Research Article

The Effect of Non-Performing Loans on Sector Profitability in the Turkish Banking Sector

Yasin KÜTÜK [a] & Ayşe ÇETİN YILMAZ [b]

Abstract

The main purpose of this study is to determine the impact of non-performing loans (NPLs) on profitability of banking industry in Turkiye. In this study, in order to examine the basic indicators of profitability, non-performing receivables and consumer credit cards, non-performing housing and vehicle loans, non-performing consumer loans, consumer loans, loans and credit cards, net profit-loss and non-performing loans were compiled to generate a data set for the period between 2004 and 2018. Due to the different integration levels of the series obtained, models based on the autoregressive distributed lag (ARDL) approach, which is one of the time series regression methods, were established to analyze. Then, the effect of non-performing receivables on the banking sector profitability was examined. The initial findings reveal that the increase in non-performing receivables significantly reduced the profit of the banking sector.

Keywords: non-performing receivables, bank's profitability, ARDL bounds testing

JEL Codes: G21, L21, C32

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Türk Bankacılık Sektöründe Takipteki Alacakların Sektör Karlılığına Etkisi

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Öz

Bu çalışmanın amacı Türkiye'de bankaların takipteki alacaklarının sektör karlılığına etkisini belirlemektir. Bu çalışmada karlılığın temel göstergelerini incelemek amacıyla, takipteki ihtiyaç kredileri ve bireysel kredi kartları, takipteki konut ve taşıt kredileri, takipteki tüketici kredileri, tüketici kredileri, krediler ve kredi kartları, dönem net kar-zararı ve takipteki alacakların 2004 - 2018 tarihleri arasındaki aylık bilançoları Bankacılık Düzenleme ve Denetleme Kurulu (BDDK) verileri ile derlenmiştir. Elde edilen serilerin farklı bütünleşme seviyeleri nedenle zaman serileri regresyonu yöntemlerinden ARDL yaklaşımı temel alınarak modeller kurulmuş ve banka karlılığı analiz edilmiş, takipteki alacakların bankacılık sektörü karlılığına etkisi incelenmiştir. Elde edilen ilk bulgulara göre, takipteki alacakların artışının, bankacılık sektörünün karını önemli ölçüde düşürdüğü ortaya çıkmaktadır.

Anahtar Kelimeler: takipteki alacaklar, banka karlılığı, ARDL yaklaşımı

JEL Kodlar: G21, L21, C32

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Introduction

Banks are economic institutions that serve the needs of private and legal persons, as well as states. Their main task is to bring together those who supply money and those who demand money. Banks are of great importance in financing economic activities. They are profit-oriented organizations, and they need to make a profit to ensure the continuity of their activities and meet their costs. Profitability is one of the most important elements of a business, and non-performing loans are one of the factors that affect it.

Non-performing loans can be defined as the result of a significant deterioration in the repayment agreement between the bank and the loan debtor, leading to the possibility of loss and delay in collection (Aktaş, 2000). Non-performing loans, non-performing receivables, and non-performing assets are used interchangeably in the banking literature. There may be many reasons for non-performing loans, originating from the bank, the environment, the company, or the individual.

The delay in the collection of loans and the fact that they become problematic affect the bank negatively. Increases in the NPL ratio indirectly affect the banking sector and the entire country's economy negatively (Yuca, 2012). From the bank's point of view, income loss is experienced as the funds allocated for non-performing loans cannot be transferred to areas with higher returns.

This study aims to investigate the relationship between net profit/loss and non-performing receivables in the Turkish banking sector. To achieve this, literature review will examine previous studies on this topic in the second. The data set will be introduced the purpose-built one in the third section. The econometric methodology will analyze in the fourth section. In the fifth, conclusion will finalize this paper by sharing the initial findings and their discussions.

Literature Review

The profitability of banks is a critical issue in the financial industry, and numerous studies have been conducted to identify the determinants of bank profitability. One factor that has been widely studied is the relationship between non-performing loans and bank profitability. Non-performing loans (NPLs) refer to loans that are in default or are close to being in default, and they are considered a major issue for banks worldwide. The following is a collection of studies that examine the relationship between non-performing loans and bank profitability.

The relationship between non-performing loans (NPLs) and bank profitability is a critical area of study in Iqbal and Nosheen (2023). NPLs represent loans that are in default or close to default, posing risks to financial institutions. Understanding how NPLs affect profitability is essential for policymakers, regulators, and practitioners.

The literature on determinants of fon-performing loans identifies two main streams when examining the determinants of bad loans:

Macroeconomic Determinants

These factors consider the broader economic environment (Syed, 2021; Manz, 2019). For instance, GDP growth, unemployment rates, and real interest rates influence credit risk. A downturn in the economy often leads to higher NPL ratios.

Bank-specific Determinants

These factors focus on internal bank characteristics (Kjosevski & Petkovski, 2021; Vogiazas & Nikolaidou, 2011). Enhanced competition due to deregulation can lead to increased credit risk. Banks may relax lending standards to gain market share, resulting in higher NPLs.

The most common indicator of credit risk on the literature looking the relation of NPLs and profitability is the ratio of NPLs to total bank loans. A high level of NPLs negatively impacts bank profitability.

Messai and Jouini (2004–2008) examined 85 banks in Italy, Greece, and Spain. They found that bank profitability decreases as NPLs rise. Additionally, unemployment rates, real interest rates, and weak credit quality positively affect the level of NPLs. Nikolopoulos and Tsalas (2017) provide a comprehensive review of NPL determinants. They emphasize the importance of both macroeconomic and bank-specific factors in explaining credit risk evolution. Their study highlights the broader legal and regulatory environment's influence on NPLs. Other studies have documented that elevated NPLs contribute to bank collapses and increased vulnerability in the banking system. The outbreak of the global financial crisis further exacerbated NPL levels, affecting liquidity and profitability.

Akhtar et al. (2011) examined the profitability of Islamic banks in Pakistan and created two models based on their study. They used return on assets (ROA) and return on equity (ROE) as dependent variables in their models. According to the results of the study, they concluded that there is a statistically significant and inverse relationship between non-performing loans and return on assets. Osuagwu (2014), on the other hand, investigated the factors affecting bank profitability using data from selected banks in Nigeria. The study concluded that there is a significant and negative relationship between non-performing loans and bank profitability. Majumder and Uddin (2017) investigated the factors affecting the profitability of four national banks in Bangladesh between 2010 and 2014. They used return on assets, capital adequacy ratio, non-performing loans ratio, total assets, liquidity ratio, non-interest income ratio, and ratio of off-balance sheet activities to total assets as independent variables. As a result of their study, they concluded that there is a statistically significant and negative relationship between non-performing loans and return on assets.

The factors affecting the profitability of Islamic banks is investigated by Bashir (2003) in the Middle East during the period of 1993-1998 and concluded that the non-performing loan ratio causes high profitability. Bodla and Verma (2006) investigated the determinants of the profitability of public banks in India between 1991 and 2004. They determined the net profit of the bank as the dependent variable and found that fixed costs and non-performing loans/total loans ratio have a negative relationship with profitability. Sufian and Chong (2008) examined the determinants of the profitability of banks in the Philippines between 1990 and 2005. As a result of the research, it was concluded that non-performing loans, general administrative expenses and inflation were negatively correlated with profitability.

For Turkish literature, Aka (2019) conducted research on the determinants of bank profitability using data from Kuveyt Türk, Türkiye Finans and Albaraka participation banks between the years 2010-2018. They examined the effect of non-performing loan rates on return on assets and return on equity capital and found a significant relationship between non-performing loans and profitability. Aydın (2019) empirically analyzed the determinants of the profitability of Turkish banks, as well as bank- and sector-specific variables and macroeconomic factors. As a result of the study, it was concluded that there is a statistically significant and negative relationship between the NPL ratio and the return on assets (Aydın, 2019: 186-187). Kaya (2002), who analyzed the determinants of net interest margin, return on assets and return on equity in the Turkish banking system during the period 1997-2000, determined that there is a negative relationship between the ratio of net non-performing loans to total assets (Kaya, 2002). Gülhan and Uzunlar (2011) analyzed the profitability of local and foreign banks operating in Turkey between 1990 and 2008, and they concluded that there is a statistically significant and negative relationship between the non-performing loans/total loans ratio of banks and their profitability. Güneş (2015) investigated the factors affecting the profitability of the Turkish banking sector between 2002 and 2012. They used ROA and ROE as dependent variables and concluded that there is a negative and significant relationship between return on assets and non-performing loans. Alper and Anbar (2011) aimed to determine the variables that have an impact on the profitability of banks in Turkey between 2002 and 2010. In the study, in which ROA and ROE were used as dependent variables, it was revealed that there is a negative relationship between non-performing loans and profitability. Karamustafa (2013) conducted a study on the importance of NPL ratios in terms of the banking sector and the financial system. The study found that the NPL ratio is an essential indicator of the financial health of banks and the overall economy. Şahbaz (2010) studied the macroeconomic effects of problem loans in the Turkish Banking Sector and investigated the causes and effects of non-performing loans in their work. The study found that non-performing loans have a significant impact on the stability of the banking sector and the overall economy.

In conclusion, the studies above suggest that non-performing loans have a negative impact on bank profitability. Therefore, banks should strive to reduce their non-performing loans ratio to maintain their profitability.

Data Set

This study aims to explore the relationship between net profit/loss and non-performing receivables in the Turkish banking sector. The data used in the study were obtained from the monthly balance sheets of the Central Bank of the Republic of Turkey, EDDS[1], and BRSA[2], covering the years 2004-2018 for banks operating in Turkey. The analysis was based on 180 months of data. The dependent variable for the study is Net Profit-Loss, while the independent variables include Loans, NPL, Consumer Loans (Short Term, Medium-Long Term, Total), Credit Cards (Short Term, Medium-Long Term, Total), NPL Consumer Loans, NPL Housing Loans, NPL Vehicle Loans, and Non-Performing Consumer Loans, as well as Non-Performing Personal Credit Cards.[3]

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[1] the Electronic Data Delivery System (provided by the CBRT).
[2] Banking Regulation and Supervision Agency (aka BDDK in Turkish).
[3] The abbreviations to be used later are as follows: ROA: Return on Assets Ratio, ROE: Return on Equity, NIM: Net Interest Margin, DNKZTP: Total Net Profit and Loss for the Period, KKTP: Credit Cards Short Term Total, KKOUTP: Credit Cards Medium-Long Term Total , KKTP: Total Credit Cards, CRTP: Total Loans, TATP: Total NPLs, TBKKTP: Total Non-Performing Personal Credit Cards, TIKTP: Total Non-

The Consumer Price Index (CPI) was used as a macroeconomic indicator for inflation, while the Consumer Confidence Index was used as a measure of consumer sentiment. This study is aligned with previous research in the literature, which mostly includes three variables: return on assets (ROA), return on equity (ROE), and net interest margin. For this study, the period's net profit-loss was used as the dependent variable.

The profitability ratios of the banking sector and the non-performing loan ratios are two important metrics that are commonly used to measure the financial health of banks. The profitability ratios, which include return on assets (ROA) and return on equity (ROE), provide insight into how well a bank is able to generate profits from its assets and equity. On the other hand, the non-performing loan ratios show the percentage of loans that are in default or are not being paid back on time. By analyzing these ratios, investors and stakeholders can assess the overall risk profile of a bank and make informed decisions about their investments or partnerships with the institution. The table below presents the latest figures for these ratios in the banking sector.

Table 1
The Profitability Ratios of the Banking Sector (%)

Year	Return on Equity (%) Net Profit (Loss) for the Period / Average Equity	Return on Assets (%) Net Profit (Loss) for the Period / Average Total Assets	Profit (Loss) Before Taxes / Average Total Assets (%)
2018	14.83	1.45	1.77
2017	15.88	1.62	2.02
2016	14.28	1.50	1.89
2015	11.28	1.16	1.48
2014	12.25	1.33	1.69
2013	14.19	1.60	2.02
2012	15.68	1.83	2.35
2011	15.48	1.74	2.22
2010	20.12	2.46	3.03
2009	22.92	2.63	3.27
2008	18.74	2.05	2.54
2007	24.77	2.78	3.41
2006	21.01	2.60	3.31
2005	12.14	1.72	2.68
2004	15.76	2.36	3.32

Note. BDDK (2020).

Performing Consumer Loans, TKKTP: Total Non-Performing Housing Loans, TKRKTP: Consumer Loans Short Term Total, TKROUTP: Medium-Long Term Total of Consumer Loans, TKRTP: Total of Consumer Loans, TTAKTP: Total of Non-Performing Vehicle Loans, TTKTP: Total of Non-Performing Consumer Loans.

Table 1 clearly shows that the banking sector had the highest return on equity in 2009 and the lowest in 2015. The highest return on assets ratio, at 2.78, was in 2007, while the lowest, at 1.16, was in 2015.

Table 2

Non-Performing Receivables in the Banking Sector for the Years 2004-2018

Year	NPLs (Total, million TL.)
2018	96655.90
2017	63989.96
2016	58163.50
2015	47540.86
2014	36425.71
2013	29621.55
2012	23407.92
2011	18972.69
2010	19993.03
2009	21852.87
2008	14052.83
2007	10345.33
2006	8550.09
2005	7807.77
2004	6355.70

Note. BDDK (2020).

In the Turkish banking sector, the rate of loans extended by banks has increased in recent years, along with a parallel increase in non-performing loans. To better analyze non-performing loans, data for five years has been arranged in a table. According to the table, receivables increased from 6,355 million TL in December 2004 to 96,655 million TL in December 2018 (Table 2).

Econometric Methodology

Since it is primarily studied with time series econometrics, the integration levels of the series were determined using unit root tests, such as the extended Dickey-Fuller test (Hamilton, 1994), the Phillips-Perron test, which includes non-parametric corrections of error terms (Greene, 2003), and the Kwiatowski et al. (1992) test, which involves performing the unit root test with LM statistics using the reverse hypothesis (Enders, 2008).

After performing unit root tests, the series to be used will be visualized. If variables with seasonality problems are found in these series, they will be adjusted for seasonal effects. This will enable the examination of the cointegration relationship between the series, taking into account the integration levels. If there is differentiation in integration levels, an ARDL model will be used for cointegration regression.

For the cointegration model, the following regression model (Equation 1) will be created after determining the lag lengths (parameter k). However, since the other variables except for inflation and confidence index are nominal and monetary amounts, logarithms of all variables will be taken to calculate elasticity coefficients simultaneously. In addition, the trend coefficient can be added to the model.

$$\text{DNKZTSA} = \beta_0 + \beta_1 \text{Enf}_{t-k1} + \beta_2 \text{Guven}_{t-k2} + \beta_3 \text{KKKTP}_{t-k3} + \beta_4 \text{KKOUTP}_{t-k4} + \beta_5 \text{KKTP}_{t-k5} + \beta_6 \text{KRTP}_{t-k6} + \beta_7 \text{TATP}_{t-k7} + \beta_8 \text{TBKKTP}_{t-k8} + \beta_9 \text{TIKTP}_{t-k9} + \beta_{10} \text{TKKTP}_{t-k10} + \beta_{11} \text{TKRKTP}_{t-k11} + \beta_{12} \text{TKROUTP}_{t-k12} + \beta_{13} \text{TKRTP}_{t-k13} + \beta_{14} \text{TTAKTP}_{t-k14} + \beta_{15} \text{TTKTP}_{t-k15} + \varepsilon_t \quad \textbf{(1)}$$

Equation 1 includes the index "t" to show the month in which the time series is located. The indices between k1 and k15 represent the lag lengths. However, since the lag length of each series will be determined differently in ARDL, they are numbered separately between 1-15.

Furthermore, Equation 2 shows the Error Correction Model (ECM) required to obtain the short-run model.

$$\Delta\text{DNKZTSA} = \beta_0 + \beta_1 \Delta\text{Enf}_{t-k1} + \beta_2 \Delta\text{Guven}_{t-k2} + \beta_3 \Delta\text{KKKTP}_{t-k3} + \beta_4 \Delta\text{KKOUTP}_{t-k4} + \beta_5 \Delta\text{KKTP}_{t-k5} + \beta_6 \Delta\text{KRTP}_{t-k6} + \beta_7 \Delta\text{TATP}_{t-k7} + \beta_8 \Delta\text{TBKKTP}_{t-k8} + \beta_9 \Delta\text{TIKTP}_{t-k9} + \beta_{10} \Delta\text{TKKTP}_{t-k10} + \beta_{11} \Delta\text{TKRKTP}_{t-k11} + \beta_{12} \Delta\text{TKROUTP}_{t-k12} + \beta_{13} \Delta\text{TKRTP}_{t-k13} + \beta_{14} \Delta\text{TTAKTP}_{t-k14} + \beta_{15} \Delta\text{TTKTP}_{t-k15} + \beta_{16} \text{Enf}_{t-1} + \beta_{17} \text{Guven}_{t-1} + \beta_{18} \text{KKKTP}_{t-1} + \beta_{19} \text{KKOUTP}_{t-1} + \beta_{20} \text{KKTP}_{t-1} + \beta_{21} \text{KRTP}_{t-1} + \beta_{22} \text{TATP}_{t-1} + \beta_{23} \text{TBKKTP}_{t-1} + \beta_{24} \text{TIKTP}_{t-1} + \beta_{25} \text{TKKTP}_{t-1} + \beta_{26} \text{TKRKTP}_{t-1} + \beta_{27} \text{TKROUTP}_{t-1} + \beta_{28} \text{TKRTP}_{t-1} + \beta_{29} \text{TTAKTP}_{t-1} + \beta_{30} \text{TTKTP}_{t-1} + \varepsilon_t \quad \textbf{(2)}$$

The ARDL cointegration test, which is run based on performing the integrated coefficient test (also known as the F-test) between β_{16}- β_{30} in Equation 2, was performed by Pesaran et al. (2001) with the special F-table value presented in the article (Kütük, 2011).

Results

To prevent the time series from trending and causing spurious regression, stationarity was tested using the Dickey-Fuller Unit Root Test (Table 3), Phillips-Perron Test (Table 4), and KPSS (Kwiatkowski-Phillips-Schmidt-Shin) Unit Root Test (Table 5). Unit root tests are crucial in time series analysis to determine whether a variable exhibits a stochastic trend or is stationary in its levels. Stationarity is essential for reliable modeling and forecasting. If the variables are found to be stationary in their levels, it implies that they do not have a unit root and can be considered as stable over time.

Stationarity is a fundamental property that ensures the statistical properties of a variable remain constant over time. When variables are deemed stationary in their levels, it signifies that they do not exhibit systematic trends, and their statistical characteristics such as mean and variance remain constant across different time periods. The stationarity test results are provided in the below tables, which indicate all variables are found to be statiotionary in their levels.

Table 3

ADF Unit Root Test Results

Variable	I(0) Constant	I(0) Constant and Linear Trend	I(1) Constant	I(1)Constant and Linear Trend
DNKZTP	0.1342	-1.7057	-2.7562	-2.9116
LN(DNKZTP)	-0.8266	-2.3347	-4.2582	-4.1526
ENF	3.4332	4.0261	0.9255	-4.1634
LN(ENF)	1.6384	0.5012	-2.3355	-2.67
GUVEN	-2.0218	-2.5771	-4.2423	-4.1866
LN(GUVEN)	-1.9543	-2.5853	-4.1052	-4.045
KKKTP	0.8462	-2.7292	-2.835	-3.1538
LN(KKKTP)	-1.281	-1.479	-3.0167	-3.3741
KKOUTP	-1.8785	-3.0215	-3.6377	-3.6284
LN(KKOUTP)	-6.9839	-8.2405	-2.8606	-3.4888
KKTP	0.6111	-2.8595	-3.0009	-3.221
LN(KKTP)	-1.2877	-1.524	-2.8739	-3.2304
KRTP	4.5286	2.5522	-1.6482	-3.9732
LN(KRTP)	-2.9192	-2.5535	-5.5689	-6.2315
TATP	2.6526	1.4415	-1.0459	-2.0496
LN(TATP)	0.6296	-2.1496	-4.8866	-5.0353
TBKKTP	-1.512	-3.4365	-2.2882	-2.4029
LN(TBKKTP)	-2.7904	-3.5258	-3.8517	-3.9486
TIKTP	0.0624	-1.6955	-4.5579	-4.6534
LN(TIKTP)	-2.9474	-2.1011	-3.9384	-4.6288
TKKTP	-1.2202	-2.2805	-2.9889	-2.9474
LN(TKKTP)	-2.7152	-2.4917	-2.7826	-5.016
TKRKTP	2.2611	0.5053	-0.3711	-1.5831
LN(TKRKTP)	0.8229	-2.903	-2.8849	-3.1727
TKROUTP	0.784	-2.1499	-3.4192	-3.4043
LN(TKROUTP)	-3.2368	-6.4249	-1.0233	-2.7068
TKRTP	1.0357	-2.0804	-3.4848	-3.5954
LN(TKRTP)	-4.9408	-4.0416	-3.2022	-6.9093
TTAKTP	-2.1893	-1.9586	-4.0758	-4.2805
LN(TTAKTP)	-5.0046	-2.3623	-2.9243	-5.0539
TTKTP	-0.4002	-2.6537	-2.833	-2.8831
LN(TTKTP)	-2.9123	-1.6985	-3.5298	-4.4927

Note. Researcher's Computation

Table 4

PP (Phillips–Perron) Unit Root Test Results

Variable	I(0) Constant	I(0) Constant and Linear Trend	I(1) Constant	I(1)Constant and Linear Trend
DNKZTP	-3.4366	-5.4812	-17.1713	-17.4198
LN(DNKZTP)	-5.6446	-6.8379	-39.9992	-40.2212
ENF	5.1137	4.7297	-8.7512	-8.9279
LN(ENF)	1.7819	-0.0781	-9.6116	-9.6851
GUVEN	2.4051	-2.9573	-11.7054	-11.723
LN(GUVEN)	-2.2681	-2.9217	-11.5441	-11.522
KKKTP	1.9294	-0.9936	-11.5681	-11.8296
LN(KKKTP)	-4.1263	-3.6972	-7.779	-8.8087
KKOUTP	-1.3435	-1.8441	-5.1092	-5.1011
LN(KKOUTP)	-4.2721	-3.1639	-11.4575	-11.6777
KKTP	1.5619	-1.2922	-11.1061	-11.3516
LN(KKTP)	-4.2715	-3.572	-7.3072	-8.6154
KRTP	4.2836	-0.2523	-11.2873	-12.2314
LN(KRTP)	-4.2711	-3.4767	-10.1481	-10.8844
TATP	5.0244	2.3123	-6.2249	-8.0023
LN(TATP)	1.0761	-3.226	-10.798	-11.0701
TBKKTP	-46.0948	-175.5601	-1797.073	-1812.346
LN(TBKKTP)	-7.9289	-15.6512	-93.6089	-120.0489
TIKTP	0.4203	-1.5521	-12.7497	-12.8252
LN(TIKTP)	-2.7146	-1.2009	-11.8172	-12.0256
TKKTP	-1.0939	-1.4768	-7.7002	-7.6812
LN(TKKTP)	-2.4727	-1.0146	-16.2294	-16.3657
TKRKTP	4.9174	2.4758	-11.7071	-12.3311
LN(TKRKTP)	0.4914	-1.3865	-12.0298	-12.0262
TKROUTP	1.0239	-2.287	-3.9242	-3.8253
LN(TKROUTP)	-8.8681	-6.5138	-5.2961	-6.3507
TKRTP	1.3323	-2.1744	-3.9846	-3.9426
LN(TKRTP)	-8.0193	-4.9249	-4.9516	-6.0731
TTAKTP	-1.8697	-1.4329	-8.0272	-8.3584
LN(TTAKTP)	-3.8159	-2.3917	-12.6507	-13.3252
TTKTP	0.5529	-1.8923	-10.3411	-10.5408
LN(TTKTP)	-3.8099	-1.0388	-13.8997	-15.0558

Note. Researcher's Computation

Table 5

KPSS (Kwiatkowski–Phillips–Schmidt–Shin) Unit Root Test Results

Variable	I(0) Constant	I(0) Constant and Linear Trend	I(1) Constant	I(1)Constant and Linear Trend
DNKZTP	1.5435	0.1952	0.1707	0.0805
LN(DNKZTP)	1.7194	0.1385	0.3158	0.2427
ENF	1.6889	0.3646	1.0338	0.2612
LN(ENF)	1.7374	0.1888	0.3252	0.1618
GUVEN	0.8885	0.1679	0.111	0.0921
LN(GUVEN)	0.839	0.1523	0.0946	0.09
KKKTP	1.7247	0.2235	0.3901	0.0743
LN(KKKTP)	1.7043	0.3565	0.7002	0.1159
KKOUTP	1.2356	0.1409	0.0804	0.0711
LN(KKOUTP)	1.1619	0.2237	0.5485	0.1294
KKTP	1.7207	0.1939	0.3174	0.0737
LN(KKTP)	1.6989	0.3513	0.7316	0.1194
KRTP	1.6126	0.4176	1.0781	0.0543
LN(KRTP)	1.7196	0.3044	0.9298	0.1366
TATP	1.5532	0.3898	0.9222	0.1441
LN(TATP)	1.6861	0.0918	0.2584	0.0744
TBKKTP	0.1288	0.1315	0.3308	0.1333
LN(TBKKTP)	1.434	0.2257	0.2198	0.1142
TIKTP	1.3664	0.3151	0.3009	0.105
LN(TIKTP)	1.5063	0.2565	0.5047	0.1019
TKKTP	1.1878	0.2706	0.124	0.1066
LN(TKKTP)	1.1987	0.3833	0.6139	0.1479
TKRKTP	1.5307	0.3897	0.8634	0.1689
LN(TKRKTP)	1.656	0.2966	0.1572	0.0657
TKROUTP	1.705	0.3875	0.3133	0.1071
LN(TKROUTP)	1.5834	0.342	1.1901	0.2714
TKRTP	1.7024	0.3944	0.3869	0.0963
LN(TKRTP)	1.6312	0.3569	1.2329	0.2326
TTAKTP	0.4206	0.3313	0.3665	0.1043
LN(TTAKTP)	0.6821	0.3646	0.9677	0.2268
TTKTP	1.6	0.2773	0.2508	0.0975
LN(TTKTP)	1.5374	0.3641	0.8392	0.1104
DNKZTP	1.5435	0.1952	0.1707	0.0805

Note. Researcher's Computation

The confirmation of stationarity in the levels of all variables, as indicated by the Dickey-Fuller Unit Root Test (Table 3), Phillips-Perron Test (Table 4), and KPSS Unit Root Test (Table 5), is a pivotal outcome in the data analysis process. This verification not only serves to prevent

the time series from trending but also guards against the risk of spurious regression, ensuring the robustness of subsequent statistical analyses and model applications.

Analysis of the Effect of Variables on Profitability

The dependent variable in this study was the period net profit and loss, and its relationship with other variables was examined. First, the logarithms of the variables were taken and analyzed. The net profit loss for the period was seasonally adjusted. Separate analyses were conducted using AIC (Akaike information criteria) and SIC (Schwarz-Bayesian information criteria), and a table of AIC and SIC was added just below. These criteria were used to choose the most suitable model among the models with different AIC criteria. SIC criteria are also quite similar to AIC criteria and are valid not only for the selected sample size but also for future predictions. The number of lags was determined by AIC and SIC criteria.

Table 6 presents the results of the model performed with different lag levels (up to a maximum of 2) and model selection optimization based on the Akaike Information Criteria (AIC) for the long term. According to the results, the model that was performed gave the smallest AIC result at ARDL(1, 0, 0, 0, 0, 2, 1, 1, 2, 2, 1, 0, 0, 2, 0, 1) lag lengths.

Table 6

ARDL Long Run Model (AIC)

ARDL Long Run Form and Bounds Test
Dependent Variable: D(DNKZTPSALOG)
Selected Model: ARDL(1, 0, 0, 0, 0, 2, 1, 1, 2, 2, 1, 0, 0, 2, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 05/13/20   Time: 13:42
Sample: 2004M01 2018M12
Included observations: 169

	Conditional Error Correction Regression			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.929975	2.452332	1.602546	0.1113
DNKZTPSALOG(-1)*	-0.313158	0.064948	4.821656	0.0000
ENFLOG**	-0.391549	0.479907	-0.815885	0.4160
GUVENLOG**	0.210819	0.130506	1.615402	0.1085
KKKTPLOG**	-3.478480	2.288379	-1.520063	0.1308
KKOUTPLOG**	0.020696	0.066977	0.308995	0.7578
KKTPLOG(-1)	3.058145	2.231863	1.370221	0.1728
KRTPLOG(-1)	0.547163	0.407272	1.343484	0.1813
TATPLOG(-1)	0.277382	0.255161	1.087087	0.2789
TBKKTPLOG(-1)	-0.669276	0.259990	-2.574241	0.0111
TIKTPLOG(-1)	0.005283	0.091187	0.057940	0.9539
TKKTPLOG(-1)	-0.097937	0.071000	-1.379395	0.1700
TKRKTPLOG**	0.173483	0.126468	1.371751	0.1723
TKROUTPLOG**	0.991425	0.928831	1.067390	0.2876
TKRTPLOG(-1)	-1.380821	1.162417	-1.187888	0.2369
TTAKTPLOG**	0.098479	0.135236	0.728197	0.4677
TTKTPLOG(-1)	0.376416	0.250765	1.501070	0.1356
D(KKTPLOG)	3.958805	2.397471	1.651242	0.1009
D(KKTPLOG(-1))	0.948793	0.548631	1.729384	0.0859
D(KRTPLOG)	-0.840995	0.440828	-1.907763	0.0585
D(TATPLOG)	-0.469339	0.494539	-0.949042	0.3442
D(TBKKTPLOG)	-0.039337	0.232413	-0.169256	0.8658
D(TBKKTPLOG(-1))	0.278881	0.200120	1.393568	0.1657
D(TIKTPLOG)	-0.267106	0.126190	-2.116704	0.0361
D(TIKTPLOG(-1))	-0.204189	0.113819	-1.793971	0.0750
D(TKKTPLOG)	-0.530048	0.151191	-3.505827	0.0006
D(TKRTPLOG)	-0.189818	1.251953	-0.151617	0.8797
D(TKRTPLOG(-1))	-2.104685	0.614775	-3.423504	0.0008
D(TTKTPLOG)	-0.139553	0.381109	-0.366175	0.7148

 * p-value incompatible with t-Bounds distribution.
 ** Variable interpreted as Z = Z(-1) + D(Z).
Note. Researcher's Computation

As can be seen from Table 6, the cointegration equation of the model, which does not include the constant term and a trend coefficient, is found to be statistically significant. After this stage, the model is also estimated for the level equation.

The most appropriate ARDL model determined according to the AIC values presented in Table 6, the level equation is formed with the short-term in Table 7. When the bounds test is performed accordingly, the F-statistic value presented in Table 8 is compared with the threshold values in the Pesaran (2001), the null hypothesis claiming that there is no relationship in the level

equation, is rejected since it is even higher than the value at the highest limit of the I(0) - I(1) band according to Pesaran (2001).

Table 7
ARDL Level Equation (AIC)

	Levels Equation			
	Case 2: Restricted Constant and No Trend			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ENFLOG	-1.250324	1.553002	-0.805102	0.4221
GUVENLOG	0.673205	0.398325	1.690091	0.0932
KKKTPLOG	-11.10776	6.885432	-1.613227	0.1089
KKOUTPLOG	0.066087	0.215979	0.305988	0.7601
KKTPLOG	9.765513	6.761335	1.444317	0.1509
KRTPLOG	1.747245	1.301683	1.342297	0.1817
TATPLOG	0.885760	0.780154	1.135366	0.2582
TBKKTPLOG	-2.137187	0.831376	-2.570663	0.0112
TIKTPLOG	0.016871	0.291127	0.057952	0.9539
TKKTPLOG	-0.312740	0.244608	-1.278534	0.2032
TKRKTPLOG	0.553978	0.419291	1.321226	0.1886
TKROUTPLOG	3.165897	2.973090	1.064851	0.2888
TKRTPLOG	-4.409349	3.737703	-1.179695	0.2401
TTAKTPLOG	0.314470	0.431032	0.729573	0.4669
TTKTPLOG	1.202003	0.830015	1.448171	0.1498
C	12.54951	8.093541	1.550559	0.1233

EC = DNKZTPSALOG - (-1.2503*ENFLOG + 0.6732*GUVENLOG -11.1078
*KKKTPLOG + 0.0661*KKOUTPLOG + 9.7655*KKTPLOG + 1.7472
*KRTPLOG + 0.8858*TATPLOG -2.1372*TBKKTPLOG + 0.0169
*TIKTPLOG -0.3127*TKKTPLOG + 0.5540*TKRKTPLOG + 3.1659
  *TKROUTPLOG -4.4093*TKRTPLOG + 0.3145*TTAKTPLOG+1.2020
*TTKTPLOG + 12.5495)

Note. Researcher's Computation

The results of bounds test are given in the Table 8 according to its AIC-based application. Therefore, it is observed that there is a long-run cointegration relationship. Banks' net profit/loss for the period is mostly affected by total non-performing personal credit cards and confidence index at 5% significance level.
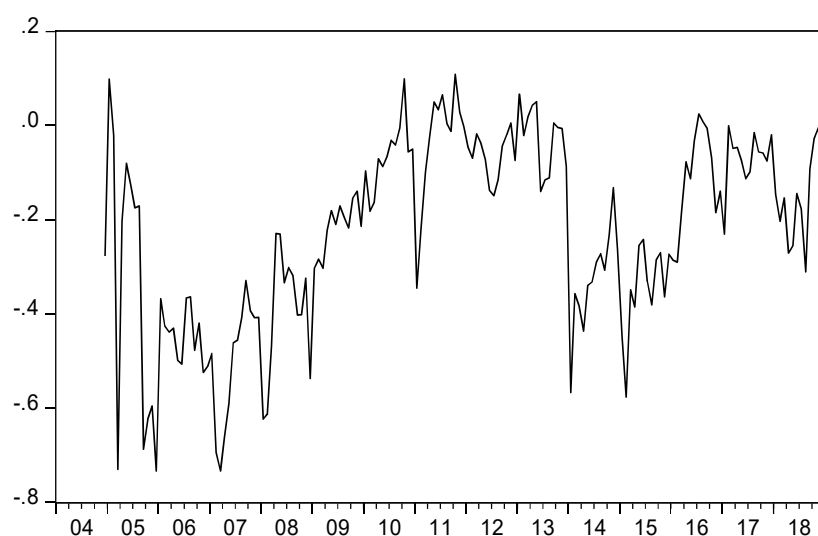
Table 8
ARDL Bound Test (AIC)

F-Bounds Test			Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)		I(1)
				Asymptotic: n=1000	
F-statistic	4.392936	10%	1.76	2.77	
k	15	5%	1.98	3.04	
		2.5%	2.18	3.28	
		1%	2.41	3.61	

Note. Researcher's Computation

In Figure 1, the cointegration graph obtained from this equation is presented, according to which banks' net profit / loss for the period moves together with all other independent variables in the long run.

Figure 1
2004-2018 AIC Cointegrating Equation

Note.Created by the author.

Equation 1 (ARDL) and Equation 2 (ECM) models were also performed according to Schwarz-Bayesian Information Criteria (SBIC) and are presented in Table 9 and Table 10.[4] Upon careful examination of Table 9, it becomes evident that the cointegration equation within the model holds statistical significance. Notably, this equation is devoid of the constant term and a trend coefficient. The observed statistical significance underscores the robustness and relevance of the model at this stage of analysis.

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[4] The selection procedure of the best candidate model was given in Figure 4 in Appendix..

Table 9

ARDL Long Run Model (SBIC)

ARDL Long Run Form and Bounds Test
Dependent Variable: D(DNKZTPSALOG)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 1, 0, 0, 2, 1, 0, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 05/13/20   Time: 13:49
Sample: 2004M01 2018M12
Included observations: 169

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.196827	2.091548	-0.094106	0.9252
DNKZTPSALOG(-1)*	-0.288782	0.059313	-4.868810	0.0000
ENFLOG**	0.289087	0.456142	0.633765	0.5272
GUVENLOG**	0.174488	0.132735	1.314560	0.1907
KKKTPLOG**	-1.188540	2.103488	0.565033	0.5729
KKOUTPLOG**	0.050024	0.060283	0.829820	0.4080
KKTPLOG**	0.953020	2.070800	0.460218	0.6460
KRTPLOG(-1)	0.504936	0.342832	1.472835	0.1429
TATPLOG**	-0.105014	0.222094	-0.472833	0.6370
TBKKTPLOG**	-0.208966	0.205467	-1.017030	0.3108
TIKTPLOG(-1)	0.138888	0.080485	1.725631	0.0865
TKKTPLOG(-1)	-0.078787	0.068631	-1.147986	0.2528
TKRKTPLOG**	0.089273	0.119698	0.745818	0.4570
TKROUTPLOG**	-0.967163	0.779315	-1.241043	0.2166
TKRTPLOG**	0.630463	1.013675	0.621958	0.5349
TTAKTPLOG**	0.299144	0.120848	2.475381	0.0144
TTKTPLOG**	-0.032267	0.211183	-0.152791	0.8788
D(KRTPLOG)	-0.601247	0.438638	-1.370714	0.1725
D(TIKTPLOG)	-0.306289	0.118650	-2.581453	0.0108
D(TIKTPLOG(-1))	-0.241849	0.109234	-2.214051	0.0284
D(TKKTPLOG)	-0.562766	0.125350	-4.489574	0.0000

  * p-value incompatible with t-Bounds distribution.
  ** Variable interpreted as Z = Z(-1) + D(Z).
Note. Researcher's Computation

   According to the AIC values determined in Table 9, the most suitable Autoregressive Distributed Lag (ARDL) model was identified, and in Table 10, a short-term Error Correction Model (ECM) and level equation were constructed. Subsequently, during the conducted bound test, the F-statistic value presented in Table 11, when compared to the threshold values in Pesaran's (2001) article, surpassed even the upper limit of the I(0) - I(1) band. Consequently, the null hypothesis (H0), which claims no relationship in the level equation, is rejected. Thus, it is concluded that there is a long-term cointegration relationship. The net profit/loss of banks during the period is found to be most influenced by the total outstanding ındividual credit card amount and the confidence ındex at a 5% significance level.

Table 10

ARDL Level Equation (SBIC)

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ENFLOG	1.001056	1.592756	0.628505	0.5306
GUVENLOG	0.604219	0.431263	1.401047	0.1633
KKKTPLOG	-4.115701	7.083060	-0.581063	0.5621
KKOUTPLOG	0.173223	0.215915	0.802274	0.4237
KKTPLOG	3.300139	7.013001	0.470574	0.6386
KRTPLOG	1.748502	1.226951	1.425078	0.1562
TATPLOG	0.363643	0.799180	-0.455020	0.6498
TBKKTPLOG	-0.723612	0.677117	-1.068666	0.2870
TIKTPLOG	0.480943	0.277369	1.733946	0.0850
TKKTPLOG	-0.272825	0.251629	-1.084235	0.2800
TKRKTPLOG	0.309137	0.418577	0.738542	0.4614
TKROUTPLOG	-3.349112	2.864844	-1.169038	0.2443
TKRTPLOG	2.183180	3.575716	0.610557	0.5424
TTAKTPLOG	1.035881	0.446805	2.318417	0.0218
TTKTPLOG	-0.111734	0.729891	-0.153084	0.8785
C	-0.681578	7.253468	-0.093966	0.9253

EC = DNKZTPSALOG - (1.0011*ENFLOG+0.6042*GUVENLOG -4.1157
*KKKTPLOG + 0.1732*KKOUTPLOG + 3.3001*KKTPLOG + 1.7485
*KRTPLOG -0.3636*TATPLOG -0.7236*TBKKTPLOG + 0.4809
*TIKTPLOG -0.2728*TKKTPLOG + 0.3091*TKRKTPLOG -3.3491
*TKROUTPLOG + 2.1832*TKRTPLOG + 1.0359*TTAKTPLOG-0.1117
*TTKTPLOG -0.6816)

Note. Researcher's Computation

The F-statistic value presented in Table 11 is greater than the I(1) limit. Since the H0 hypothesis is rejected, it can be claimed that there is a long-term cointegration relationship. The total non-performing consumer loans seem to affect banks' net profit/loss for the period in this model at a 5% significance level. Cointegrating relation was drawn in Figure 2.

Table 11

ARDL Bound Test (SBIC)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.080955	10%	1.76	2.77
k	15	5%	1.98	3.04
		2.5%	2.18	3.28
		1%	2.41	3.61

Note. Researcher's Computation

Figure 2
2004-2018 SBIC Cointegrating Equation
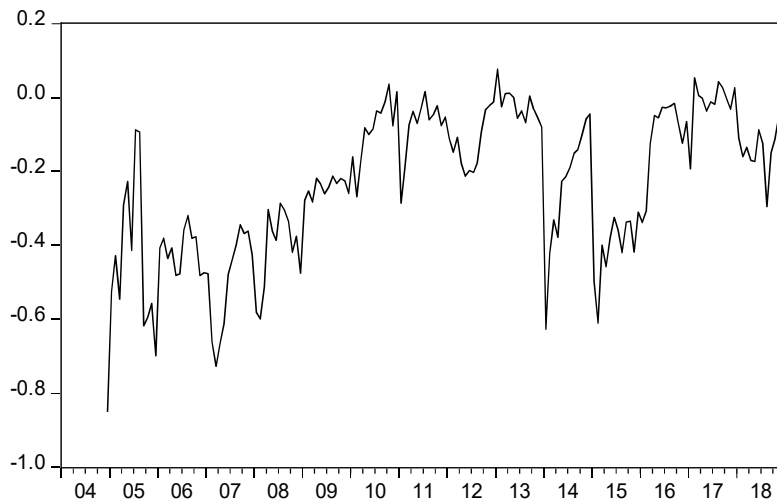
Note.Created by the author.

Conclusion

The primary objective of this research is to assess the influence of non-performing loans (NPLs) on the profitability of the banking industry in Turkiye. To comprehensively investigate the fundamental indicators of profitability, a dataset spanning the years 2004 to 2018 was compiled. This dataset encompasses non-performing receivables, consumer credit cards, non-performing housing and vehicle loans, non-performing consumer loans, consumer loans, loans and credit cards, net profit-loss, and non-performing loans.

Loans are defined as the funds given by banks to individuals or institutions in return for interest to be repaid after a certain maturity period (Black et al., 2009). Banks give loans under risk, as they want to collect the loans given on the basis of the payment agreements they have made, but the collection does not always take place on the due date, and delays may occur (Selimler, 2015). When customers cannot repay the loans on time, banks may restructure the loan to make it easier to repay, or initiate legal proceedings if necessary. Bad loans can shake the image of the bank in the market, decrease its competitive power, and negatively affect its growth. Administrative and legal extra costs for the collection of non-performing receivables will arise and the bank balance sheet and asset profitability will be adversely affected. The increase in non-performing loans will cause limited growth, which will reduce the willingness of employees and reduce work efficiency. The increase in non-performing loans will also cause the quality of the loan portfolio to decrease.

Non-performing loans have negative effects not only on the banking sector but also on the country's economy. Problematic loans reduce the profitability of banks, which causes them to increase their interest rates, leading to cost inflation. When the non-performing loan ratio increases, the financial situation of banks will suffer, and they will want to take this situation under control. Banks may stop giving new loans and want to obtain their receivables in a short time. This situation affects companies and can cause economic recession. When banks demand their receivables from their customers, the cash flow of even companies that have not been in financial distress will deteriorate. In this way, companies will suffer from liquidity problems,

and the economy will be adversely affected. Therefore, banks need to research their customers in detail and obtain collateral before giving loans.

Given the diverse integration levels of the obtained series, we employed models based on the autoregressive distributed lag (ARDL) approach, a recognized time series regression method. This method facilitated a thorough analysis of the relationships between the mentioned variables. Specifically, we examined the impact of non-performing receivables on the profitability of the banking sector.

The preliminary findings underscore a noteworthy outcome: an escalation in non-performing receivables is associated with a substantial reduction in the profit margins of the banking sector. These outcomes illuminate a crucial dimension of the dynamic relationship between non-performing loans and the financial well-being of the banking industry, contributing valuable insights to the broader discourse on financial stability and risk management.

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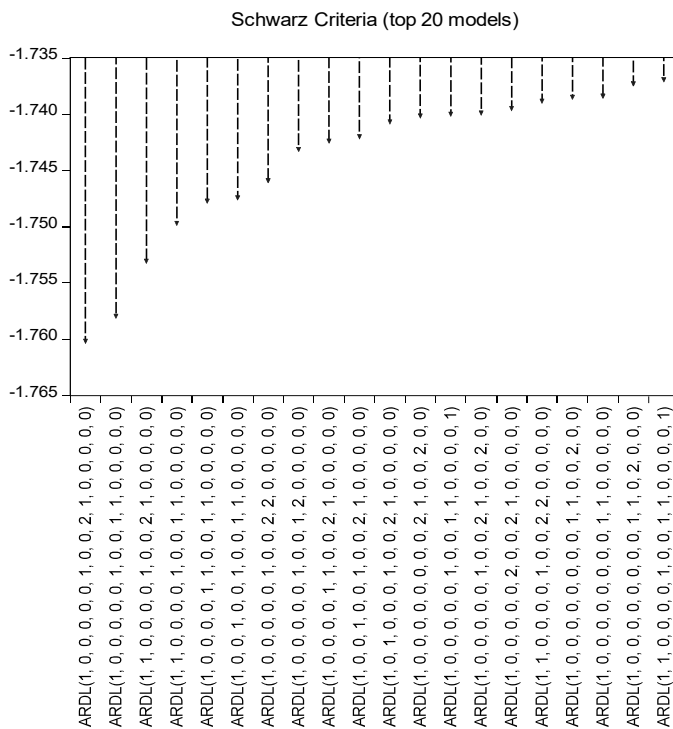
Appendix

Appendix 1:

Figure 3
Selection of the Best Appropriate Model in AIC
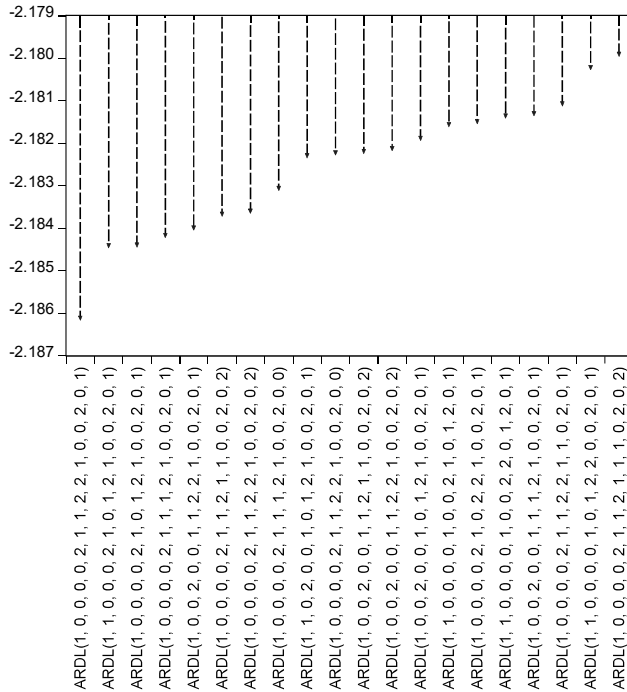
 Figure 4
Selection of the Best Appropriate Model in AIC