investigated in the literature are included in the data set[1]. The variables used in the study are explained in Table 2.

Table 2. Variables used in the study (source: compiled by the author)

Symbol	Definition	Data source
Dependent Variable		
NPCL	Non-Performing Consumer Loans and Personal Credit Cards/Total Consumer Loans and Personal Credit Cards (%)	BRSA
Independent Variables (Internal Factors)		
LOANS	Logarithm of total loans in deposit banks	BRSA
CAR	Capital adequacy standard ratio (%)	BRSA
ROA	Return of assets (%)	BRSA
NII/NIE	Non-Interest Income/Non-Interest Expense (%)	BRSA
HOMELOAN	Home Loans / Total Consumer Loans and Personal Credit Cards (%)	BRSA
TA	Logarithm of total assets	BRSA
Independent Variables (Macroeconomic Factors)		
USD	Logarithm of USD/TL	CBRT
LIR	Weighted Average Interest Rates Applied by Banks for TL Consumer Loans (%)	CBRT
DIR	Weighted Average Interest Rates Applied by Banks for TL Deposits with a Term of Up to 3 Months	CBRT
UNEMP	Unemployment rate (%)	TSI
CPI	Logarithm of the Consumer Price Index	TSI
IPI	Industrial Production Index (2015 = 100)	TSI

Note: BRSA: Banking Regulation and Supervison of Agency, CBRT: The Central Bank of the Republic of Türkiye, TSI: Turkish Statistical Institute.

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[1] Although GDP growth is a factor that is frequently examined in the literature and its negative effect is determined, it is not included in the data set because the data is used on a monthly basis in this study, since GDP is not calculated monthly. Instead, the Industrial Production Index is included in dataset to express economic activity.

In this study, which investigated the effects of bank-specific internal factors and macro-economic factors on the ratio of non-performing consumer loans, ARDL limit test is used. The ARDL bounds test can be applied with series that are I(0) and I(1), except for the constraint that the series is I(2) (Pesaran et al., 2001). For this reason, the stationarity of the series used is investigated with Augmented Dickey Fuller (ADF) Unit Root Test and the results are summarized in Table 3.

It was determined that the dependent variable of the study, the NPCL variable, is not I(0) according to the constant and trend model, but is I(1) according to both models. As seen in the table, the independent variables are found to be I(0) or I(1). The fact that all series were stationary at the level or at the first difference demonstrated the compatibility with the ARDL bounds test.

There are two stages in the ARDL bounds testing approach. Firstly, the cointegration relationship between the variables is examined with the unlimited error correction model (UECM).

Table 3. ADF unit root test results (source: own calculation of author)

Variables	I(0)		I(1)	
	constant, no trend	*constant, trend*	*constant, no trend*	*constant, trend*
NPCL	−2.9608 (0.0404)[b]	−2.9937 (0.1366)	−3.9569[a] (0.0020)	−3.8924[b] (0.0141)
LOANS	−2.0723 (0.2562)	−3.8315[b] (0.0168)	−10.9239[a] (0.0000)	−11.1006[a] (0.0000)
CAR	−5.2205[a] (0.0000)	−4.6843[a] (0.0010)	−11.0935[a] (0.0000)	−11.3993[a] (0.0000)
ROA	−1.5670 (0.4975)	−3.6161[b] (0.0310)	−3.8723[a] (0.0027)	−3.8750[b] (0.0149)
NII/NIE	−10.2188[a] (0.0000)	−10.2113[a] (0.0000)	−10.0684[a] (0.0000)	−10.0424[a] (0.0000)
HOMELOAN	−6.2431[a] (0.0000)	−5.6593[a] (0.0000)	−4.5302[a] (0.0002)	−5.1825[a] (0.0001)
TA	0.5869 (0.9891)	−2.2572 (0.4549)	−13.6074[a] (0.0000)	−13.6099[a] (0.0000)
USD	2.6294 (1.0000)	−0.1366 (0.9940)	−8.8289[a] (0.0000)	−9.3910[a] (0.0000)
LIR	−2.9955[b] (0.0370)	−2.9433 (0.1512)	−8.6246[a] (0.0000)	−8.6496[a] (0.0000)
DIR	−2.6059[c] (0.0934)	−2.5597 (0.2994)	−7.8413[a] (0.0000)	−7.8658[a] (0.0000)
UNEMP	−1.5818 (0.4900)	−1.7725 (0.7146)	−13.1656[a] (0.0000)	−13.1364[a] (0.0000)
CPI	2.9897 (1.0000)	2.9933 (1.0000)	−5.7653[a] (0.0000)	−6.3234[a] (0.0000)
IPI	0.9557 (0.9961)	−1.5632 (0.8039)	−5.2757[a] (0.0000)	−5.4421[a] (0.0000)

Note: [a], [b] ve [c] denote 1%, 5% and 10% statistical significance levels, respectively. The values in parentheses are the *t* statistic probabilities.

If there is a cointegration relationship between the variables, the long and short run coefficients of the model are estimated in the second stage (Akalin et al., 2018). In this study, Eq. (1) will be used for unlimited ECM that tests cointegration with ARDL bounds test for macroeconomic factors. If the null hypothesis (H0) for Eq. (1) is rejected, in other words, if cointegration is detected, Eq. (2) and Eq. (3) will be used to determine the effect of macroeconomic factors on the NPCL ratio. Eq. (4) will be used to test the cointegration for the rate of non-performing consumer loans with the internal factors, and Eq. (5) and Eq. (6) will be used to determine the effect of the internal factors on the rate of non-performing consumer loans.

$$\Delta NPCL_t = y_0 + \sum_{i=1}^{a} y_{1i}\Delta NPCL_{t-i} + \sum_{i=0}^{b} y_{2i}\Delta USD_{t-i} + \sum_{i=0}^{c} y_{3i}\Delta LIR_{t-i} + \sum_{i=0}^{d} y_{4i}\Delta DIR_{t-i} +$$

$$\sum_{i=0}^{e} y_{5i}\Delta UNEMP_{t-i} + \sum_{i=0}^{f} y_{6i}\Delta CPI_{t-i} + \sum_{i=0}^{g} y_{7i}\Delta IPI_{t-i} + \alpha_1 NPCL_{t-1} + \alpha_2 USD_{t-1} + \alpha_3 LIR_{t-1} + \quad (1)$$

$$\alpha_4 DIR_{t-1} + \alpha_5 UNEMP_{t-1} + \alpha_6 CPI_{t-1} + \alpha_7 IPI_{t-1} + \epsilon_t;$$

$$XNPCL_t = y_0 + \sum_{i=1}^{a} y_{1i} NPCL_{t-i} + \sum_{i=0}^{b} y_{2i} USD_{t-i} + \sum_{i=0}^{c} y_{3i} LIR_{t-i} + \sum_{i=0}^{d} y_{4i} DIR_{t-i} +$$

$$\sum_{i=0}^{e} y_{5i} UNEMP_{t-i} + \sum_{i=0}^{f} y_{6i} CPI_{t-i} + \sum_{i=0}^{g} y_{7i} IPI_{t-i} + \epsilon_t; \quad (2)$$

$$\Delta NPCL_t = y_0 + \sum_{i=1}^{a} y_{1i}\Delta NPCL_{t-i} + \sum_{i=0}^{b} y_{2i}\Delta USD_{t-i} + \sum_{i=0}^{c} y_{3i}\Delta LIR_{t-i} + \sum_{i=0}^{d} y_{4i}\Delta DIR_{t-i} +$$

$$\sum_{i=0}^{e} y_{5i}\Delta UNEMP_{t-i} + \sum_{i=0}^{f} y_{6i}\Delta CPI_{t-i} + \sum_{i=0}^{g} y_{7i}\Delta IPI_{t-i} + \psi ECT_{t-1} + \epsilon_t; \quad (3)$$

$$\Delta NPCL_t = y_0 + \sum_{i=1}^{a} y_{1i}\Delta NPCL_{t-i} + \sum_{i=0}^{b} y_{2i}\Delta LOANS_{t-i} + \sum_{i=0}^{c} y_{3i}\Delta CAR_{t-i} +$$

$$\sum_{i=0}^{d} y_{4i}\Delta ROA_{t-i} + \sum_{i=0}^{e} y_{5i}\Delta NII/NIE_{t-i} + \sum_{i=0}^{f} y_{6i}\Delta HOMELOAN_{t-i} + \sum_{i=0}^{g} y_{7i}\Delta TA_{t-i} +$$

$$\alpha_1 NPCL_{t-1} + \alpha_2 LOANS_{t-1} + \alpha_3 CAR_{t-1} + \alpha_4 ROA_{t-1} + \alpha_5 NII/NIE_{t-1} + \quad (4)$$

$$\alpha_6 HOMELOAN_{t-1} + \alpha_7 TA_{t-1} + \epsilon_t;$$

$$XNPCL_t = y_0 + \sum_{i=1}^{a} y_{1i} NPCL_{t-i} + \sum_{i=0}^{b} y_{2i} LOANS_{t-i} + \sum_{i=0}^{c} y_{3i} CAR_{t-i} + \sum_{i=0}^{d} y_{4i} ROA_{t-i} +$$

$$\sum_{i=0}^{e} y_{5i} NII/NIE_{t-i} + \sum_{i=0}^{f} y_{6i} HOMELOAN_{t-i} + \sum_{i=0}^{g} y_{7i} TA_{t-i} + \epsilon_t; \quad (5)$$

$$\Delta NPCL_t = y_0 + \sum_{i=1}^{a} y_{1i}\Delta NPCL_{t-i} + \sum_{i=0}^{b} y_{2i}\Delta LOANS_{t-i} + \sum_{i=0}^{c} y_{3i}\Delta CAR_{t-i} + \sum_{i=0}^{d} y_{4i}\Delta ROA_{t-i} +$$

$$\sum_{i=0}^{e} y_{5i}\Delta NII/NIE_{t-i} + \sum_{i=0}^{f} y_{6i}\Delta HOMELOAN_{t-i} + \sum_{i=0}^{g} y_{7i}\Delta TA_{t-i} + \psi ECT_{t-1} + \epsilon_t. \quad (6)$$

3. Effects of macroeconomic factors on non-performing consumer loans

For the ARDL bounds test, firstly the appropriate lag length will be determined. In order to select the appropriate model, the variables are tested with different combinations of lags and the model that gives the lowest value according to the information criteria is determined (Akel & Gazel, 2014). In this study, ARDL (7,2,1,2,0,3,4) model was chosen as the appropriate model by Akaike Information Criteria (AIC) (Figure 1).
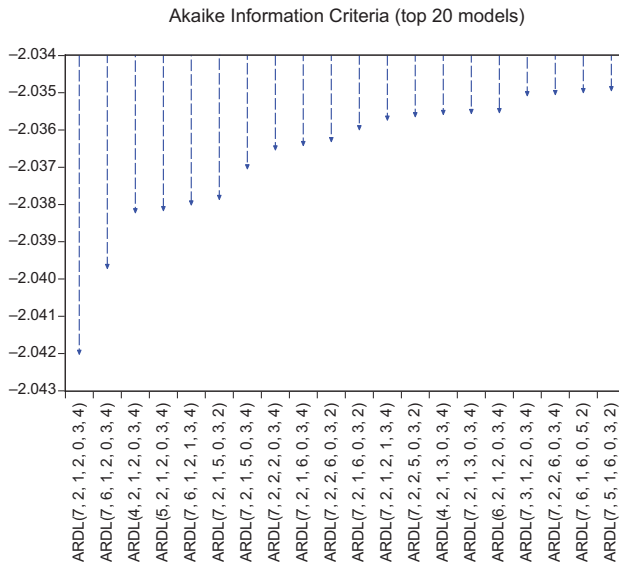

Figure 1. Selection of appropriate lag length for ARDL bounds test
(source: own calculation of author)

ARDL bounds test results for the determined (7,2,1,2,0,3,4) model are given in Table 4. F-statistic is greater than the upper limit critical value at the 1% significance level. Therefore, the null hypothesis (H0) is rejected and the alternative hypothesis (H1), which states cointegration between the variables at the 1% significance level, is accepted. Also, there is cointegration at the 5% significance level for the critical values suggested by Narayan (2005).

Table 4. ARDL bounds test results (source: own calculation of author)

Model	F-statistics		Critical values for the F-statistic[a]		Critical values for the F-statistic[b]	
		Probability	*I(0)*	*I(1)*	*I(0)*	*I(1)*
(7, 2, 1, 2, 0, 3, 4)	4.1666	10%	1.99	2.94	2.088	3.103
		5%	2.27	3.28	2.431	3.518
		1%	2.88	3.99	3.173	4.485

Note: [a]The critical values determined by Pesaran, Shin and Smith (2001) for T = 1000 and k = 6. [b]The critical values suggested by Narayan (2005) for Case III: T = 80 and k = 6 for the constant, no trend model.

After determining the cointegration between the variables, long-term coefficients are estimated for the variables and the results are shown in Table 5. The results obtained reveals that the increase in the LIR and UNEMP variables causes an increase in the NPCL variable at the 1% statistical significance level. While, the increase in the USD and DIR variables causes a decrease in the NPCL variable at the 5% and 1% significance level, respectively. Diagnostic tests also show that there is not heteroscedasticity (Breusch Pagan Godfrey Test) and autocorrelation (Breusch-Godfrey Serial Correlation LM Test) and the model is well defined (Ramsey RESET Test). In addition, parameter stability for the predicted model is examined by CUSUM and CUSUMSQ tests. The test results are shown in Figure 2. When Figure 2 is examined, the fact that the plots showing CUSUM and CUSUMSQ are within the limits (95% confidence interval), confirms the stability of the estimations.

Table 5. Long-run coefficients estimation results (source: own calculation of author)

| Dependent variable: NPCL			
Independent variables	*Coefficient*	*t-statistics*	*Probability*
USD	−3.3654	−2.2359	0.0266
LIR	0.3114	3.0150	0.0030
DIR	−0.2633	−2.7715	0.0062
UNEMP	0.4950	2.9763	0.0033
CPI	0.9665	0.3915	0.6958
IPI	0.0419	1.4268	0.1554
C	−9.4560	−0.8406	0.4017
Diagnostic Tests			
	Statistics	*Probability*	
Breusch-Godfrey Serial Correlation LM Test	0.0528	0.9485	
Breusch Pagan Godfrey Test	0.9920	0.4804	
Ramsey RESET Test	0.0653	0.9479	
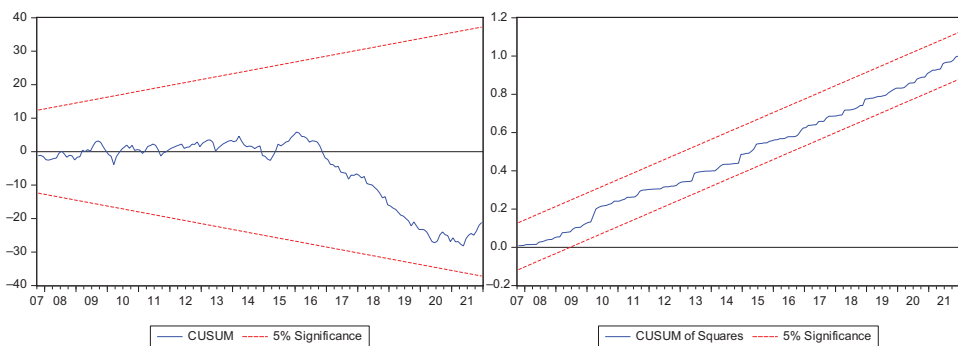
Figure 2. CUSUM and CUSUMSQ Test Results (source: own calculation of author)

The short-term coefficient estimates of the variables based on the error correction model are presented in Table 6. The one period lagged value of the error term (ECM(−1)) has a value between −1 and 0 and is statistically significant. This indicates that the effects of a shock that will occur in the short term will disappear and the long-term equilibrium will be approached. The fact that the ECM(−1) coefficient is 0.04 indicates that after a shock, approximately 4% of the deviation in the long-term balance will improve within a month and approach the long-term balance, and the long-term balance will be achieved in approximately 25 months.

Table 6. Error correction model results (source: own calculation of author)

Dependent variable: NPCL			
Variables	*Coefficient*	*t-statistics*	*Probability*
D(NPCL(−1))	0.2767	4.4008	0.0000
D(NPCL(−2))	0.0962	1.3794	0.1695
D(NPCL (−3))	0.2034	2.9318	0.0038
D(NPCL (−4))	0.0501	0.7915	0.4297
D(NPCL (−5))	0.0468	0.8632	0.3892
D(NPCL (−6))	0.0951	1.7806	0.0767
D(USD)	0.1208	0.6561	0.5126
D(USD(−1))	0.5954	2.8262	0.0053
D(LIR)	0.0332	4.3407	0.0000
D(DIR)	−0.0663	−5.8869	0.0000
D(DIR(−1))	0.0342	3.8380	0.0002
D(CPI)	−0.1788	−0.2872	0.7743
D(CPI(−1))	−1.5413	−1.8647	0.0639
D(CPI(−2))	−1.8799	−2.6881	0.0079
D(IPI)	−0.0016	−2.2372	0.0266
D(IPI(−1))	−0.0030	−3.7538	0.0002
D(IPI(−2))	−0.0008	−0.9625	0.3371
D(IPI(−3))	−0.0017	−2.3752	0.0186
ECM(−1)	−0.0438	−5.8904	0.0000

When the findings related to macroeconomic factors are evaluated, it is revealed that there is a cointegration relationship with non-performing loans. Increases in loan interest rates and unemployment rates in the long run increase the rate of non-performing loans in consumer loans. On the other hand, it is concluded that the increase in deposit interest rates and the USD exchange rate decreased the rate of non-performing loans.

4. Effects of internal factors on non-performing consumer loans

The ARDL model to be established to analyze the cointegration relationship between the internal factors and non-performing consumer loans ratio is determined by Akaike Information criterion and the ARDL (4,4,1,6,0,4,0) model is chosen as the appropriate model (Figure 3).
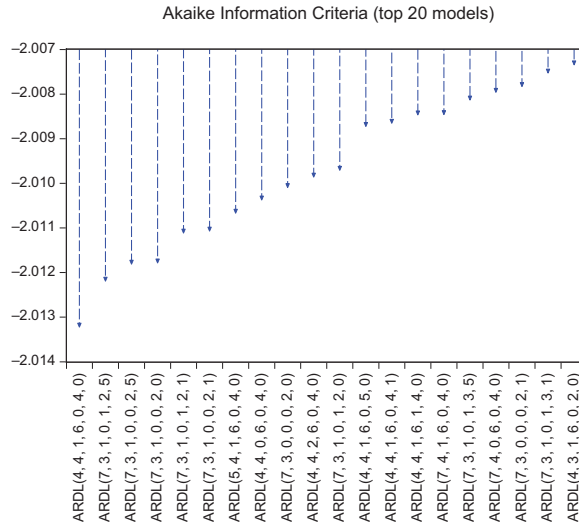
Akaike Information Criteria (top 20 models)

Figure 3. Selection of appropriate lag length for ARDL bounds test
(source: own calculation of author)

ARDL bounds test results for the determined (4,4,1,6,0,4,0) model are given in Table 7. F-statistic is greater than the upper limit critical value at the 1% significance level, and the alternative hypothesis (H1) is accepted.

Table 7. ARDL bounds test results (source: own calculation of author)

Model	F-statistics		Critical values for the F-statistic[a]		Critical values for the F-statistic[b]	
		Probability	*I(0)*	*I(1)*	*I(0)*	*I(1)*
(4, 4, 1, 6, 0, 4, 0)	7.9044	10%	1.99	2.94	2.088	3.103
		5%	2.27	3.28	2.431	3.518
		1%	2.88	3.99	3.173	4.485

Note: [a] The critical values determined by Pesaran, Shin and Smith (2001) for T = 1000 and k = 6. [b] The critical values suggested by Narayan (2005) for Case III: T = 80 and k = 6 for the constant, no trend model.

After determining that there is cointegration between the variables, long-term coefficients are estimated for the variables and the results are shown in Table 8. The results reveals that the increase in CAR and ROA variables results a decrease in NPCL variable at 10% and 5% significance levels, respectively. The effect of other variables on NPCL could not be explained statistically. Diagnostic tests also show that there is not heteroscedasticity (Breusch Pagan Godfrey Test) and autocorrelation (Breusch-Godfrey Serial Correlation LM Test) and the model is well defined (Ramsey RESET Test). The plots showing CUSUM and CUSUMSQ in Figure 4 are within the limits (95% confidence interval), confirming the stability of the estimations.

Table 8. Long-run coefficients estimation results (source: own calculation of author)

| Dependent variable: NPCL			
Independent variables	*Coefficient*	*t-statistics*	*Probability*
LOANS	−11.8324	−1.4489	0.1492
CAR	−0.8392	−1.8734	0.0627
ROA	−5.8131	2.3069	0.0127
NII/NIE	0.0080	0.3764	0.7070
HOMELOAN	0.0981	0.7328	0.4647
TA	8.4428	0.9886	0.3242
C	62.6026	2.3101	0.0221
Diagnostic Tests			
	Statistics		*Probability*
Breusch–Godfrey Serial Correlation LM Test	0.0964		0.9081
Breusch Pagan Godfrey Test	1.4196		0.1004
Ramsey RESET Test	1.1101		0.2685
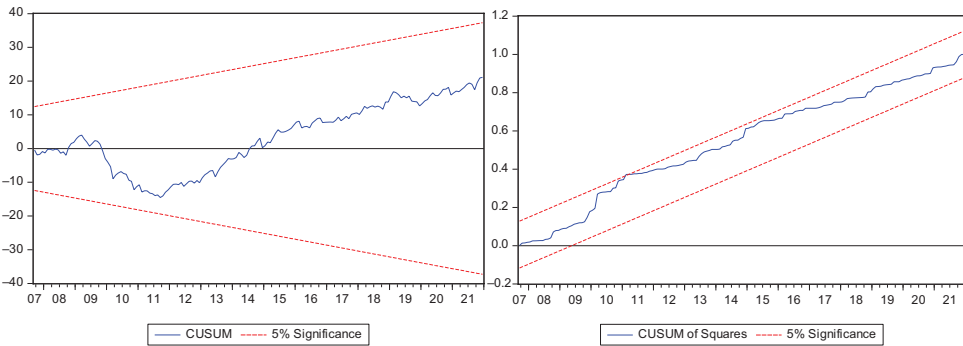
Figure 4. CUSUM and CUSUMSQ Test Results (source: own calculation of author)

The short-term coefficient estimates of the variables based on the error correction model are presented in Table 9. The fact that the ECM(−1) coefficient is 0.02 indicates that a deviation in the long-term balance after a shock will improve by approximately 2% within a month and approach the long-term balance.

A cointegration relationship is determined between the bank-specific factors and the NPL ratio for consumer loans. In the long run, it is determined that the increase in the capital adequacy standard ratio and return on assets decreases the non-performing loans ratio. Again, it is concluded that the resulting shocks approached the equilibrium in the long run.

Table 9. Error correction model results (source: own calculation of author)

Dependent variable: NPCL			
Variables	*Coefficient*	*t-statistics*	*Probability*
D(NPCL(−1))	0.1042	1.5384	0.1258
D(NPCL(−2))	0.0502	0.7646	0.4455
D(NPCL(−3))	0.1966	3.3014	0.0012
D(TA)	3.0056	5.0185	0.0000
D(TA (−1))	2.4295	3.7663	0.0002
D(TA(−2))	1.8141	2.6527	0.0087
D(TA(−3))	1.7024	2.4706	0.0145
D(CAR)	0.0025	0.1808	0.8567
D(ROA)	−0.0747	−5.6515	0.0000
D(ROA(−1))	0.0701	3.9623	0.0001
D(ROA(−2))	0.0785	4.7062	0.0000
D(ROA(−3))	0.0587	3.9739	0.0001
D(ROA(−4))	0.0494	3.5185	0.0006
D(ROA(−5))	0.0424	3.1826	0.0017
D(LOANS)	−3.8135	−4.6807	0.0000
D(LOANS(−1))	−3.1460	−3.6296	0.0004
D(LOANS(−2))	−1.5670	−1.7525	0.0815
D(LOANS(−3))	−2.0619	−2.3359	0.0206
ECM(−1)	−0.0245	−8.1122	0.0000

Conclusions

In addition to the benefits, they provide for the economies, banks can also cause significant damage to the economies with their failures. Consequently, it is appropriate to ensure financial success of banks. High asset quality and profitability of banks are essential for their financial success. It is important for banks to be able to collect their loans in due time, in order to ensure asset quality and profitability. It is necessary to determine the factors affecting this situation in order to ensure that the loans are collected at maturity and therefore there are no non-performing loans. Although the factors affecting non-performing loans are frequently investigated in the literature, studies investigating this effect according to loan types are limited. The aim of this study is to determine the bank-specific internal factors and macroeconomic factors that affect non-performing consumer loans for deposit banks operating in Turkey. For this purpose, ARDL bounds testing approach is used by using monthly data of the Turkish deposit banking sector for 2005–2021. In the study, the effects of 6 bank-specific internal factors and 6 macroeconomic factors are investigated.

The findings obtained in the research reveal the cointegration between macroeconomic factors and non-performing consumer loans. Long-term relationships are investigated for the factors with cointegration relationship. The increase in loan interest rates and unemployment rate increase the rate of non-performing consumer loans. The results obtained are consistent.

The increase in unemployment rate and the deprivation of income of more individuals will negatively affect their ability to pay loans. It is also determined that when loan interest rates increase, the rate of non-performing consumer loans increases. The increase in loan interest rates will cause more risky individuals to use loans. The increase in those with high risk among individuals using loans will cause non-repayment of consumer loans, which will increase the rate of non-performing loans. Conversely, the increase in deposit interest rates and the dollar exchange rate decreases the rate of non-performing consumer loans. When deposit interests increase, the increase in interest income and the positive effect on the income level as a result of its distribution among individuals in the society may facilitate the payment of consumer loans. Again, due to the high foreign currency and gold savings of individuals in Turkey, the increase in the dollar exchange rate is likely to reduce the ratio of non-performing consumer loans.

In the study, a cointegration relationship is determined between the internal factors specific to banks and the ratio of non-performing consumer loans. The effect of only 2 of the 6 internal factors on the ratio of non-performing consumer loans in the long term is found to be statistically significant. It is determined that the increase in the capital adequacy standard ratio and the return on assets decreases the ratio of non-performing consumer loans. This result shows that the decrease in risk and increase in profitability in banks decrease the ratio of non-performing consumer loans. The fact that banks with lower risk and increased profitability will turn to customers with lower risk in consumer loans, and will avoid too much risk due to sufficient profitability, may reveal this result.

In the study, the effect of the increase in the return on assets decreasing the NPL ratio is determined and the results are consistent with the results obtained by Messai and Jouini (2013), Yağcılar and Demir (2015), Bayar (2019) and Kjosevski et al. (2019). The negative effect of the capital adequacy ratio on non-performing loans is similar to the results obtained by Kumar et al. (2018) for the Fiji market. However, Yağcılar and Demir (2015) obtained a different result in their study, in which they examined the 2002–2013 period for the Turkish market. This indicates that the effect of capital adequacy ratio on non-performing loans may vary periodically. The effect of unemployment rate on non-performing loans has also been determined for different markets and periods by Messai and Jouini (2013), Makri et al. (2014), Kumar et al. (2018), Bayar (2019), Kjosevski et al. (2019), Ciukaj and Kil (2020), Kozarić and Dželihodžić (2020) and Ayaydın et al. (2021). Findings regarding the decrease in non-performing loans due to the increase in the exchange rate differ with the findings obtained by Yüksel (2016).

The results obtained in the study are valuable for bank managers and investors. Administrative decisions and investment decisions to be taken according to the factors affecting the non-performing consumer loans ratio will increase the performance of both groups. Bank managers can maximize the profits of banks by re-evaluating the risks of consumer loans in periods when unemployment rate and loan interest rates are expected to increase. Investors can prevent portfolio values from decreasing by avoiding investments in banks with high consumer credit in their portfolio in periods when an increase in unemployment rate and loan interest rates is expected. It is also determined that the decrease in the capital adequacy standard ratio and the return on assets will cause the ratio of non-performing consumer loans to increase. Despite falling profitability, bank managers can maintain their asset quality by not turning to risky consumer loans, thus enabling profitability to rise again.

The main limitation of this study is to investigate only the factors affecting the non-performing consumer loans ratio. In future studies, determining the factors affecting non-performing for other loan types, even for loan types included in consumer loans, will make a significant contribution to the literature and will help managers and investors in developing strategies.

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