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Determinants of Non-Performing Loans in Turkish Deposit Banks

Türk Mevduat Bankalarında Sorunlu Kredilerin Belirleyicileri

Serpil TOMAK[1]

Abstract

The main purpose of this research is to reveal the determinants of non-performing loans (NPLs) of Turkish deposit banks on banking operations. This study applies panel data analysis using annual data to examine the determinants of non-performing loans (NPLs) in Turkish private deposit banks from 2012 to 2023. A panel regression model, incorporating both bank-specific (size, capital, profitability, lending activity, credit quality, revenue diversification) and macroeconomic factors (inflation, unemployment, GDP growth), is employed. Analysis results reveal that the effect of bank size (BS), return on assets (ROA), lending level (LTA) and credit quality (PLLTA) on NPLs are statistically significant. The empirical findings indicate that larger banks (BS) and higher provisions for loan losses (PLLTA) are positively associated with increased NPL ratios, suggesting that larger banks may face greater credit risk. Conversely, higher profitability (ROA) and lending activity (LTA) contribute to lower NPL levels, highlighting the importance of efficient asset management in mitigating credit risk. This study highlights that bank-specific factors -especially bank size, provisions for loan losses, profitability, and lending activity- are more critical in determining NPL levels than macroeconomic indicators. These findings provide valuable insights for bank managers, policymakers, and investors in managing credit risk and maintaining financial stability in Türkiye.

Keywords: Non-performing loans, Bank credits, Panel data analysis, Deposit banks, Credit risk

Öz

Bu araştırmanın temel amacı Türk mevduat bankalarının bankacılık faaliyetleri üzerinde batık kredilerin (NPL) belirleyicilerini ortaya koymaktır. Bu çalışmada 2012-2023 yılları arasında Türk özel mevduat bankalarında sorunlu kredilerin (NPL) belirleyicilerini incelemek amacıyla yıllık veriler kullanarak bankaya özgü (büyüklük, sermaye, kârlılık, kredi faaliyeti, kredi kalitesi, gelir çeşitlendirmesi) ve makroekonomik faktörleri (enflasyon, işsizlik, GSYİH büyümesi) içeren bir panel regresyon modeli kullanılmıştır. Analiz sonuçları banka büyüklüğünün (BS), varlık kârlılığının (ROA), kredi düzeyinin (LTA) ve kredi kalitesinin (PLLTA) sorunlu krediler (NPL) üzerindeki etkisinin istatistiksel olarak anlamlı olduğunu göstermektedir. Ampirik bulgular, banka büyüklüğü (BS) ve kredi zararları karşılıklarının (PLLTA) sorunlu krediler (NPL) ile pozitif ilişkili olduğunu ve bu durumun büyük bankaların daha fazla kredi riskiyle karşı karşıya kalabileceğini ortaya koymaktadır. Buna karşılık daha yüksek kârlılık (ROA) ve kredi faaliyeti (LTA) ise daha düşük sorunlu krediler (NPL) düzeyine katkıda bulunarak kredi riskinin azaltılmasında etkili varlık yönetiminin önemini vurgulamaktadır. Bu çalışma banka özelindeki faktörlerin -özellikle banka büyüklüğü, kredi kayıpları için ayrılan karşılıklar, kârlılık ve kredi faaliyeti- NPL seviyelerini belirlemede makroekonomik göstergelerden daha kritik olduğunu ortaya koymaktadır. Elde edilen bulgular Türkiye'de kredi riskinin yönetilmesi ve finansal istikrarın korunması konusunda banka yöneticileri, politika yapıcılar ve yatırımcılar için değerli öngörüler sunmaktadır.

Anahtar Kelimeler: Sorunlu krediler, Banka kredileri, Panel veri analizi, Mevduat bankaları, Kredi riski

[1] Assoc. Prof. Dr., Mersin University, Social Sciences Vocational School, Department of Management and Organization serpild@mersin.edu.tr, **https://orcid.org/0000-0002-2092-1582**, https://ror.org/04nqdwb39

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Introduction

The level of non-performing loans (NPLs) is important not only for financial stability but also well-functioning of the loan financing. In developing economies like Türkiye, solving the non-performing loans problem as a proxy of credit management failure is one of the priority issues. Non-performing loans and insufficient capital are among the biggest challenges facing the banking system in Türkiye. High levels of non-performing loans directly affect the overall financial performance of banks in the system (Berger & DeYoung, 1997: 850). The final repayment risk of the loan remains on the commercial banks whose main function is financial intermediation. Their distorting effects on lending behavior are also a significant problem. The deterioration in the asset quality of banks because of NPLs, in addition to disrupting the financial stability for the banking system, reduces economic efficiency, negatively affects social welfare and economic activities. Owing to these negative effects on all markets, Ghosh (2015) defines non-performing loans as "financial pollution". Therefore, it is important to know these variables as the factors explaining bad loans comprise very important information for the banking system.

There have been an extensive studies and debates on credit losses and their primary motives in banking sector. Understanding the subject of NPLs have received considerable attention in banking literature. Bank-related causes of high nonperforming loans are generally listed as poor loan standarts, low skilled bank professionals, high profit margins, lack of monitoring policy, and low credit policies. Studies indicates that the non-performing loan problem of banks are justified by bank-spesific, sectoral, macroeconomic, and other factors like feedback effects (Nkusu, 2011; Belgrave et al., 2012; Klein, 2013; Beaton et al., 2016; Us, 2020) and health crises like COVID-19 (Kryzanowski, 2023; OECD, 2021; Žunić et al., 2021: Hardiyanti & Aziz, 2021; Park & Shin, 2012).

The impact of COVID-19 to the non-performing loans (NPLs) depends on the country-spesific conditions. The strictness of the quarantine measures generally prevents from repaying their loans and increases their outstanding debts. However, financial support policies or moratorium on loans measures positively affected or deferred effect on the NPLs. In addition, profitable and well-capitalized financial instutions are generally in better condition.

Most academic studies reveal that macroeconomic conditions have more explanatory power than bank-spesific factors in explaining the non-performing loans level. That is, the dramatic increase in non-performing loans is largely due to macroeconomic imbalances. Therefore, the impact of non-performing loans (NPLs) on banking performance and lending behavior is an important issue in the banking sector especially on times of economic crisis. It shows that macroeconomic stability and economic growth are related to the decreasing level of non-performing loans. On the contrary, adverse macroeconomic shocks coupled with higher cost of capital and lower interest margins are associated with the increased scope of NPLs (Fofack, 2005: 1).

The relation between the macroeconomic environment and the quality of loans has been studied in the context of linking banking stability and the phases of the business cycle (Messai & Joini, 2013; Rajan & Dhal, 2003). The level of NPLs is low since those who use loans during economic expansion periods have sufficient income to pay their debts on time. If the expansion phase continues, banks apply more flexible loan terms regardless of the quality of the receivables. However, tighter credit policy is followed due to the increase in bad debts during recessions.

The most commonly used indicators among macroeconomic determinants are listed as unemployment rate, real exchange rate, real interest rate, annual inflation rate, the degree of

global risk aversion, annual GDP growth, Money supply (M2) and credit growth. Bank-specific factors that is commonly listed as equity-to-asset ratio, income-to-total assets (ROA), solvency ratio, return on equity (ROE), expected loss provisions (the loans reserves) and the change of the loans granted.

While high unemployment rate, depreciation of exchange rate, high inflation figures, high degree of global risk aversion generally exacerbate the problem of non-performing loans; the increase in GDP (growth) generally leads to a lower level of non-performing loans. Of the bank-specific factors, the equity-to-asset ratio, income-to-total assets (ROA) and return on equity (ROE) are negatively associated with NPLs, while a high rate of lending results in higher non-performing loans in literature. Although bank-level factors have a significant impact on NPLs, the overall explanatory power of these factors has been found to be low as compared to macroeconomic variables (Klein, 2013: 4). In conclusion, besides these commonly used macroeconomic and bank specific variables indicators, other estimators can also be used. The main purpose of this study is to analyze the effect of economic and financial factors on non-performing loans of banks for Turkish private deposit banks. Distinct countries may also produce different results in terms of various estimation procedures and bank sub-samples that is used.

The paper is organized as follows: following the introduction provided above, Section 2 presents the concept of NPL and an overview of the Turkish banking system. Section 3 reviews the relevant literature. Section 4 outlines the data and methodological framework. Section 5 presents the empirical findings. The final section, Section 6, provides the conclusion and recommendations.

1. NPL Concept And The Turkish Banking System

Lending and the quality of the loan portfolio are the main functions and sources of income and well-functioning of the banking system. The non-performing loans (NPLs) problem (known as bad loans) is explained in the literature by information asymmetry, adverse selection, and moral hazard theories. These theories explain how inefficiencies and risks in the lending process can lead to an increase in loans that are not repaid on time or at all, ultimately harming the financial stability of banks and lenders. Akerlof (1970) states that distinguishing between good and bad debtors can be complex, and inequality of information between parties can lead to adverse selection and moral hazard problems. The moral hazard theory is based on the assumption that the probability of borrowers repaying the bank loan given to them cannot be predetermined by the banks.

As the cost of borrowing (interest rates) increases, the quality of borrowers also decreases. In times of tight credit policies, high-risk borrowers who are not worried about strict lending conditions and are prone to credit default are more likely to make loan. A borrower may apply for a loan by overstating their ability to repay or underreporting their financial difficulties. The lender, having limited insight into the borrower's actual financial condition, may approve the loan based on incorrect assumptions, leading to an NPL if the borrower is unable to meet repayment terms. This informational gap can make it difficult for lenders to accurately assess the risks associated with lending to specific individuals or businesses, increasing the likelihood of defaults and NPLs. However, information sharing between banks is known to reduce adverse selection problems by increasing knowledge about loan applicants.

Adverse selection occurs when high-risk borrowers, who are more likely to default, are more inclined to apply for loans. If the lender is unable to accurately identify these high-risk borrowers, they may inadvertently lend to individuals who are less likely to repay, leading to an increase in the volume of non-performing loans (NPLs). Moral hazard arises when

borrowers, aware that they have limited financial responsibility, assume excessive risk after receiving a loan. This risk-taking behavior increases the probability of default, further contributing to the problem of non-performing loans. The literature suggests that moral hazard may be further exacerbated in state-owned banks, as the government's perceived willingness and capacity to provide support are often considered greater than those of privately-owned banks. The literature suggests that moral hazard may be further exacerbated in state-owned banks, as the government's perceived willingness and capacity to provide support are often considered greater than those of privately-owned banks (Das et al., 2024; Maseke & Swartz, 2021). To mitigate issues related to information asymmetry, adverse selection, and moral hazard issues, the literature recommends various policy interventions, including strengthening market discipline, increasing capital requirements, and limiting the range of activities permitted for banks (Goyal et al, 2023; Wang, 2019).

A loan is considered non-performing if payments due (principal and/or interest) are not paid within at least 90 days, in accordance with the definition of international institutions such as the IMF, The Basel Committee on Banking Supervision, and the European Central Bank (ECB). NPL is a regulatory concept that primarily reflects nonperforming loans that are more than 90 days past due. According to the Law of the Banking Regulation and Supervision Board (BRSA) No. 9644 dated 07/29/2021, compatible with international definitions, receivables overdue up to 90 days are defined as problematic even in Türkiye.

In times of economic recession or crisis, the rate of financial failure of firms also deepens. The increase in unemployment rates, volatility in exchange rates, tight money and credit policies aggravate the problem of non-performing loans. There is a widespread view that banks' lending policy can have significant effects on bad loans (Reddy, 2004). In banking crises experienced both in Türkiye and the other countries, especially in systemic crisis periods, the failure of the banking sector is generally associated with the huge accumulation of non-performing loans. Non-performing loans prevent interest income and are reflected in the provisions account. Increasing reserves lowers bank profits as it erodes existing profits and the capital base of banks. Exceeding manageable figures exacerbates financial distress in the banking sector.

The 2001 financial crisis in Türkiye was one of the most severe economic events in the country's history. The 2001 banking crisis in Türkiye clearly demonstrated the destructive impact of excessive NPLs on financial stability. The lessons learned from the crisis led to substantial reforms in the Turkish banking sector, particularly in NPL management. These reforms include improved regulations, better loan classification practices, enhanced NPL resolution frameworks, and the development of tools to monitor and mitigate credit risk. As a result, the banking sector has become more resilient to future shocks.

The Banking Regulation and Supervision Agency (BRSA, 2003) was given greater authority to oversee banks' risk management practices and capital adequacy. More stringent requirements for loan classification and provisioning were introduced, ensuring banks are better prepared for potential defaults. The management of NPLs became a central focus. Banks were required to adopt more proactive measures for identifying, monitoring, and dealing with bad loans, including the establishment of dedicated restructuring units to manage distressed assets.

In Türkiye, a total of 22 banks were transferred to the TMSF (Saving Deposit Insurance Fund) in the period of 1997-2003. Some of them were sold by being combined, while others were liquidated with the cancellation of banking licenses. The most important reason for the seizure of these institutions by the BDDK (Banking Regulation and Supervision Agency) is generally bank losses arising from uncollectible receivables by providing benefits to group companies or making illegal loans to group companies. Information asymmetry problem and

moral hazard problem have a decisive role in banking supervision principles. The measures taken after the 2001 banking crisis and the introduction of a risk management approach enabled the banking system to become stronger.

The recent increase in global (economic problems experienced after the Russia-Ukraine war and the Covid-19 epidemic) and national risks (especially the Kahramanmarash-centered earthquake and others), the structural transformations brought about by digitalization and the associated increased risks have negatively affected the banking sector and the credit market. Developing countries like Türkiye have various structural or institutional bottlenecks. Banks with weak senior management may have problems monitoring both their costs and their loan customers. Identifying the constraints that impair the credit provision mechanism or affect the credit flow and how to balance. In such a case, what precautions should be taken is critical.

The banking sector dominates the financial system in Türkiye. According to the data of the BRSA (Banking Regulation and Supervision Agency), it is seen that the Turkish banking sector still has the largest share in the financial system with 82.6% of total assets. Although the Turkish financial system is largely bank-oriented, the evolution of the elements of financial deepening needs to be understood. The economic crisis and the banking structure dominated by a few large banks may further increase the risks arising from non-performing loans.

Since banking crises are linked to the growth of non-performing loans, it is necessary to understand the leading motives for the increase in these loans. The soundness of banks and other financial institutions is also critical in improving private investment and economic growth. However, in times of crisis, banks cannot fulfill their main function of transferring resources efficiently to the real sector. The critical issue for banks is to confirm NPLs problems in a timely manner and to take necessary measures.

2. Literature Review

Numerous studies have been conducted in the literature on the main determinants of non-performing loans in developing and developed economies. The most important factor in lending and the important determinants in lending decisions may display variability by countries. However, there is a heavily concensus of the negative and significant impact of NPLs on the loan growth and economic performance.

The body of literature focuses on non-performing loans (NPLs), a critical issue in banking, and analyzes various factors affecting loan quality, efficiency, and bank capital across different countries and time periods. These studies consistently reveal the significance of both macroeconomic and bank-specific determinants in influencing NPLs, as well as the relationships between NPLs and other banking factors like profitability, capital adequacy, and operating efficiency.

Several studies focus on the effects of macroeconomic variables like GDP growth, unemployment, inflation, and real interest rates on NPLs. For example, Messai & Joini (2013) highlight that high NPLs are typically linked to financial crises and banking bankruptcies, while Klein (2013) and Skarica (2014) similarly confirm that GDP growth, unemployment, and inflation contribute to NPL variations.

Bank-specific factors also play a crucial role. Studies by Ghosh (2015), Khan et al. (2020), and Chaibi & Ftiti (2015) suggest that factors like capitalization, liquidity risks, profitability, and operating efficiency influence NPL levels. Ghosh, for instance, finds that capitalization, liquidity risks, and poor credit quality lead to higher NPLs, while profitability tends to decrease NPLs. On the other hand, Khan et al. (2020) show that profitability and operating efficiency have a significant negative impact on NPLs for banks in Pakistan.

The studies also touch on various hypotheses to explain NPL behavior. For example, the "bad management" hypothesis, highlighted by Berger & DeYoung (1997) and Mamonov (2013), suggests that inefficient management practices contribute to high NPLs. In contrast, the "bad luck" hypothesis, which is also discussed by Mamonov and others, implies that external, uncontrollable factors play a major role. This is particularly relevant in the context of economic crises or sudden macroeconomic shocks. Similarly, the "skimping" hypothesis, which posits that banks with lower capital ratios tend to take on higher portfolio risks, is examined by Berger & DeYoung and others, but generally finds weaker support in comparison to the bad management and bad luck explanations.

Moreover, the studies highlight feedback effects, where high NPLs negatively impact economic recovery. As Messai & Joini (2013) and Klein (2013) point out, rising NPLs create a vicious cycle, undermining bank operations and destabilizing the broader economy.

Bekereci et al. (2024) investigate the relationship between problem loans and their determinants across 59 countries with varying development levels, using 20 years of data (2001-2020) for high, upper-middle, and lower-middle income nations. Applying the Generalized Method of Moments (GMM) estimator, the study finds that macroeconomic factors, rather than sector-specific ones, play a more significant role in deteriorating asset quality. GDP, global crises, and the persistence of problem loans are identified as key predictors. The study highlights that problem loan rates are higher in low-income countries, and crises exacerbate problem loans in these nations. Conversely, growth is a primary factor in reducing problem loans in high-income countries. Overall, macroeconomic and sector-specific influences on credit risk vary depending on a country's welfare level.

Toksoy (2024) empirically analyzes the impact of macroeconomic indicators on non-performing loans (NPL) for 30 European countries over the period 2008-2022. The results indicate that both the real interest rate and inflation have a significant positive effect on NPL, while economic growth has a significant negative effect. Additionally, political stability and the real effective exchange rate are found to have no significant impact on NPL.

In summary, these studies collectively emphasize the multifaceted nature of NPLs. They demonstrate that NPLs are driven not only by macroeconomic factors, such as economic downturns and inflation, but also by bank-specific variables, including capital adequacy, profitability, and management efficiency. The interplay between these factors can have significant implications for financial stability, and understanding these dynamics is essential for developing effective banking policies and regulations.

The literature on the determinants of non-performing loans (NPLs) in the Turkish banking sector reflects a nuanced understanding of both macroeconomic and bank-specific factors. While numerous studies explore these determinants, a common theme emerges, highlighting the complex interaction between macroeconomic conditions, individual bank behaviors, and financial stability. However, these studies reveal differing perspectives, particularly in terms of causality and the nature of relationships, demonstrating both long-term patterns and bidirectional effects between NPLs and various determinants.

Several studies emphasize the significant influence of macroeconomic variables on NPL dynamics. For instance, Vardar and Özgüler (2015) identify a robust long-term relationship between macroeconomic factors—such as overnight lending rates, unemployment, inflation, GDP per capita, and current account deficits—and NPLs. Their findings suggest that fluctuations in macroeconomic conditions have substantial implications for the performance of loans. Similarly, Sahbaz and Inkaya (2010) investigate a broader time span (1998-2012) and conclude that the relationship between macroeconomic variables and NPLs is bidirectional. This highlights the notion that not only do macroeconomic factors influence NPLs, but the state

of NPLs may, in turn, impact macroeconomic conditions. This bidirectional causality aligns with broader literature on the interdependence of financial stability and economic performance, signaling the importance of maintaining macroeconomic stability to reduce NPL risks.

Bank-specific factors have also been found to play a pivotal role in NPL dynamics, with various studies pointing to the role of financial health and management practices. For example, Isik and Bolat (2016) introduce an important layer of analysis by highlighting the influence of bank-specific determinants, such as solvency, profitability, credit quality, and diversification, on NPL levels. Their study underscores that better capital structures and diversified revenue sources can mitigate NPLs, while the reverse is true for institutions with weaker financial health and higher loan loss provisions. These findings resonate with those of Ersoy (2021), who examines a larger sample of Turkish banks from 2010 to 2019. Ersoy's analysis reveals that factors such as capital adequacy and GDP growth have a negative impact on NPLs, whereas elements like operating efficiency and income diversification exacerbate NPL levels. Furthermore, Ersoy introduces the moral hazard hypothesis, suggesting that poor management practices may contribute significantly to the accumulation of NPLs.

Recent studies, such as those by Us (2020) and Altınbaş and Hanifoğlu (2023), reinforce the importance of macroeconomic stability in influencing NPL levels. Us (2020) finds that economic growth reduces NPLs, while inflation, unemployment, and debt stock tend to increase them, reiterating the sensitivity of NPLs to these macroeconomic factors. Altınbaş and Hanifoğlu (2023), on the other hand, uncover a positive relationship between inflation, interest rates, and capital adequacy ratios with NPLs, while a negative relationship emerges with the credit-to-GDP ratio. This underscores the multifaceted nature of NPL dynamics, where both macroeconomic policies and financial health of banks are key drivers.

Kartal (2023) expands the discussion by examining the impact of problematic loans on key financial indicators such as profitability, equity, capital adequacy, and the ability to extend new credit. His findings suggest that even a small increase in problematic loans can have far-reaching consequences, including a significant reduction in equity and a deterioration of capital adequacy ratios. This highlights the cascading effects that NPLs can have on the broader financial ecosystem, suggesting that improving credit quality and enhancing capital buffers are crucial to mitigate the risks posed by NPLs.

In a more recent contribution, İlhan and Gökçe (2024) investigate the relationship between NPL rates and credit extension willingness, demonstrating a negative correlation between rising NPLs and the growth rate of credit in Turkey. Their study reveals that the accumulation of NPLs discourages banks from extending new credit, exacerbating the problem of credit contraction in the banking sector. This feedback loop suggests that rising NPLs not only have a direct financial impact but also hinder economic growth by restricting access to credit.

Erdoğan (2024) also contributes to the literature by focusing on commercial banks listed on Borsa İstanbul (BİST). Through panel data analysis, Erdoğan identifies a positive and significant relationship between NPLs and loan provisions to total assets, as well as the capital adequacy ratio. These findings reinforce earlier conclusions that effective provisioning and maintaining robust capital buffers are essential for mitigating NPL risks.

Overall, the literature reveals a complex interplay between macroeconomic conditions and bank-specific characteristics in determining NPL levels. While there is consensus on the importance of macroeconomic stability and sound bank management in reducing NPLs, studies also highlight the bidirectional nature of these relationships, emphasizing that the dynamics of NPLs can feedback into broader economic trends. Moreover, the varying focus across studies—ranging from macroeconomic trends to bank-specific factors and institutional behavior—

demonstrates the multifaceted nature of NPL determinants, pointing to the need for integrated approaches in managing banking sector stability and financial health. Additionally, while much attention has been paid to general banking conditions, further research could delve deeper into the NPL challenges faced by SMEs, which represent a significant portion of Turkish economic activity.

To sum up, a well-rounded approach to managing NPLs in Türkiye would require not only monitoring macroeconomic conditions but also ensuring that banks maintain strong governance, efficient management practices, and appropriate levels of diversification to reduce the likelihood of loan defaults. Policymakers and financial institutions need to consider these factors when designing strategies to reduce NPLs and enhance the stability of the banking sector.

As Alnabuski et al. (2023) state that different econometric methods are used as a research method, from simple regressions to vector autoregression model, in the literature review covering 76 studies in 58 peer-reviewed journals as the determinants of NPLs. In this context, 64.47% of the sample studied used panel models. This is because GMM estimates have the advantage of avoiding biases by generating p-values and accurate standard errors. However, it is recommended to apply more advanced econometric models. Using these methods leads to the detection of an additional break that cannot be detected when using the time series dataset.

3. Empirical Analysis

This section outlines the methodology adopted in this research, including data source, variables used and the types of analysis adopted.

3.1. Data and Methodology

The sample consists of 20 private deposit banks in Türkiye, using annual data from 2012 to 2023. Information on the banks included in the analysis is presented in Table 2. A total of 20 banks, comprising 8 private and 12 foreign banks, with available data for the analyzed period, were included in the study. Public banks were excluded from the analysis due to their distinct operational motivations, which prioritize public interest over profit maximization. This research used secondary data. The source of data was the annual reports of commercial banks taken from the The Banks Associations of Türkiye's (TBB) website which includes financial reports: Balance sheet, Income statement. Key financial indicators data are sourced from the Central Bank of Türkiye (TCMB) and the Turkish Statistical Institute (TUIK). The number of bank observations in this study is 240.

Panel data analysis is selected for this study as it facilitates the examination of both cross-sectional and time-series dimensions, offering a more comprehensive analysis of the determinants of non-performing loans (NPLs) in Turkisprivate deposit banks. By analyzing data from 20 banks over a 12-year period (2012-2023), panel data models can account for individual heterogeneity, capturing both time-invariant characteristics of each bank and the dynamic effects of macroeconomic and bank-specific factors over time. This approach enhances the statistical efficiency of the analysis and controls for unobserved factors that may vary across banks. A key advantage of using panel data is its ability to provide more informative data, thereby reducing collinearity and improving the generalizability of the results. However, panel data analysis also has certain limitations, such as the risk of omitted variable bias if significant time-varying factors are not adequately included, and the potential for model misspecification (whether fixed or random effects) despite the use of the Hausman test for model selection.

As one of the indicators of financial health, the ratio of non-performing loans is calculated by the ratio of non-performing loans to total gross loans (before deducting NPLs and certain loan loss provisions). As an indicator of asset quality, it is intended to identify problems related to asset quality in the credit portfolio with the NPLs ratio. This study use macro-economic and bank-spesific financial variables for determining the non-performing loans indicators which are widely used in finance literature (Toksoy, 2024; İlhan & Gökçe, 2024; Bekereci et al., 2023; Alnabulsi et al, 2023; Us, 2020; Isik & Bolat, 2016).

The variables included in the regression model below represent a combination of bank-specific factors and macroeconomic conditions that may influence the Non-Performing Loans (NPLs) ratio of banks. The selection of each variable is grounded in both theoretical and empirical frameworks, as outlined in the literature on banking, economics, and finance. These variables encompass internal bank characteristics (such as size, capital, and profitability) as well as external economic conditions (including inflation, unemployment, and economic growth). Together, they offer a comprehensive understanding of the factors influencing NPLs within the banking sector. The relationships among these variables provide insights into how effectively a bank manages its loan portfolio, its exposure to economic fluctuations, and the impact of its operational characteristics on its susceptibility to defaults.

$$NPLs_{i,t} = \beta_0 + \beta_1 BS_t + \beta_2 EQ_t + \beta_3 ROA_{i,t} + \beta_4 LTA_{i,t} \beta_5 PLLTA_{i,t} + \beta_6 NII + \beta_7 INF + \beta_8 UNEMP + \beta_9 \Delta GDP_t + \varepsilon_{i,t}$$

$NPLs_{i,t}$: is the ratio of non-performing loans to total loans for bank i in year t.
BS_t: is natural log of total assets for bank i in year t.
EQ: is shareholders' equity over total assets for bank i in year t.
$ROA_{i,t}$: is the return on assets for bank i in year t.
LTA: is total loans and receivables over total assets
PLLTA: is provision for loan losses over total assets for bank i in year t.
NII: is the non-interest income over total assets for bank i in year t.
INF: is the annual inflation rate at period t.
UNE: is the rate of unemployment at period t.
ΔGDP_t: is the annual growth in real GDP at period t.
The study's data sources and descriptive information are given in Table 1.

Table 1. Definition of the variables

Name of Variables	Notation	Description
Dependent variable	NPLs	Non-performing loans over total loans
Non-performing loans		
Bank-spesific variables		
Bank size	BS	Natural log of total assets
Bank capital	EQ	Shareholders' equity over total assets
Profitability	ROA	Net income over total assets
Lending activity	LTA	Total loans and receivables over total assets
Credit quality	PLLTA	Provision for loan losses over total assets
Revenue diversification	NII	Non-interest income over total assets
Macroeconomic variables		
Inflation	INF	Annual inflation rate (CPI, year by year % change)
Unemployment	UNE	Annual unemployment rate
Economic growth	GDP	Annual growth rate of real GDP per capita

The selection of variables in this study is informed by both theoretical foundations and empirical findings in the literature. The following section outlines the independent variables, which are presented in Table 1 and utilized in the analysis:

Bank-specific variables:

1. **Bank size (BS):** This variable is measured as the natural logarithm of total assets. Studies such as Ghosh (2015), Isik & Bolat (2016) and Gjeçi et al. (2023) suggest that larger banks tend to exhibit better management practices and more diversified portfolios, thereby reducing their non-performing loan (NPL) ratios. However, the "too big to fail" hypothesis also posits that larger banks may be riskier due to their complex operations (Tölö et al, 2021; Li & Lai, 2024).
2. **Bank capital (EQ):** This ratio assesses the financial stability of a bank by comparing shareholders' equity to total assets. A higher equity ratio indicates a more capitalized bank, providing a buffer against potential loan losses. Higher capital ratios are generally associated with lower NPLs, as shown by Ghosh (2015), Ersoy (2021) and Gjeçi et al. (2023) who demonstrate that capital buffers help banks absorb shocks, including loan defaults.
3. **Profitability (ROA):** Research by Khan et al. (2020) and Ghosh (2015) has found that banks with higher profitability tend to have lower NPL ratios. Such banks are more likely to make adequate provisions for loan losses and exhibit superior risk management practices.
4. **Lending activity (LTA):** This is a key indicator of lending activity and reflects the bank's exposure to credit risk. The LTA ratio is commonly used in banking literature (e.g., Ghosh, 2015; Us, 2020) as a measure of credit risk. A higher LTA ratio indicates that a larger portion of assets is tied up in loans, thereby increasing the bank's exposure to defaults.
5. **Credit Quality (PLLTA):** As demonstrated by Erdoğan (2024), provisioning is a significant determinant of NPLs. Banks with higher provisions are better prepared for loan defaults and typically face fewer liquidity issues, which reduces the risk of higher NPLs.
6. **Revenue diversification (NII):** Diversifying income sources is essential for mitigating reliance on interest income from loans. Studies by Isik & Bolat (2016), Us (2020) and Ersoy (2021) suggest that income diversification reduces NPLs because banks are less dependent on loan income. Banks with more diversified revenue streams tend to experience lower NPLs.

Macroeconomic variables:

1. **Inflatıın (INF):** High inflation can diminish borrowers' ability to repay loans, leading to an increase in NPLs. Studies by Messai & Joini (2013), Us (2020) and Toksoy (2024) demonstrate that high inflation is associated with higher NPL ratios as borrowers struggle to meet repayment obligations.
2. **Unemployment Rate (UNE)**: High unemployment is a significant factor contributing to the rise in NPLs, as shown in studies by Klein (2013) and Skarica (2014), which find a correlation between higher unemployment rates and elevated NPL ratios. Higher unemployment is expected to lead to an increase in NPLs, as unemployed borrowers are more likely to default on their loans.
3. **Economic growth (GDP):** The relationship between GDP growth and NPLs is well-documented. Studies such as Us (2020), Toksoy (2024) and Bekereci et al. (2024) show that economic growth reduces NPLs, whereas recessions exacerbate them. A higher

GDP growth rate is expected to lower NPLs, as economic expansion enhances borrowers' ability to repay loans.

Table 2. Banks in the study

Akbank T.A.Ş.	Burgan Bank A.Ş
Anadolubank A.Ş.	Citibank A.Ş.
Fibabanka A.Ş.	Denizbank A.Ş.
Şekerbank T.A.Ş.	Deutsche Bank A.Ş.
Turkish Bank A.Ş	HSBC Bank A.Ş
Türk Ekonomi Bankası A.Ş.	ING Bank A.Ş.
Türkiye İş Bankası A.Ş.	Odea Bank A.Ş.
Yapı ve Kredi Bankası A.Ş.	QNB Finansbank A.Ş.
Alternatifbank A.Ş	Turkland Bank A.Ş.
Arap Türk Bankası A.Ş.	Türkiye Garanti Bankası A.Ş.

To ensure the robustness of the model's findings, several sensitivity analysis were conducted. These included testing alternative model specifications, such as varying the definitions of key variables and including or excluding specific bank types (private vs. foreign banks). Additionally, the impact of potential outliers was examined by rerunning the model with trimmed datasets, excluding extreme values from the NPL and macroeconomic variables. The results remained consistent across these variations, thereby reinforcing the reliability of the primary findings. Furthermore, different subsamples based on bank size and capital adequacy were analyzed, with similar outcomes observed, which supports the generalizability of the conclusions. Finally, the Hausman test confirmed the suitability of the random effects model, further validating the robustness of the estimated relationships between both bank-specific and macroeconomic variables and NPLs.

3.2. Empirical Findings

Table 3 presents descriptive statistics of variables used in the model. NPLs mean is 0.053±0.073 with 0.000-649 range. BS mean is 17.434±1.792, and range is 13.470-21.621. EQ range is 0.029-0.397, and EQ mean is 0.116±0.042, ROA mean is 0.015±0.020, LTA mean is 0.524±0.199, PLLTA mean is 0.0019±0.020, and NII mean is 0.007±0.013 with 0.000-0.167 range. The highest inflation rate is 64.770% and lowest rate is 6.160% with 21.904±20.633 mean. Unemployment range is 9.20-13.70 and annual real GDP growth range is 0.000-10.500.

The econometric quality of the model is assessed using several statistical measures. R-squared (R^2) indicates the proportion of variation in non-performing loans (NPLs) explained by the model, with a value of 33.16% suggesting a moderate explanatory power. The F-statistic of 9.63 ($p<0.05$) confirms that the model is statistically significant, meaning the independent variables collectively explain a significant portion of the variation in NPLs. The Hausman test ($p=0.9138$) supports the validity of the random effects model for the data, suggesting that random effects are more appropriate than fixed effects. These measures collectively show that the model is a good fit, providing significant insights into the factors influencing NPLs (Table 5).

Table 3. Descriptive statistics

	Mean	Standard Deviation	Minimum	Maximum
NPLs	0.053	0.073	0.000	0.649
BS	17.434	1.792	13.470	21.621
EQ	0.116	0.042	0.029	0.397
ROA	0.015	0.020	-0.115	0.137
LTA	0.524	0.199	0.000	0.826
PLLTA	0.019	0.020	0.000	0.162
NII	0.007	0.013	0.000	0.167
INF	21.904	20.633	6.160	64.770
UNE	10.875	1.359	9.200	13.700
GDP	3.850	2.795	1.100	10.500

Correlation matrix for the explanatory variables is reported in Table 3. Correlation analysis provides an information on the direction and size of the relationship between variables. Correlation analysis results show that NPLs is significantly correlated with BS ($r=0.153$; $p<0.01$), EQ ($r=-0.195$; $p<0.01$), ROA, ($r=-0.300$; $p<0.01$), PLLTA ($r=0.443$; $p<0.01$) and UNE ($r=0.250$; $p<0.01$) (Tablo 4).

The correlation direction is positive for BS, PLLTA, and UNE, whereas it is negative for EQ and ROA series (Table 3). This means that key variables such as bank size (BS), credit quality (PLLTA), and unemployment rate (UNE) have a significant positive impact on non-performing loans. However, bank capital (EQ) and return on assets (ROA) affect bad loans in a significant negative way. In summary, bank size, provisions for loan losses over total assets, and unemployment rate change in the same direction. In contrast, bank capital (EQ) and return on assets (ROA) move in the opposite direction. An increase in bank size (BS) and return on assets will contribute to the reduction of non-performing loans in deposit banks. This implies that the default risk is higher in larger deposit banks.

Table 4. Correlation matrix

	NPLs	BS	EQ	ROA	LTA	PLLTA	NII	INF	UNE	GDP
NPLs	1	0.153*	-0.195**	-0.300**	-0.017	0.443**	-0.042	0.091	0.250**	0.005
BS	0.153*	1	-0.297**	0.180**	-0.103	0.047	-0.114	0.304**	0.063	0.040
EQ	-0.195**	-0.297**	1	0.531**	-0.233**	-0.191**	0.350**	-0.082	-0.040	-0.148*
ROA	-0.300**	0.180**	0.531**	1	-0.439**	-0.315**	0.193**	0.451**	-0.177**	0.024
LTA	-0.017	-0.103	-0.233**	-0.439**	1	0.343**	-0.115	-0.641**	0.259**	0.041
PLLTA	0.443**	0.047	-0.191**	-0.315**	0.343**	1	-0.017	-0.067	0.468**	-0.073
NII	-0.042	-0.114	0.350**	0.193**	-0.115	-0.017	1	0.019	-0.080	0.015
INF	0.091	0.304**	-0.082	0.451**	-0.641**	-0.067	0.019	1	-0.145*	0.217**
UNE	0.250**	0.063	-0.040	-0.177**	0.259**	0.468**	-0.080	-0.145*	1	-0.222**
GDP	0.005	0.040	-0.148*	0.024	0.041	-0.073	0.015	0.217**	-0.222**	1

*p<0.05, **p<0.01.

The regression results are given in Table 5. According to Hausman test, the random model is valid for NPLs. The validity of the random model for NPLs based on the Hausman test, which resulted in a x^2 value of 3.31 and a p-value of 0.9138. Since the p-value is greater than 0.05, the random model was deemed appropriate for this analysis. Analysis results show that the effect of BS (B=0.0072; p<0.05), ROA (B=-1.4926; p<0.01), LTA (B=-0.0787; p<0.05) and PLLTA (B=1.4305; p<0.01) on NPLs are significant. Explanatory value of the model was 33.16%, and significant (p<0.05). Direction of effect of ROA and LTA are negative, whereas effects of BS and PLLTA are positive (Table 5).

The relationship between the variable bank size (BS) and the provision for loan losses ratio (PLLTA) with non-performing loans (NPLs) is positive and significant. However, the relationship between profitability, measured as return on assets (ROA), and the lending activity level (LTA) is negative and significant in the Random model. A one-unit increase in bank size (BS) leads to an average increase of 0.0072 units in the NPL ratio, holding other factors constant. This effect is statistically significant, suggesting that larger banks may have slightly higher NPL ratios.

A one-unit increase in the bank's return on assets (ROA) results in a decrease of 1.4926 units in the NPL ratio on average in the Random model. This relationship is statistically significant, indicating that higher profitability (measured by ROA) reduces the NPL ratio, which is a positive sign for the bank's asset quality.

A one-unit increase in the loan-to-asset ratio (LTA) decreases the NPL ratio by 0.0787 units on average. This effect is statistically significant at the 5% level, suggesting that banks with a higher proportion of loans relative to their total assets tend to have lower NPL ratios. This could reflect a more efficient or profitable lending strategy, or it may indicate that these banks have better control over the quality of their loan portfolios.

A one-unit increase in the provision for loan losses to total assets ratio (PLLTA) leads to an average increase of 1.4305 units in the NPL ratio. This effect is statistically significant at the 1% level. The positive relationship suggests that higher provisions for loan losses (likely in response to anticipated loan defaults) are associated with higher NPLs, as these provisions are often set aside to cover expected losses from non-performing loans.

As mentioned earlier, non-performing loans are one of the biggest challenges facing the banking system in Türkiye (Ersoy, 2021; Us, 2020; Isik & Bolat, 2016). In general, non-performing loans are considered bad debts because the likelihood of recovering the defaulted loan repayment is minimal. Having more non-performing loans on a bank's balance sheet can significantly affect the bank's cash flow. Therefore, understanding the impact of independent bank-specific and macroeconomic variables on non-performing loans is crucial.

The findings indicate that for effective management of non-performing loans increase in return on assets (ROA) and lending level (LTA) will lowering the bad loan problems in the system. On the other hand, high level bank size (BS) and provision for loan losses (PLLTA) will also increase the non-performing loans level. That is, high level of bank size (BS) and provision for loan losses (PLLTA) will exacerbate the risk of the non-performing loans level.

Table 5. Factors affecting Turkish deposit banks' NPLs

Regressions	Fixed model	Random model
Constant	-0.1220	-0.1166
Bank characteristics		
BS	0.0074	0.0072*
EQ	0.2194	0.2095
ROA	-1.5121*	-1.4926**
LTA	-0.0545	-0.0787*
PLLTA	1.5164*	1.4305**
NII	-0.0326	-0.0197
Economic and Market Conditions		
INF	0.0006	0.0004
UNE	0.0024	0.0038
GDP	0.0009	0.0014
R^2	0.3265	0.3316
F-statistic	9.63	
Wald $\chi 2$		106.45
$\chi 2$		0.000
No. of observations	240	
Hausman Test	X^2: 3.31; p: 0.9138 (Random)	

*p<0.05, **p<0.01

Robustness analysis were conducted using different model specifications, including fixed and random effects models, to test the reliability of the results. The findings consistently highlight that an increase in return on assets (ROA) and lending levels (LTA) leads to a reduction in non-performing loans (NPLs), suggesting effective management practices. However, higher bank size (BS) and provisions for loan losses (PLLTA) are associated with an

increase in NPLs, indicating that larger banks with higher provisions may face greater risks in managing bad loans. Additionally, the robustness tests, such as the Hausman test, support the choice of the random effects model, as indicated by the p-value of 0.9138.

4. Conclusion

As we mention before, non-performing loans are not only problematic for banking system. It also leads to serious problems in the economy itself. NPLs disrupt the bank's asset-liability balance and bring to a decrease in the liquidity structure. The increase in non-performing loans prevents banks from using their resources in productive and profitable investments by increasing the provisions set aside for bad loans. Banks with low incomes are failed to fulfill their responsibilities. Their reliability and reputation are damaged. Occasionally, this situation can even lead to bankruptcy depending on the size of bad loans.

Non-performing loans are considered to be one of the main causes of economic recession. Therefore, it is very important for banks to keep non-performing loans at a manageable level. Especially in times of crisis, banks cannot fulfill their main function of transferring resources to the real sector efficiently. Understanding the drivers of non-performing loans maintains the soundness and stability of the banking system. Determining macro-economic and bank-specific factors allows banks and policy makers to monitor effective credit applications by reducing the level of NPLs.

There have been an extensive research on the determinants of non-performing loans in the literature. This situation does not reduce the importance of the issue. Because, bad loans identifers may change depending on the data set, method, and the time period that is used. Besides that, economic conditions and implemented policies may change periodically. That's why determinants of the non-performing loans may change even in the same country analysis.

The results of this study align with some of the key findings from the existing literature on non-performing loans (NPLs) but also introduce new insights that expand the understanding of NPL dynamics in the Turkish banking sector. The examination of both macroeconomic and bank-specific factors affecting NPL levels offers important contributions to the ongoing debate about the determinants of NPLs.

Bank-specific factors, particularly bank size and provisions for loan losses, exhibit a strong positive relationship with non-performing loans (NPLs) in this study. Larger banks tend to have higher levels of NPLs, which is consistent with findings from Ghosh (2015) and Khan et al. (2020). These studies suggest that larger banks often have higher exposure to credit risk due to the nature of their operations and a greater tendency to offer loans in larger volumes. Additionally, the positive relationship between loan loss provisions (PLLTA) and NPLs aligns with previous research, such as Ghosh (2015), which emphasizes that banks with higher loan loss provisions tend to manage a larger number of non-performing loans. This could suggest that large banks in Turkey may have more challenging credit portfolios or a greater emphasis on managing risk through provisions, rather than directly addressing underlying loan quality.

On the other hand, the negative and significant relationship between profitability (ROA) and lending activity (LTA) with NPLs provides an interesting contrast. This suggests that banks with higher profitability and more active lending may be better positioned to manage or reduce NPLs. This finding is in line with studies such as those by Ghosh (2015) and Chaibi & Ftiti (2015), which highlight that profitable and well-capitalized banks tend to have lower NPL levels because they are better able to absorb potential losses and focus on higher-quality lending. This result further reinforces the importance of strong financial health in mitigating the risk of non-performing loans.

The finding that macroeconomic variables such as inflation, unemployment, and GDP growth do not have a significant relationship with NPLs in Turkey contradicts much of the existing literature that identifies a clear link between these factors and NPLs. For instance, Messai & Joini (2013), Klein (2013), and Skarica (2014) consistently find that economic downturns, high unemployment, and inflation rates contribute to higher NPLs. This discrepancy may be attributed to the specific context of the Turkish economy during the analyzed period. Turkey has undergone significant economic transformations, and perhaps certain macroeconomic conditions were less impactful in the short term than in other countries. Alternatively, their effects may have been absorbed by other factors, such as bank-specific variables.

Moreover, studies like those by Toksoy (2024) and Bekereci et al. (2024) show a significant impact of macroeconomic variables like inflation and GDP growth on NPLs in other regions, emphasizing the importance of considering the unique economic and institutional context when analyzing NPL dynamics. The non-significance of macroeconomic factors in this study suggests that, during periods of stability or when other financial buffers are in place, the effects of inflation and unemployment may not immediately manifest in NPL levels. This could also indicate that other institutional and banking practices play a more dominant role in the Turkish context.

This paper intends to contribute the literature by examining the existence and direction of causality among non-performing loans for 20 private deposit banks in Türkiye. The non-performing loans (NPLs) is used as dependent bad loan measures. Besides, there are five internal (bank size, bank capital, profitability, lending activity, credit quality and revenue diversification), and three external (inflation rate, unemployment and the economic growth) independent variables are used in the analysis.

It is generally known as the high inflationary conditions and unemployment rates increase the NPLs level. High inflationary conditions and unemployment rates often cause NPLs rates to rise. However, there is no significant relationship between inflation, unemployment and GDP rates with NPLs. Surprisingly, there is no significant relation with macroeconomic variables. This could imply that other factors, such as banking practices, regulatory environment, or specific domestic conditions, might be more influential in determining NPL levels, rather than the broader economic indicators typically associated with credit risk.

The relation between the variable bank size and provision for loan losses ratio (PLLTA) with NPLs is positive and significant level. But the relation between profitability named as return on assets (ROA) and lending activity level (LTA) is negative and significant. The results suggest that the primary cause of high levels of NPLs is the bank size, provision for loan losses ratio. This means that the problem loans increase when bank size and provision for loan losses ratio (LTA) increases, and decrease when the return on assets (ROA) and total loans and receivables over total assets (PLLTA) increase in Turkish deposit banks for the period analyzed.

The limitations of this paper should be considered when interpreting our empirical findings. In this study, we exclude public deposit banks in the analysis. Although public banking has strategic role in the Turkish banking system, they work with different motives. Politically public benefit motive is more important than profitability in public banks (Das et al., 2024; Ranjan & Dhal, 2023). Further research could explore additional variables, such as the specific characteristics of SMEs, to provide a more comprehensive understanding of NPL determinants in the Turkish context.

In summary, the banking sector as a dominant in the Turkish financial system is of critical importance in terms of meeting financing requests and ensuring economic growth and

financial stability by mediating investment financing. Therefore, we can conclude that this study makes contribution to the literature by exploring the effects of bank-spesific and macroeconomic variables impact on non-performing loans in Türkiye for the analyzed period, which is important in terms of providing information and guidance for stakeholders as bank managements, policy makers, credit users, investors, and the public.

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No potential conflict of interest was reported by the author.
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In the study, scientific and ethical principles were followed and all the studies used were indicated in the bibliography.

References

Alnabulsi, K., Kozarević, E., & Hakimi, A. (2023). Non-performing loans as a driver of banking distress: A systematic literature review. *Commodities,* 111-130. https://doi.org/10.3390/commodities2020007

Altınbaş, H., & Hanişoğlu, G.S. (2023). Forecasting and evaluation of non-performing loans in the Turkish banking sector. *Istanbul Business Research,* 52(2), 381-406. https://doi.org/10.26650/ibr.2023.52.994354

Beaton, K., Myrvoda, A., & Thompson, S. (2016). Non-performing loans in the ECCU: Determinants and macroeconomic impact. *IMF Working Paper,* No. 16/229, 1-33.

Bekereci, N.E., Kısakürek, M., Ayrıçay, Y. (2023). Sorunlu kredilere etki eden faktörler: Farklı gelişmişlik düzeyindeki ülkeler üzerine bir araştırma. BDDK Bankacılık ve Finansal Piyasalar Dergisi, 17(2), 131-152.

Belgrave, A., Kester, G., & Jackman, M. (2012). Industry specific shocks and non-performing loans in Barbados. *The Review of Finance and Banking*, 4(2): 123-133.

Berger, A., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. Journal of Banking & Finance, 21, 849–870. https://doi.org/10.1016/S0378-4266(97)00003-4

BRSA Report. (2023). https://www.bddk.org.tr/KurumHakkinda/EkGetir/5?ekId=262

Chaibi, H., & Ftiti, Z. (2015). Credit risk determinants: Evidence from a cross-country study. *Research in International Business and Finance,* 33, 1-16. https://doi.org/10.1016/j.ribaf.2014.06.001

Cucinelli, D. (2015). The impact of non-performing loans on bank lending behavior: Evidence from the Italian banking sector. *Eurasian Journal of Business and Economics,* 8(16), 59-71. http://dx.doi.org/10.17015/ejbe.2015.016.04

Das, D., Rathi, M., & Suresh, K. (2024). Moral Hazard in Lending Decisions of Indian Public Sector Banks. *Journal of Financial Risk Management,* 13, 605-617. https://doi.org/10.4236/jfrm.2024.134028

Erdoğan, B. (2024). Bankaların takipteki kredilerini etkileyen faktörlerin panel veri modelleri ile analizi. Uluslararası Ekonomi Siyaset İnsan ve Toplum Bilimleri Dergisi, 7(3), 141-152.

Ersoy, E. (2021), The determinants of the non-performing loans: The case of Turkish banking sector. *International Journal of Insurance and Finance,* 1-11. https://doi.org/10.52898/ijif.2021.6

Fofack, H. (2005). Non-performing loans in Sub-saharan Africa: Causal analysis and macroeconomic implications. *World Bank Policy Research Working Paper,* No. WP 3769:1-36.

Gjeçi, A., Marinč, M., Rant, V. (2023). Non-performing loans and bank lending behaviour. *Risk Management*, 25(7), 1-26.

Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: evidence from US states. *Journal of Financial Stability,* 20, 93-104. https://doi.org/10.1016/j.jfs.2015.08.004

Goyal, S., Singhal, N., Mishra, N., & Verma, S.K. (2023). The impact of macroeconomic and institutional environment on NPL of developing and developed countries. Future Business Journal, 9(45), 1-15.

İlhan, S.T., & Gökçe, A. (2024). Türkiye'de takipteki kredilerin banka kredi verme davranışına etkisi. Gazi İktisat ve İşletme Dergisi, 10(1): 120-134. https://doi.org/10.30855/gjeb.2024.10.1.008

Hardiyanti, S.E., & Aziz, L.H. (2021). The case of COVID-19 impact on the level of non-performing loans of conventional commercial banks in Indonesia. *Banks and Bank Systems,* 16(1), 62-68. http://dx.doi.org/10.21511/bbs.16(1).2021.06

Isik, O., & Bolat, S. (2016). Determinants of non-performing loans of deposit banks in Turkey. *Journal of Business, Economics and Finance,* 5(4), 341-350. http://doi.org/10.17261/pressacademia.2017.356

Kartal, F. (2023). Sorunlu kredilerdeki değişimin kârlılık ve sermaye yeterliliğine etkisi. Ekonomi, *İşletme ve Maliye Araştırmaları Dergisi,* 5(1), 25-42. https://doi.org/10.38009/ekimad.1210493

Khan, M.A., Siddique, A., & Sarwar, Z. (2020). Determinants of non-performing loans in the banking sector in developing state. *Asian Journal of Accounting Research,* 5 (1),135-145. https://doi.org/10.1108/AJAR-10-2019-0080

Klein, N. (2013). Non-performing loans in CESEE: Determinants and macroeconomic Performance. *IMF Working Paper,* WP/13/72, 1-26.

Li, Z., & Lai. R.N. (2024). Are "too big to fail" banks just different in size? – A study on systemic risk and stand-alone risk. International Review of Financial Analysis, 93, 1-23.

Mamonov, M.E. (2013). Bad management, skimping, or both? The relationship between cost efficiency and loan quality in Russian banks. *Basic Research Program Working Paper,* Series: Financial Economics WP BRP 19/FE/2013, 1-43.

Maseke, B. F., & Swartz, E. M. (2021). Risk Management Impact on Non-Performing Loans and Profitability in the Namibian Banking Sector. *Open Access Library Journal,* 8, e6943. https://doi.org/10.4236/oalib.1106943

Kryzanowski, L. Liu, J., & Zhang, J. (2023). Effect of COVID-19 on non-performing loans in China. *Finance Research Letters,* 52, 1-8. https://doi.org/10.1016/j.frl.2022.103372

Messai, A.S., & Jouini, F. (2013). Micro and Macro Determinants of Non-performing Loans. *International Journal of Economics and Financial Issues*, 3(4), 852-860.

Nkusu, M. (2011). Nonperforming loans and macrofinancial vulnerabilities in advanced economies. *IMF Working Paper,* No 11/161.

OECD Report. (2021). The COVID-19 crisis and banking system resilience: Simulation of losses on non-performing loans and policy implications, 1-52.

Park, C.Y., & Shin, K. (2021). COVID-19, nonperforming loans, and cross-border bank lending. *Journal of Banking & Finance,* 133, 1-14. https://doi.org/10.1016/j.jbankfin.2021.106233

Plikas, J.H., Kenourgios, D., & Savvakis, G.A. (2024). COVID-19 and non-performing loans in Europe. *Risk Financial Management,* 17(7), 1-38. https://doi.org/10.3390/jrfm17070271

Ranjan, R., & Dhal, S.C. (2003). Non-performing loans and terms of credit of public sector banks in India: An empirical assessment. *Reserve Bank of India Occasional Papers,* 24(3), 81-121. https://doi.org/10.4236/ajibm.2016.64042

Reddy, Y.V. (2004). Credit policy, systems, and culture. *Reserve Bank of India Bulletin,* 303-311. https://doi.org/10.33203/mfy.843836

Sahbaz, N., & Inkaya, I. (2010). Türk bankacılık sektöründe sorunlu krediler ve makroekonomik etkileri. *Optimum Journal of Economics and Management Sciences,* 1(1), 69-82.

Skarica, B. (2014). Determinants of non-performing loans in Central and Eastern European countries. *Financial Theory and Practice,* 38(1), 37-59. https://doi.org/10.3326/fintp.38.1.2

Toksoy, T. (2024). Makroekonomik göstergelerin takipteki banka kredileri üzerindeki etkisi: Avrupa bölgesi ülkeleri için ampirik bir inceleme. *Scientific Journal of Innovation and Social Sciences Research,* 4(2), 130-140.

Tölö, E., Jokivuolle, E., & Viren, M. (2021). Have too-big-to-fail expectations diminished? Evidence from the European overnight interbank market. *Journal of Financial Services Research,* 60, 25-54. https://doi.org/10.1007/s10693-021-00351-2

Us, V. (2020). A panel VAR approach on analyzing non-performing loans in the Turkish banking sector. 14(1), Journal of BRSA Banking and Financial Markets,1-38. https://doi.org/10.46520/bddkdergisi.789935

Vardar, G., & Özgüler, İ.C. (2015). Short term and long term linkages among nonperforming loans, macroeconomic and bank specific factors: An empirical analysis for Turkey. *Ege Academic Review,* 15 (3), 313-325.

Wang, K. (2019). Comparative analysis of business management of Chinese and foreign commercial banks—Based on the perspective of non-performing loans of commercial banks. *Modern Economy,* 10, 108-119. https://doi.org/10.4236/me.2019.101008

Žunić, A., Kozarić, K., & Dželihodžić, E.Z. (2021). Non-performing loan determinants and impact of COVID-19: Case of Bosnia and Herzegovina. *Journal of Central Banking Theory and Practice,* 3, 5-22. https://doi.org/10.2478/jcbtp-2021-0021