



**THE REPUBLIC OF TÜRKİYE
SOCIAL SCIENCES UNIVERSITY OF ANKARA
INSTITUTE FOR ISLAMIC STUDIES**

**FINANCIAL STABILITY AND CREDIT RISK MANAGEMENT OF TURKISH
PARTICIPATION BANKS**

Master's Thesis

İnan GİDİŞ

Islamic Economics and Finance Department

November 2023



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ACCEPTANCE AND APPROVAL PAGE



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ABSTRACT

Recently, the field of Islamic finance has experienced significant developments both in Türkiye and globally. Islamic banks as know participation banks (PBs) in Türkiye, operating in accordance with Islamic law and ethical principles, offer a unique financial landscape distinct from conventional banks (CBs). However, the distinctive nature of PBs and the industry norms they follow require tailored approaches for assessing their financial health.

This thesis aims to assess the financial stability and credit risk profiles of PBs in Türkiye while making a comparative analysis with CBs. To achieve this, the study incorporates the Non-Performing Loans (NPL) ratio as a supplementary measure to the Emerging Market (EM) Score model. The EM Score is a modified version of Altman's Z-Score model. The original Z-Score and its developed versions are widely used methods for predicting the financial stability and bankruptcy probability of companies, including banks. Combining the EM Score with the NPL ratio allows for a more comprehensive evaluation of financial stability and a deeper understanding of the banks' risk profiles.

The research methodology involves the collection and analysis of financial data from the banking sector, with a focus on six primary PBs in Türkiye: Kuveyt Türk, Albaraka Türk, Türkiye Finans, Ziraat, Vakıf, and Türkiye Emlak. These banks serve as Islamic banking models alongside other types of banks. The relevant financial data is sourced from the official websites of the Participant Banks Association of Turkey (TKBB) and the Banking Regulation and Supervision Agency (BRSA).

The results of this study are expected to contribute to more informed decision-making processes and assist in the development of effective risk management strategies within Turkish PBs, ultimately strengthening their financial stability and resilience. Moreover, comparing PBs and CBs will offer insights into specific areas where PBs may have a competitive advantage or face unique challenges in managing risk and ensuring financial stability. These findings are anticipated to be valuable for policymakers, regulators, and stakeholders in the Turkish banking sector.

Key terms: Altman Z-score, Bankruptcy, Credit risk, Emerging market, Non-performing loans

ÖZET

Son yıllarda, Şeriat kurallarına ve etik değerlere dayanan katılım finansı olarak da bilinen İslam finansı, sadece Türkiye'de değil küresel ölçekte önemli gelişmeler ve ilerlemeler kaydetmiştir. Katılım finansının en önemli parçası olan katılım bankaları özgün yapısı ve iş modelleriyle konvansiyonel bankalardan ayrılarak bireylere, işletmelere ve kurumlara cazip bir alternatif ve sürdürülebilir bir finansal araç olarak dikkatleri her geçen gün üzerine çekmeye devam etmektedir.

Finansal istikrar ve kredi riski yönetimi bankalar için oldukça önem arz etmektedir. Altman Z-Skor modeli, şirketlerin finansal istikrarını değerlendirmek için en yaygın kullanılan bir araçtır. Bu çalışmada Türkiye'de fiziki teşkilatlanmaya sahip katılım bankası olarak faaliyet gösteren; Kuveyt Türk, Albaraka Türk, Türkiye Finans, Ziraat, Vakıf ve Türkiye Emlak katılım bankalarının iflas profillerini analiz etmek için Altman Z-Score modelinin gelişmekte olan pazarlar için geliştirilen Emerging Market (EM) Score metoduyla, kredi riskini ve yönetimini değerlendirmek için Takipteki Krediler Oranı (NPL) uygulanarak, daha bütüncül ve destekleyici bir bakış açısı elde edilmeye çalışılmıştır. Bu iki model karşılaştırmalı olarak katılım bankaları ile mevduat bankalarına da uygulanmıştır. Karşılaştırmalı analizdeki amaç daha kapsamlı bir çalışma yürütmek ve katılım bankalarının rekabet avantajına sahip olabileceği veya finansal istikrarını ve risk yönetimini sağlamak adına kendilerine mahsus olabilecek zorlukları ve noktaları görmelerini sağlamaktır. Gerekli finansal veriler Türkiye Katılım Bankaları Birliği (TKBB) ve Bankacılık Düzenleme ve Denetleme Kurumu (BDDK) resmi sitelerindeki verilerden ve raporlardan elde edilmiştir.

Son olarak, söz konusu iki model arasındaki ilişki incelenmiş bankacılık sektörü açısından finansal istikrarın daha iyi anlaşılması hedeflenmiştir. Deneysel nitelikteki bu çalışma, banka yatırımcıları, banka paydaşları ve politika yapıcılar için önem arz etmekle beraber literatüre değerli katkılar sunmaktadır.

Anahtar kelimeler: Altman Z-skor, Finansal istikrar, Katılım bankası, Kredi riski, Takipteki alacaklar

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LIST OF ABBREVIATIONS

AAOIFI	: Accounting and Auditing Organization for Islamic Financial Institutions
ASEAN	: Association of Southeast Asian Nations
BPRS	: Islamic Rural Banks
BRSA	: Banking Regulation and Supervision Agency
BOPO	: Operating Expense to Operating Income Ratio
CAR	: Capital Adequacy Ratio
CB	: Conventional Bank
CSR	: Corporate Social Responsibility
CMB	: Capital Markets Board of Türkiye
DFL	: Debt-To-Equity Ratio
EM	: Emerging Market
EMS	: Emerging Market System
FBI	: Fee-based Income
FX	: Foreign Exchange
FDR	: Financing Deposit Ratio
GCC	: Gulf Cooperation Council
GDP	: Gross Domestic Product
IDB	: The Islamic Development Bank
IFI	: Islamic Financial Institution

IFRS	: International Financial Reporting Standards
LATD	: Loan-to-Asset
LDR	: Loan-to-Deposit Ratio
LLP	: Loan Loss Provision
LLPCR	: Loan Loss Provision Coverage Ratio
LOTA	: Loan-to-Assets Ratio
MDA	: Multiple Discriminant Analysis
MENA	: Middle East and North Africa
MÜİSEF	: Institute of Islamic Economics and Finance
NBFI	: Non-Bank Financial Institutions
NIM	: Net Interest Margin
NPA	: Non-Performing Asset
NPF	: Non-Performing Finance
NPI	: Non-Performing Investment
NPL	: Non-Performing Loan
NOM	: Non-Operating Income Margin
ÖFK	: Special Financial Institutions
PB	: Participation Bank
PCB	: Private Commercial Bank
PLA	: Provision for Loan Assets

PLD	: Provision Loan Decrease
PLS	: Profit and Loss Sharing
PPL	: Provision for Possible Losses
REIT	: Real Estate Investment Trusts
ROA	: Return on Assets
ROE	: Return on Equity
SDIF	: Savings Deposit Insurance Fund
SEDDK	: Insurance and Private Pension Regulatory and Supervisory Authority
SRCB	: Syariah Rural Credit Banks
SME	: Small and Medium-Sized Enterprises
TKBB	: Participant Banks Association of Türkiye
TSB	: Insurance Association of Türkiye
UAE	: United Arab Emirates

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CHAPTER 1: INTRODUCTION

The financial sector plays a crucial role in the broader finance industry. Within this sector, banks perform a range of essential functions. They engage in financial intermediation, promote savings, facilitate national and international trade for businesses and individuals, finance projects that significantly contribute to the economy, and provide liquidity to depositors and lending institutions. However, during times of financial crisis, banks often find themselves at the epicenter of such crises due to their numerous responsibilities (Hasman & Samartín, 2023). Therefore, the strength and stability of banks become crucial for maintaining and fostering the economic growth of any country.

The banking industry has undergone significant changes, crises, and developments in recent years. These financial crises have heightened the demand for alternative financial systems, and the importance of financial stability has become paramount for the resilience of financial institutions. This discussion brings our attention to a specific area of growing prominence, which is Islamic finance (Routledge, 2023). Islamic banks (IBs), also known as participation banks (PBs) in Türkiye, are the most crucial instruments within the realm of Islamic finance. They play a central role in facilitating financial activities under Islamic law, which prohibits interest-based transactions and promotes ethical financial practices, including profit and loss sharing. Their unique characteristics and adherence to these principles set them apart from conventional counterparts, offering an appealing alternative financial system for economies.

Financial stability refers to the condition where a financial system, including banks and other financial institutions, is resilient and able to withstand shocks and disruptions while efficiently performing its functions. It involves maintaining the soundness, strength, and smooth functioning of the financial system, thereby fostering economic growth, and minimizing the risk of financial crises (Alam, Hussain, & Saqib, 2023).

On the other hand, credit risk pertains to the potential loss faced by banks due to borrowers' failure to fulfill their repayment obligations. It encompasses the risk of non-payment or delayed

payment of interest or principal on loans and credit instruments (Dell'Atti, Tommaso, & Pacelli, 2023).

Given the unique characteristics of PBs and the evolving dynamics of the financial landscape, it is essential to assess the financial stability of Turkish PBs to gauge their resilience and ability to navigate potential challenges. Moreover, mitigating credit risk is essential for PBs to protect their depositors, maintain liquidity, and foster stability in the Islamic finance industry, ultimately contributing to the financial stability of economies.

In this study, I will utilize the Emerging Market (EM) Score model to measure the financial stability of Turkish participation banks. The EM Score is a developed version of the Altman Z-Score model that is widely used by scholars and researchers to assess the performance of companies and predict their financial distress, including banks. Furthermore, I will employ the Non-Performing Loan (NPL) Ratio as a proxy for evaluating the credit risk portfolio of Turkish PBs. Additionally, I will conduct a comparative analysis of PBs and CBs by using both sector average data. This thesis aims to investigate the financial health and stability of Turkish PBs while contributing to a broader understanding of the banking industry.

1.1 Research Objectives and Research Questions

This study focuses on analyzing the financial stability and credit risk of Turkish PBs with the following specific objectives:

- ✓ Measure the financial stability of Turkish PBs and compare it with their CBs counterparts.
- ✓ Evaluate the credit risk of Turkish PBs in comparison to CBs.
- ✓ Investigate the correlation between the financial stability and credit risk of Turkish PBs and CBs.

To address these objectives, the research will address the following key questions:

- ✓ How does the financial stability of Turkish PBs compare to those of CBs?

- ✓ How does the credit risk indicator for Turkish PBs change over time, and what differences exist in the credit risk between PBs and CBs?
- ✓ Is there any relationship between financial stability and credit risk indicators in Turkish PBs and CBs?

1.2 Significance of Study

Understanding the financial stability and credit risk of Turkish PBs and comparison of PBs and CBs hold significant importance for various stakeholders. Firstly, PBs themselves can benefit from a comprehensive analysis of their financial stability indicators and examine their NPL ratio to establish better credit risk management practices.

Furthermore, the research outcomes can guide regulatory initiatives aimed at maintaining a healthy banking environment and mitigating systemic risks. Hence, policymakers and regulators can utilize the findings of this study to develop targeted regulations and policies.

Lastly, it can contribute to the existing knowledge by expanding the literature on the banking sector and providing empirical evidence in the context of Turkish PBs and CBs. Therefore, the academic community and researchers in the field of banking and finance can benefit from this study for further research and exploration of financial stability and credit risk soundness in the banking sector.

1.3 Structure of the Thesis

This thesis consists of six chapters. The introduction chapter provides the necessary context, including the problem statement, research objectives, questions, and significance of the study. It also outlines the thesis structure.

The second chapter explores the outlook of participation banking, discussing the developments of Islamic banking globally and within Türkiye. It covers the definition of financial

stability and credit risk in terms of the banking sector. It also delves into the literature review, evaluating previous similar studies and presenting their findings.

The third chapter discusses the methodology, explaining the research approach, the EM Score method, the NPL ratio, the scope of the study, and the data.

The fourth chapter presents the findings and results of the models.

The fifth chapter covers the interpretation of the results and, a comparison of the study with previous research. It also presents the implications and limitations of the study.

The conclusion chapter summarizes the study, provides policy recommendations, and suggests directions for future research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Today, Islamic finance stands as one of the fastest-growing sectors in the global financial industry, with its financial institutions, models, and services. Within a few years, it has rapidly grown from a niche industry to a globally recognized and important sector (Refinitiv, 2023). According to S&P Global Ratings (2023), despite a forecasted economic slowdown, the global Islamic finance industry is expected to grow by around 10% in 2023-2024, after expanding by a similar number in 2022. Hasan et al. (2020) highlighted that the developments in the field of Islamic finance enable Muslims to engage in savings and investments while adhering to their religious and ethical beliefs and obtaining financing. The industry's growing popularity goes beyond its initial purpose. Islamic finance now serves as a viable alternative to the conventional financial system, providing an appealing option for everyone.

Islamic financial institutions (IFIs), although initially developed to meet the needs of Muslims, have seen substantial growth and expansion (Farahani & Dastan, 2013). The industry's appeal is partly due to the principles that govern it, and it is gradually gaining recognition in non-Muslim countries as well.

Hussain et al. (2016) state that in alignment with Islamic principles, IFIs encompass several prohibitions, which include:

- ✓ Interest (Riba) is forbidden. Islamic finance opts for profit and loss sharing (PLS) methods, like mudarabah and musharakah, where both lender and borrower share project profits and losses.
- ✓ Transactions with excessive uncertainty or risk (Gharar) are prohibited. Islamic finance mandates contracts based on tangible assets and shared risk.
- ✓ Gambling or speculation (Maisir) is not allowed, resulting in the exclusion of derivatives and speculative financial instruments.

- ✓ Financing activities deemed haram, such as alcohol, pork, tobacco, and businesses that promote unethical behaviors, is prohibited. Instead, Islamic finance focuses on investing in halal, socially beneficial activities.

Moreover, other rules include the requirement that the subject of the transaction should not be harmful or damaging, contract freedom, consideration of public interest, prohibition of price control and manipulation, provision of accurate and equal information, fair pricing, fostering brotherhood, and so on. All these principles, prohibitions, and rules are derived from the two main sources of Islam, the Holy Quran, and Hadiths.

Growing in popularity, Islamic banking currently constitutes about 70% of the entire Islamic finance industry, primarily encompassing a larger share of deposits and financing instruments. Another area of activity in this market is the Islamic Capital Market, which includes funds, equity, real estate investment trusts (REITs), investment funds, venture capital, structured capital, and Sukuk. Sukuk, also known as Islamic bonds, are financial instruments that comply with Islamic principles and are used to raise capital in a Sharia-compliant manner (Refinitiv, 2023). Unlike conventional bonds that represent debt obligations and generate interest payments, sukuk represents ownership in underlying assets, businesses, or projects. The structure of sukuk allows investors to earn returns from the underlying assets or projects instead of receiving interest. The total share of the Islamic capital market in the sector is approximately 25%. Sukuk itself represents nearly 95% of this share (TKBB, 2023). The two relatively smaller areas are the Commodity Market which includes the trading of physical goods or raw materials, metals, and energy resources with Islamic finance instruments like the commodity Murabaha, and the Takaful which is a type of insurance within Islamic principles. In recent times, in addition to these services, some Islamic Wealth Planning services have also emerged.

Due to its reliance on various principles and rules that differentiate it from the traditional finance and banking system, the sector has developed many specialized financing instruments, including commercial and investment banks, asset management, insurance, and leasing companies. Although it presents itself with different variations and applications, some of the main instruments include Murabaha, Mudarabah, Musharakah, Ijarah, Tawarruq, Wakalah, Takaful, Istisna, Salam, Sukuk, and Karz Hasan.

2.2 Background of Islamic Finance

In the past century, CBs, despite engaging in activities that are not compliant with Islamic law, have been prevalent in Muslim countries and societies. However, the emergence of IFIs also occurred during this time. This establishment began with the Farmers' Credit Union in Pakistan during the late 1950s, followed by the founding of the Mit Ghamr Savings Bank and the Nasser Social Bank in Egypt in 1963 (Maali & Napier, 2010). It is more accurate to assert that the Islamic Development Bank, established in Jeddah and commencing operations in 1975, can be considered the first interest-free bank, as initial institutions primarily function as social assistance organizations (Özal, 2022).

Although Islamic economics and finance initially concentrated in the Middle East, particularly in Bahrain, and Southeast Asia, especially in Malaysia, they have continually evolved and expanded their reach. Developing economies such as Iran and Sudan, where the entire financial sector is predominantly Islamic, as well as Indonesia, Malaysia, Pakistan, the United Arab Emirates (UAE), and Türkiye, where Islamic and traditional financial systems coexist, have become important parts of this market. However, IFIs operate in nearly 75 countries globally, not limited to countries with a majority Muslim population, but also continuing to expand in Western countries (Emek, 2021). Notably, in developed economies like the United Kingdom, and the United States, major CBs have established Islamic finance windows within their operations (Ali, 2023). This global expansion of Islamic finance underscores its growing importance and its ability to transcend geographical and cultural boundaries.

Türkiye's involvement in interest-free finance and banking began in 1974 with becoming a founding member of the Islamic Development Bank. The provision of participation banking services was officially decided by the Council of Ministers through Decree Law No. 83/7506 on December 16, 1983. This decree referred to the establishment of "Özel Finans Kurumları (ÖFK)" to provide services in this field (Erdoğan, 2019).

Albaraka Türk Special Finance Institution, which was operating in Gulf countries at that time, was the first institution established in Türkiye in 1984. It was followed by Faisal Finance Institution in 1985 and Kuveyt Türk Special Finance Institution in 1989. Anadolu Special Finance Institution, established with domestic capital in 1991, became the first domestic institution.

However, Ihlas Finance Institution, established in 1995, had its license revoked by the Banking Regulation and Supervision Agency (BRSA) in 2001 due to management and operational problems leading to the termination of its activities (Tenekeci, 2017). It left a negative impression on the sector (Elbadri & Bektaş, 2017). Asya Special Finance Institution was established in 1996 but had its management transferred to the Savings Deposit Insurance Fund (SDIF) in 2015. Subsequently, its activities were suspended by the BRSA in 2016, making it the second PB whose operations were terminated. In 1999, Special Finance Institutions were included in the Banking Law No. 4389. In 2005, with the enactment of Banking Law No. 5411, the institutions in the sector were rebranded as "Participation Bank," and the Special Finance Institutions Association changed its name to the Participation Banks Association of Türkiye (TKBB). In the same year, Anadolu Finans and Family Finans merged to form Türkiye Finans PB. Regarding public banks, Ziraat and Vakıf PBs were established in 2015, and Türkiye Emlak PB was established in 2019. In 2018, the 'Advisory Board of TKBB' was established within the TKBB organization through a decision made by the TKBB on 02.05.2018, in alignment with the decision of the BRSA dated 22.02.2018 and numbered 7736 (TKBB, 2023). The Advisory Board is the central and independent board established under the association. The advisory board consists of two main bodies which are the Secretariat of the Advisory Board of TKBB and the Secretariat of the Advisory Board of TKBB. It plays a role in shaping policies, strategies, and initiatives within the Turkish banking industry. It aims to promote collaboration and address common challenges faced by banks, contributing to the overall stability and development of the banking sector in Türkiye. Decisions made by this board are binding for all Islamic financial institutions (Çınar, 2021). The advisory board also publishes standards, and as of now, they have issued five standards. These standards pertain to equity issuance and trading, tawarruq, murabaha, kafalah, and mudaraba (TKBB, 2023).

2.3 Islamic Banking Developments

This section aims to shed light on the recent domestic and global developments and advancements in participation banking.

2.3.1 Recent Developments in Türkiye

Türkiye, a country with a rich Islamic heritage and a predominantly Muslim population, has been a hub for significant Islamic developments in recent years. These developments encompass a wide range of areas, including Islamic finance, education, culture, and social practices (Kaplan, 2023).

The Turkish participation banking sector has experienced substantial growth in recent years, playing a pivotal role in the country's financial system. As of 2023, there are six PBs which has physical branches and operate in Türkiye. These are: Kuveyt Türk, Türkiye Finans, Albaraka Türk, Ziraat, Vakıf, and Türkiye Emlak PBs. Moreover, "Regulation on the Operation Principles of Digital Banks and Service Model Banking" was published by the BRSA in December 2021 (BRSA, 2023). With this regulation, Hayat, Kasa, and T.O.M PBs obtained operating licenses "Crowdfunding Regulation (III-35/A.2)" which encompasses debt-based and equity-based crowdfunding. Currently, a total of eight companies have obtained crowdfunding licenses from the Capital Markets Board of Türkiye (CMB) (TKBB, 2023).

According to the report of TKBB (2023), the share of the total assets of the PBs in Türkiye within the banking sector was recorded as 2.4 % in 2005, 8.1 % in 2022, and it has reached 8.6 % by the end of August 2023.

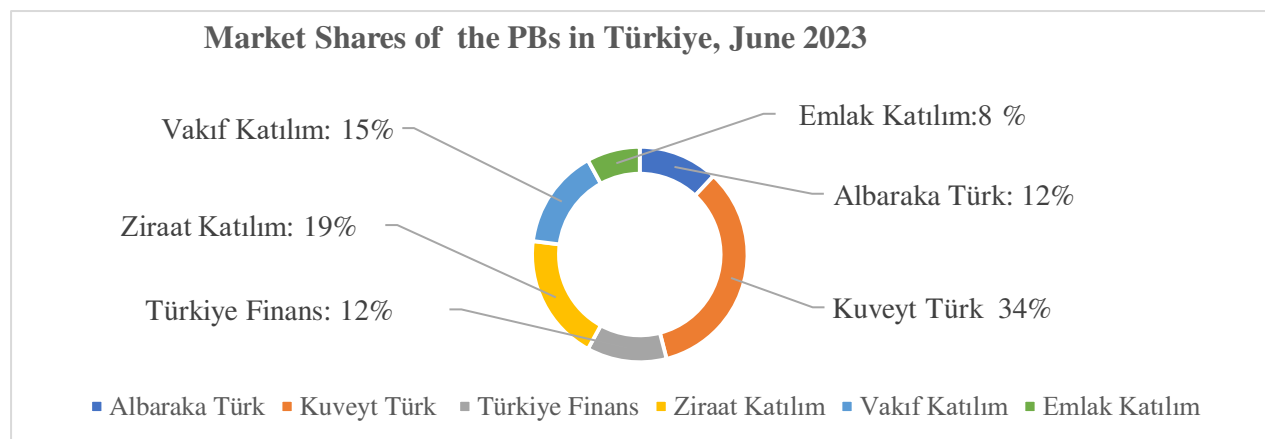


Figure 2.1 Market shares of the PBs in Türkiye, June 2023 (%).

Source: TKBB Financial Reports Archive, created by the author using data obtained on Oct 2023, from <https://tkbb.org.tr/veri/bilancoarsiv>

Figure 2.1 shows the market shares of PBs by the end of June 2023. Kuveyt Türk PB holds the largest market share with 34%, followed by state-owned PB Ziraat Katılım with 19%. Vakıf Katılım, as a second state-owned PB, has got 15 %. Albaraka Türk and Türkiye Finans PBs both have 12 %. Türkiye Emlak PB is the last and youngest state-owned company and holds 8 % of the whole market (TKBB, 2023).

Table 2.1 Financial size of the PBs and the CBs in the banking sector, June 2023 (%)

Financial Titles	PBs		CBs	
	2022	2023/June	2022	2023/June
Collected Funds	10.1 %	10.0 %	89.9 %	90.0 %
Disbursed Funds	8.2 %	8.5 %	85.4 %	84.9 %
Total Assets	8.3 %	8.5 %	86.0 %	85.9 %
Equity	6.0 %	6.6 %	87.2 %	86.6 %
Net Profit	6.9 %	9.2 %	88.0 %	84.0 %
Number of Employees	8.7 %	9.1 %	88.6 %	88.0 %
Number of Branches	12.5 %	12.8 %	86.9 %	86.6 %

Source: Prepared by the author based on the Banking Regulation and Supervision Agency (BRSA) reports accessed October 12, 2023, from <https://www.bddk.org.tr/BultenAylık/tr/Home/Gelismis>.

Table 2.1 shows the financial size of Turkish PBs and CBs in the banking sector as of June 2023, with a comparison to the previous year's data. These percentage changes show that PBs had an increase in their financial size in June 2023 compared to the previous year, while CBs had a decrease in most categories except for collected funds which increased by 0.1 %. Even PBs are smaller in size compared to CBs in terms of collected funds, disbursed funds, total assets, equity, net profit, number of employees, and number of branches, the data highlights the robust performance and growth of PBs in those variables, reinforcing their significance in the financial industry.

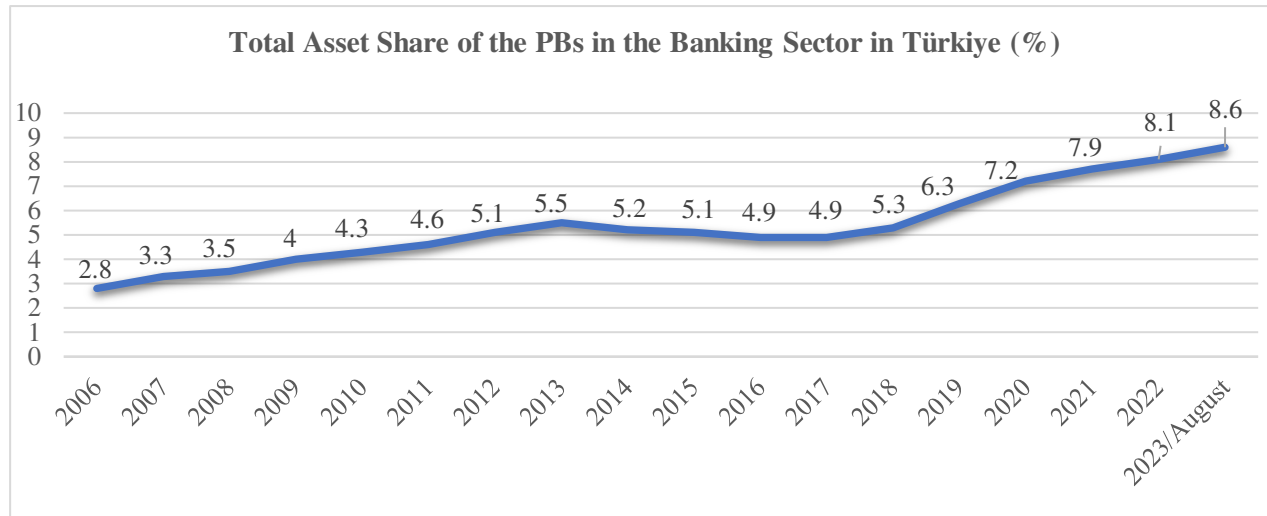


Figure 2.2. Total asset share of the PBs in the banking sector in Türkiye, August 2023 (%)

Source: Prepared by the author using data obtained on October 12, 2023, from the BRSA website: <https://www.bddk.org.tr/BultenAylık/tr/Home/Gelismis>.

Examining the 15-year graph in Figure 2.2, participation banking has experienced consistent growth in its asset size. Despite the global financial crises in 2008-2009, PBs have managed to sustain their growth and expand their market share within the sector. The reduction observed in 2016 was primarily caused by the revocation of Bank Asya's operating license by the BRSA. Additionally, global rating agencies such as S&P and Moody's downgraded Türkiye's credit rating during the same period, resulting in reduced global capital investments and higher borrowing costs from international sources (Arslan, 2020). Despite these unfavorable circumstances, the participation banking sector has demonstrated resilience and continued to grow even amidst the challenging conditions of the global COVID-19 pandemic (Delice & Karadaş, 2022)

Sukuk, also known as Islamic bonds, is an Islamic financial instrument that complies with Shariah principles. They have gained popularity in Islamic finance for funding projects and investments. Sukuk structures can vary, but the most common is based on the concept of real asset ownership. Sukuk holders receive a share of the profits generated by the underlying assets or investments (Askari, 2023). It has been mostly used by PBs. Therefore, I will give recent developments and the growth rate of this instrument.

The issuance of sukuk in Türkiye has witnessed a significant increase in line with the growth of participation banking. The first regulation regarding sukuk was introduced by the CMB on April 1, 2010, through its announcement numbered III No: 43. Subsequently, in 2013, a more comprehensive regulation was issued, allowing for the issuance of sukuk based on construction contracts, murabaha, musharakah, and mudarabah. Kuveyt Türk PB conducted the first corporate Sukuk issuance in 2010, amounting to 100 million US dollars with a maturity of three years. This issuance received a significant level of demand. Following that, the same bank successfully issued a second sukuk worth 350 million US dollars with a maturity of five years, which started trading on the London Stock Exchange. In 2012, the Treasury Ministry initiated its first Sukuk issuance valued at 1.5 billion US dollars with a maturity of two years. This issuance garnered substantial interest and demand in the global markets. Furthermore, starting in 2017, sukuk based on gold mines were introduced in Türkiye, expanding the scope of sukuk offerings. Over the years, PBs have collectively issued sukuk worth a total of approximately 356 billion Turkish lira, 4.5 billion US dollars, and 2 billion Malaysian ringgit (TKBB, 2023).

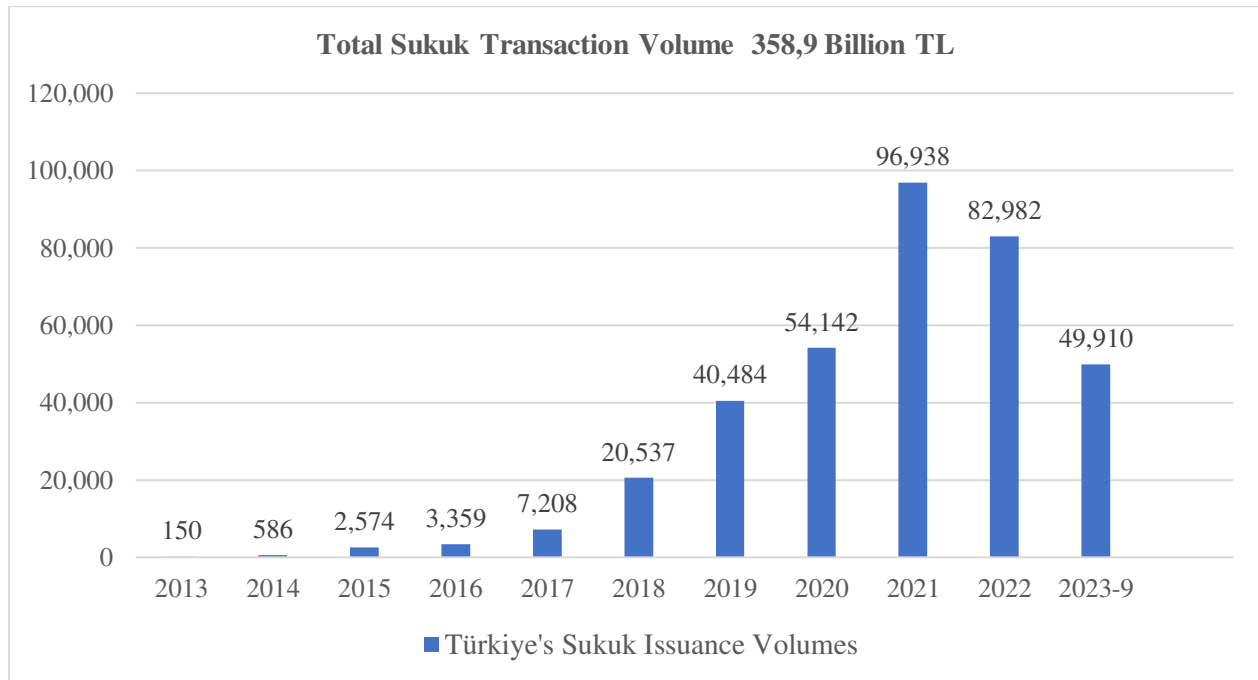


Figure 2.3 Development of sukuk issuance volumes in Türkiye over the years (million TL).

Source: TKBB Participation Banks Sukuk Size, accessed from the TKBB official website on October 12, 2023, <https://veripetegi.tkbb.org.tr>

In the year 2022, the value of sukuk issuances by PBs amounted to 82.982 million TL. This amount shows a decrease of 14% compared to the previous year. As of the end of September 2023, this figure is observed to be 49.910 million TL (TKBB, 2023).

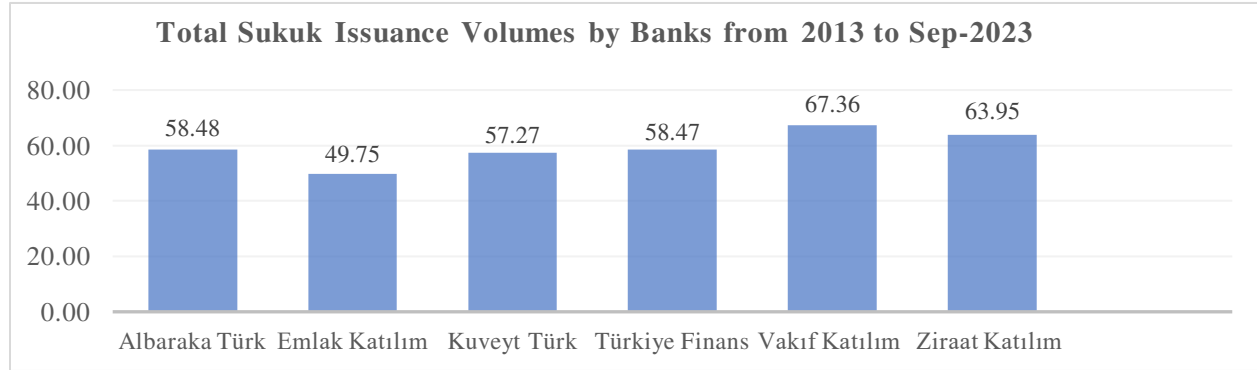


Figure 2.4. Total Sukuk issuance volumes by banks from 2013 to Sep-2023 (million TL)

Source: TKBB Participation Banks Sukuk Size, accessed from the TKBB official website on October 12, 2023, <https://veripetegi.tkbb.org.tr>

Figure 2.4 illustrates that Emlak Katılım PB, being a newcomer in the sector, had a relatively lower sukuk volume compared to others. On the other hand, the other two public banks, Vakıf Katılım and Ziraat Katılım PBs achieved significant volumes over private PBs. This serves as a clear indication of the government's support for the sector.

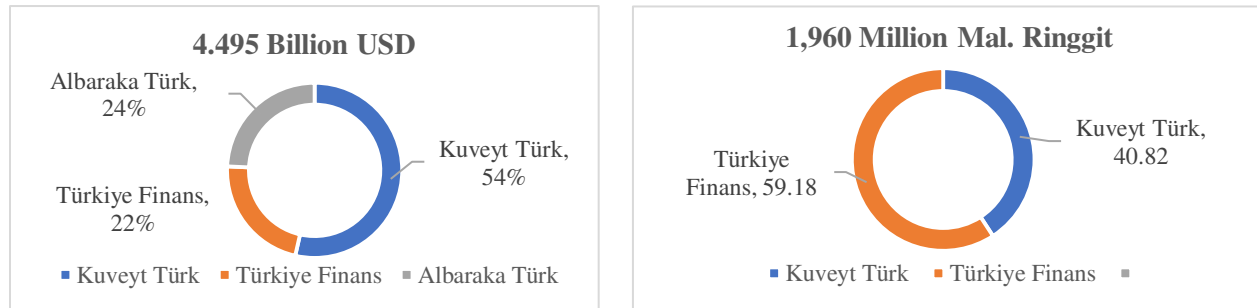


Figure 2.5 Development of Sukuk issuance volumes in Türkiye over the years (million TL).

Source: TKBB Participation Banks Sukuk Size, accessed from the TKBB official website on October 12, 2023, <https://veripetegi.tkbb.org.tr>

As observed in Figure 2.5, the foreign currency-denominated sukuk issuances in our country have been carried out by three private enterprises so far.

2.3.2 Recent Developments in Global Scale

The conventional finance and banking sector in countries with a significant Muslim population began to be questioned in the 1950s, and concrete steps and developments have been made since the 1970s. The Accounting and Auditing Organizations for Islamic Financial Institutions (AAOIFI) was established in 1991 and is based in Bahrain as one of the organizations that would pioneer and provide effective support to this growing and developing sector through legal regulations (AAOIFI, 2023). Islamic finance, particularly during the 2008 economic crisis, drew significant attention by continuing to grow and develop despite the crisis, unlike traditional banks, and it continues its operations without slowing down in different countries and regions. Currently, the digitalization and technology-driven advancements accelerated by the COVID-19 pandemic have been seen and used effectively in the Islamic banking sector as well (TKBB, 2020). Despite the challenging circumstances imposed by the COVID-19 pandemic, IBs have effectively implemented financing restructuring policies during the pandemic, thereby ensuring the stability of Islamic banking (Hamda & Sudarmawan, 2023).

In 2019, the total value of global Islamic banking assets, sukuk, Islamic funds, and takaful amounted to \$2.44 trillion. However, in 2020, despite global economic uncertainties and financial market challenges, this figure witnessed a growth of 10.7% and reached the level of \$2.70 trillion. Islamic finance, once again, attracted attention by demonstrating growth amidst worldwide economic uncertainties and financial market problems (TKBB, 2020).

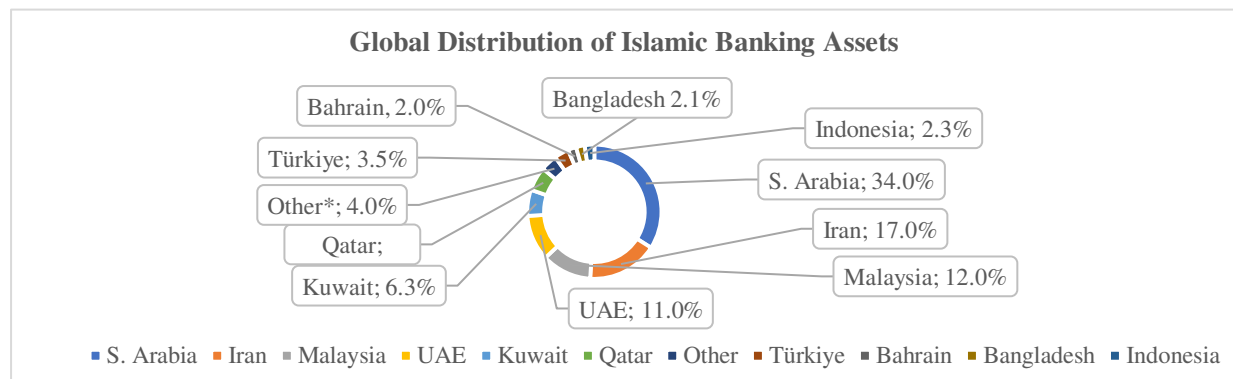
Table 2.2. Regional and sector distribution of global Islamic finance, 2022 (trillion USD)

Region	Banking	Sukuk	Islamic Funds	Takaful	Total	%
Gulf Countries	1342.9	356.6	24.1	16.7	1740.4	53.6%
Southeast Asia	307.2	411.4	32.8	6.0	757.4	23.3%
Middle East and South Asia	478.3	57.8	62.9	5.9	604.9	18.6%
Africa	49.6	2.9	1.9	0.8	55.2	1.7%
Others*	71.2	1.0	14.9	0.6	87.7	2.7%
Total	2249.2	829.7	136.6	30.0	3245.5	100 %
Share %	69.3 %	25.6 %	4.2%	0.9 %	100 %	

* Türkiye is included in the other region category.

Source: IFSB Stability Report 2023, obtained from the IFSB website on Oct 2023, https://www.ifsb.org/press_full.php?id=570&submit=moreb

According to Table 2.2, the total value of global Islamic banking assets amounted to \$3.25 trillion by the end of 2022. the Gulf countries, with a 53.6 % share, held the highest portion of the global Islamic finance sector. Southeast Asia followed with a 23.3% share, and the Middle East and South Asia accounted for 18,6 % of the market. In terms of specific areas, banking assets constituted the largest share with 69.3%, while sukuk accounted for 25.6% of the market (Refinitiv, 2023).

**Figure 2.6.** Global distribution of Islamic banking assets by country, 2022 (billion USD)

* Countries with a share of 2% or less are classified under the "Other" category.

Source: Islamic Financial Services Industry Stability Report 2023, created by the author with data obtained from the Islamic Financial Services Board website on October 13, 2023, https://www.ifsb.org/press_full.php?id=570&submit=moreb

According to figure 2.6, Saudi Arabia holds the highest share in global Islamic banking assets with 34%, followed by Iran with 17%, Malaysia with 12%, and UAE with 11%. Türkiye, on the other hand, ranked 7th in the global Islamic banking assets rankings with a share of 3,5 % as of the end of 2022.

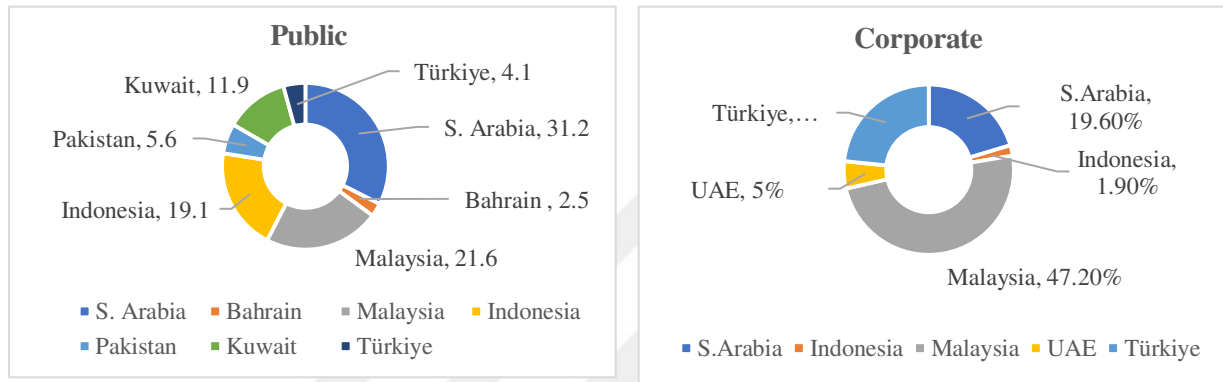


Figure 2.7. Public and corporate Sukuk issuance values of selected countries, 2022 (billion USD)

Source: Islamic Financial Services Industry Stability Report 2023, created by the author with data obtained from the Islamic Financial Services Board website on October 13, 2023, https://www.ifsb.org/press_full.php?id=570&submit=moreb

According to the Islamic Financial Services Industry Stability Report 2023 (Refinitiv, 2023), Saudi Arabia holds the top position in total sukuk issuance as well with a share of 31.2 %, while the combined share of Malaysia, Indonesia, Kuwait, Pakistan Türkiye, and Bahrain accounted for 64.8 % of the sukuk issuance values.

Public sector sukuk issuances have consistently played an active role in the market and attracted attention as the largest segment with stable growth. Based on the global sukuk data for 2020, Türkiye ranked sixth in terms of public sector sukuk issuance and second in terms of corporate sukuk issuance.

Recently, the Islamic Development Bank (IDB), of which Türkiye is a member, issued lease certificates backed by its net asset value and has obtained an "AAA" credit rating from credit rating agencies (ISDB, 2022). These certificates also have a significant impact on investments from traditional investors.

2.4 Conceptual Framework of Financial Stability and Credit Risk Management in Islamic Banks

2.4.1 Financial Stability for IBs

Financial stability refers to the state of a financial system where it can efficiently perform its functions and withstand external shocks without any disruptions. In the context of the banking industry, financial stability is of utmost importance as it ensures the smooth functioning of financial institutions, maintains public confidence, and supports sustainable economic growth. When the financial system is stable, it facilitates the allocation of funds, promotes investment, and enables efficient risk management (Washeka, Anjom, & Faruq, 2023).

Financial instability can have severe implications for the economy, including systematic risks, bank failures, and economic downturns. Systematic risks arise when disruptions in the financial system have far-reaching consequences that can spread across institutions and markets. Bank failures can have detrimental effects on depositors, investors, and the overall economy. Economic downturns, such as recessions or financial crises, can result from financial instability, leading to reduced economic activity, unemployment, and negative impacts on individuals and businesses (The World Bank, 2023). Therefore, financial stability is critically important for any kind of bank, including PBs.

To assess financial stability, various indicators and measures have been used. These include capital adequacy ratios, which assess the adequacy of banks' capital buffers to absorb potential losses. Asset quality indicators evaluate the quality and performance of banks' loan portfolios. Liquidity ratios measure a bank's ability to meet short-term obligations. Profitability ratios assess the bank's ability to generate sustainable earnings. Solvency ratios examine the long-term viability and financial strength of banks (Schinasi, 2004). There are however some methods of mixing and using some of these financial ratios. Altman Z-Score model, which has been used in this thesis, is one of the most used examples of it.

While their adherence to Shariah principles and emphasis on ethical practices contribute to their stability, there are certain characteristics unique to Islamic banking, such as profit and loss

sharing and liquidity management challenges, that need to be effectively managed (Al-Binali, 2023).

IBs employ several strategies to enhance financial stability within their operations. Here are some common strategies taken by IBs (Radzi & Lonik, 2016):

- ✓ *Compliance with Islamic Principles:* Ensuring compliance with Sharia principles is vital for maintaining the integrity and stability of IBs. Therefore, Each IB has a Sharia Supervisory Board comprising Islamic scholars (muftis) who provide guidance and ensure that the bank's operations adhere to these principles. IBs use Sharia-compliant contracts to ensure compliance with these principles. Moreover, regulatory bodies and supervisory authorities play a significant role in overseeing and enforcing compliance with these principles.
- ✓ *Governance and Risk Management:* Effective governance and robust risk management practices are essential for financial stability in IBs. Setting a well-defined governance framework can ensure proper oversight, accountability, and transparency in decision-making processes. Additionally, strong risk management practices help identify, assess, and mitigate various risks, including credit risk, liquidity risk, market risk, and operational risk. A well-organized Shariah governance committee which is a necessary body for IBs can play a crucial role in ensuring compliance with Islamic principles and mitigating potential risks.
- ✓ *Asset Quality and Profitability:* The quality of assets is necessary for IBs, and it is a tical determinant of their financial stability. IBs need to ensure that the assets are high quality to minimize credit risk and potential losses. Furthermore, maintaining profitability is essential for the financial sustainability and stability of IBs, as it enables them to build capital buffers and absorb potential shocks.
- ✓ *Diversification of Portfolio:* IBs also prioritize the diversification of their financing portfolio. By extending financing to various sectors and industries, they reduce concentration risk and minimize the impact of downturns in specific sectors.

Diversification enhances stability by spreading risks across different segments of the economy.

- ✓ *Liquidity Management:* IBs face unique challenges in liquidity management. Some of these challenges result from a lack of interest-based borrowing and lending from other banks, dependency on profit-sharing investment accounts, asset-based financing focus, shari'ah compliance considerations, limited access to the interbank market, and the possibility of asset-liability mismatching (Warninda, 2022). Some strategies adhere to IBs to manage liquidity risk, such as Sukuk and engaging in Shariah-compliant interbank transactions, like Wakalah and Murabahah. They rely on asset-backed financing based on Shariah-compliant contracts, emphasizing risk-sharing over interest-based lending. In some jurisdictions, IBs have access to Shariah-compliant central bank facilities during liquidity stress. IBs may use these assets as collateral and implement Shariah-compliant cash management practices (Dolgun & Ng, 2019). Overall, there should be such facilities for IBs to maintain banks' obligations, respond to unexpected liquidity needs, and contribute to better financial stability (Sutrisno, Hakim, & Panuntun, 2023).
- ✓ *Transparency:* Transparency in financial reporting and communication builds trust and enhances stability by fostering confidence among stakeholders. IBs prioritize transparency in their operations as a necessity of Islamic principles.
- ✓ *Market Perception and Confidence:* The perception and confidence of stakeholders, including customers, investors, and regulators, play a significant role in maintaining financial stability for IBs. Building trust through transparent operations and effective communication fosters confidence in the integrity and stability of IBs. Therefore, providing clear and reliable information about the financial performance and risk profile of IBs enhances market perception and confidence.
- ✓ *Regulatory Compliance:* IBs adhere to relevant regulatory frameworks and standards. They comply with prudential regulations, capital adequacy requirements, and Shariah governance guidelines. Adhering to regulatory requirements ensures

sound and responsible financial practices, contributing to stability (Susanto & Walyoto, 2023).

By considering these principles and implementing appropriate strategies, IBs enhance their financial stability, mitigate risks, and contribute to the overall stability of the financial system.

On the other hand, according to the report of IMF (2017), Islamic banking needs strong financial safety networks that follow its principles and global best practices. Therefore, international guidance is necessary for creating resolution frameworks, specifying institutions, legal rules, creditor priorities, and cross-border issues. The establishment of an international standard for Islamic banking deposit insurance schemes is also necessary to solve deposit challenges, manage funds, and ensure resolution funding.

2.4.2 Credit Risk Management for IBs

Credit risk refers to the chance that the other party might not fulfill its obligations. Credit risk is one of the most significant risks faced by banks and requires dedicated attention due to its potential impact on financial stability (Salem, 2013). As debts make up over 70% of assets in banks' financial records, it's understandable that credit risk stands as the primary cause for banks facing financial collapse (Greuning & Bratanovic, 2020).

Unlike CBs that primarily rely on interest income, IBs share profits and losses with their customers. This means that they assume a greater degree of risk for themselves. To ensure the profitability and sustainability of their financing arrangements, IBs must employ effective risk assessment, monitoring, and control mechanisms (Zahra & Miranti, 2023). Following the discussion of general risks, the specific risks that are unique to IBs will be presented in this title. Then, the focus will be on credit risk. Moreover, credit risk identification, assessment techniques, mitigation strategies, and monitoring and control measures employed in Islamic banking will be discussed.

Type of Risk for Banking Industry

Banks face certain risks. These risks can either originate from internal factors or external factors. These risks can be classified as systemic, systematic, and nonsystematic risks. Systemic risk is different from systematic risk. Systemic risk is the risk that a specific event can cause a major shock to the system. An example of systemic risk is the 2008 financial crisis, which was caused by the collapse of the housing market and the mortgage industry (Allen & Carletti, 2013). In contrast, systematic risk refers to the possibility of a disruption or failure within a financial system that can have widespread and severe adverse effects on the overall economy (Nistor & Ongena, 2023). Price shocks, interest rate risks, inflation risks, and recessions are some examples of systematic risks, and they affect all market actors. Systemic and systematic risks extend beyond individual institutions.

On the other hand, non-systematic risks, also known as unsystematic risks or specific risks, are the kinds of risks that are specific to a particular company, industry, or asset and are not directly related to broader market or systemic factors. The non-systematic risks can be listed as management risk, operational risk, financial risk, reputational risk, etc. These risks are unique to the individual entity and can be mitigated through diversification (Oliver, 2015). Therefore, it can be prevented before they occur with the measures to be taken by companies, including banks and they can be reduced after they occur.

Banks need to identify, assess, and manage both systemic and nonsystematic risks effectively to maintain stability, protect their stakeholders, and ensure the overall health of the banking sector. Here are the main types of risks encountered in the banking sector (Kakaç, 2019):

- ✓ *Credit Risk:* Credit risk refers to the potential for borrowers to default on their loan obligations, causing financial loss to the bank as we mentioned above. Credit risk arises when a financial institution anticipates receiving a payment that has been mutually agreed upon with another party, but the obligors fail to fulfill their obligations, commonly known as default. Furthermore, credit risk is also triggered by changes or underestimations in the counterparty's rating.

- ✓ *Operational Risk:* Operational risk is the risk of loss resulting from inadequate or failed internal processes, people, and systems, or from external events. It includes risks associated with technology failures, fraud, human error, legal and regulatory compliance, and business disruptions. Fiduciary risk is also part of operational risk, where it emerges from the bank not fulfilling its contractual commitments.
- ✓ *Market Risk:* Market risk is the potential for financial loss due to adverse changes in market conditions. It includes risks arising from fluctuations in interest rates, foreign exchange rates, equity prices, commodity prices, and other market variables. Banks with trading activities are particularly exposed to market risk (Tzouvanas, 2023).
- ✓ *Liquidity Risk:* Liquidity risk is the risk of not being able to meet financial obligations as they become due without incurring excessive costs. It arises when a bank has insufficient liquid assets to fund its operations or faces difficulty in accessing funding sources.
- ✓ *Interest Rate Risk:* Interest rate risk is the potential for financial loss due to changes in interest rates. Banks, especially those with significant exposure to fixed-rate assets and liabilities, face interest rate risk. Changes in interest rates can affect the bank's net interest income, the value of its fixed-income securities, and the cost of funding.
- ✓ *Foreign Exchange Risk:* Foreign exchange risk arises from fluctuations in foreign currency exchange rates. Banks engaged in international operations or exposed to foreign currency transactions face this risk. Adverse movements in exchange rates can impact the bank's profits, balance sheet valuation, and cash flows.
- ✓ *Strategic Risk:* Strategic risk refers to the potential for financial loss resulting from inadequate business decisions, ineffective strategic planning, or failure to adapt to changing market conditions. It includes risks associated with entering new markets, mergers and acquisitions, product diversification, and competitive pressures.

- ✓ *Country Risk:* Country risk refers to the potential for financial loss due to adverse political, economic, or social events in a specific country or region. It includes risks associated with currency convertibility, government regulations, legal systems, and geopolitical instability.
- ✓ *Compliance and Regulatory Risk:* Compliance and regulatory risk relates to the potential for penalties, fines, reputational damage, and legal consequences arising from non-compliance with laws, regulations, and industry standards. Banks must comply with a wide range of regulations governing their operations, such as capital adequacy requirements, anti-money laundering laws, and consumer protection regulations.
- ✓ *Reputational Risk:* Reputational risk is the potential for negative public perception or loss of trust and confidence in the bank's integrity and business practices. It can arise from poor customer service, ethical misconduct, data breaches, or involvement in controversial activities (Syadali, Segaf, & Parmujianto, 2023).

Each of these risks requires effective risk management practices and mitigation strategies to ensure the stability and sustainability of the bank's operations (Washington Bankers Association, 2023).

Risks Specific to IBs

Although IBs include these all risks except for interest rate risk. However, some risks are specific to Islamic or PBs due to their unique operational and Sharia-compliant nature (Shah, Sukmana, & Fianto, 2021). These are:

- ✓ *Sharia Compliance Risk:* IBs must adhere to Sharia principles, which prohibit interest (Riba) and certain economic activities. Sharia compliance risk arises from non-compliance with these principles.

- ✓ *Profit-Sharing Investment Risk:* IBs engage in profit-sharing investment contracts (e.g., Mudarabah) with customers, where the bank shares profits and losses. The risk arises from potential losses in these investment activities.
- ✓ *Asset Quality Risk:* IBs must ensure that their assets are Sharia-compliant and of high quality as we mentioned before. The risk involves assessing the authenticity and value of the assets held.
- ✓ *Equity Investment Risk:* IBs often engage in equity-based investments (e.g., Musharakah and Sukuk). The risk lies in the volatility and potential losses associated with equity markets.
- ✓ *Commodity Price Risk:* IBs involved in commodity financing face price risk due to fluctuations in commodity prices, as they often engage in Murabahah (cost-plus financing) transactions.
- ✓ *Transparency risk:* Emerging from the lack of standardized accounting and reporting in Islamic banking.

Credit risk management is of utmost importance for IBs, as they engage in financing activities without charging interest (Riba) and rely heavily on profit-sharing and equity-based financing (Alkhawaja & Görmüş, 2019). By focusing on credit risk in this thesis, complexities of credit risk and specific challenges can be observed.

Credit Risk Management for IBs

Both CBs and IBs encounter credit risk and employ some common strategies to address it. Nevertheless, distinctions arise in their approaches due to the distinct focus of IBs. This focus includes activities like lending in Murabaha, leasing in Ijarah, taking on delivery or purchase commitments in Istisna and Salam, and investing based on business performance in Musharakah and Murabaha contracts (Khandelwal, 2008).

I mentioned earlier some strategies for ensuring financial stability. Within the boarder framework of these strategies, specific strategies are designed by IBs to manage credit risk and enhance the overall stability of their operations (Ahmed & Khan, 2007). These are:

- ✓ *Shariah Compliance:* IBs must ensure that their credit risk management practices comply with Shariah principles. This involves conducting thorough due diligence on the financing transactions to ensure they adhere to the principles of fairness, transparency, and ethical conduct. Shariah scholars and committees guide the permissibility and compliance of financing activities, ensuring that the credit risk management framework aligns with Islamic principles.
- ✓ *Risk Identification and Assessment:* IBs need to identify and assess credit risks associated with their financing activities. This involves evaluating the creditworthiness and financial strength of potential borrowers, as well as analyzing the risk characteristics of the financing contracts. IBs use various tools, such as financial statement analysis, cash flow projections, and risk scoring models, to assess the creditworthiness of customers seeking financing (Grassa, Moumen, & Hussainey, 2020).
- ✓ *Risk Mitigation Strategies:* IBs employ a range of risk mitigation strategies to manage credit risk. These strategies include collateralization, where assets are pledged as security for the financing, providing a form of risk protection in case of default (Aldoseri & Worthington, 2022). Qard diversification is also important, spreading credit exposure across different sectors and customers to reduce concentration risk. IBs may employ risk transfer mechanisms, such as Takaful (Islamic insurance), to manage credit risk. Takaful protects against potential losses arising from defaults or other credit-related risks. IBs can participate in Takaful schemes to mitigate their exposure to credit risk (Tapsir & Talib, 2012).
- ✓ *Profit and Loss Sharing:* IBs share profit and loss with their customers due to the absence of interest-based transactions. This unique feature introduces a different dimension to credit risk management. IBs need to assess the creditworthiness and

viability of financing projects or ventures, as they bear the risk of potential losses along with the customers (Malim, 2015).

- ✓ *Monitoring and Control:* IBs establish robust monitoring and control mechanisms to track the performance of financed projects and manage credit risk. Regular monitoring of customers' financial conditions, cash flows, and compliance with contractual obligations is essential. In case of any signs of financial distress or non-compliance, appropriate remedial actions are taken to mitigate credit risk. Additionally, strong internal controls, risk management committees, and reporting mechanisms support effective credit risk management (Islam & Barghouthi, 2017).
- ✓ *Regulatory and Supervisory Framework:* Regulatory and supervisory authorities play a significant role in establishing and enforcing the credit risk management framework for IBs. They set prudential standards, guidelines, and reporting requirements specific to Islamic finance to ensure the soundness and stability of the banking system. Regular assessments, audits, and inspections are conducted to monitor compliance and the effectiveness of credit risk management practices. One of the good examples of such regulatory and supervisory institutions is AAOIFI.

These strategies and measures help mitigate the potential impact of credit defaults and enhance the overall stability of the banks. IBs can effectively identify, assess, and manage the risks inherent in their operations (Akram & Rahman, 2018).

2.5 Previous Research Related to the Financial Stability of Banks

Previous research related to financial stability has been a critical area of study in economics and finance. Numerous studies have delved into various aspects of financial stability, including the identification of early warning indicators, the measurement and assessment of systemic risk, the impact of macroeconomic factors on financial stability, and the effectiveness of regulatory frameworks in ensuring stability, etc.

There have been many models developed to measure the financial stability or instability of companies. For the first time in 1966, Beaver tried to explore the predictive ability of financial ratios. He built discriminant models, which have five different ratios namely, cash flow to total debt, total debt to total assets, net income to total assets, working capital to total assets, and current ratio (Beaver, 1966). Then, the Z-score was applied first time in 1968 by Edward Altman to measure financial performance and predict the bankruptcy of firms. In his first study, he took a sample of 33 companies that are financially successful manufacturing companies that are also open to the public and 33 of the same companies that filed for bankruptcy (Altman E. I., 1968). Later the model was adjusted and modified several times by him and several other researchers. Altman et al. (1977) noticed the fact that model accuracy reaches about 94%, especially in a year before business failure and it is about 72% before two years. According to Chieng (2013), the Z-Score model has demonstrated its reliability as a predictor of Eurozone bank failures occurring within five years before bankruptcy. The study revealed that the Z-Score model successfully predicted the occurrence of all banking failures during the five years leading up to their eventual demise.

In their research Altman et al. (1977) the adjusted model divided the calculation of corporate bankruptcy into 3 model equations, those are:

1. If the company is a public firm, the following equation should be used:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + .999X5$$

X1: Net Working Capital / Total Assets

X2: Retained Earnings / Total Assets

X3: Earnings before Interest and Taxes (EBIT) / Total Assets

X4: Market Value of Equity / Total Liabilities

X5: Net Sales / Total Assets

Altman established reference intervals for evaluating the obtained Z-Score using the above equation as follows:

$Z > 2.99$ indicates financial success.

$1.8 < Z < 2.99$ indicates a grey zone.

$Z < 1.8$ indicates financial failure.

2. If the company is a private firm, the following equation will be used:

$$Z = 0.717 X1 + 0.847 X2 + 3.107 X3 + 0.420 X4 + 0.998 X5$$

X1: Net Working Capital / Total Assets

X2: Retained Earnings / Total Assets

X3: Earnings before Interest and Taxes (EBIT) / Total Assets

X4: Book Value of Equity / Total Liabilities

X5: Net Sales / Total Assets

With this new function, the coefficients have changed, and the effects of X1 and X4 ratios on the Z-Score value have decreased. Unlike the first function, the book value of equity is used instead of market value. The evaluation of the obtained Z-Score is similar to the previous model. However, the discriminant regions to consider have been changed as follows:

$Z' > 2.90$ indicates financial success.

$1.23 < Z' < 2.90$ represents the gray zone.

$Z' < 1.23$ indicates financial failure.

3. If the company is in the service sector, the following equation will be used:

$$Z = 6.56 X1 + 3.26 X2 + 6.72 X3 + 1.05 X4$$

X1: Net Working Capital / Total Assets

X2: Retained Earnings / Total Assets

X3: Earnings before Interest and Taxes (EBIT) / Total Assets

X4: Book Value of Equity / Total Liabilities

The discriminant regions determined for the results obtained from the third function Z'' -Score are as follows:

$Z'' > 2.6$ indicates financial success.

$1.1 < Z'' < 2.6$ represents the gray zone.

$Z'' < 1.1$ indicates financial failure.

Altman et al. (2014) demonstrated that the Z-Score model's effectiveness extends beyond its original application in an international context. The model showcased its robustness and reliability in predicting bankruptcy and identifying distressed firms across a wide range of firms from different European and non-European countries. However, for greater efficiency, country-specific models can be derived for both European and non-European countries by incorporating additional background variables along with the original four variables. While a general international model works reasonably well, classification accuracy can be improved by using country-specific estimation in most cases. Even simple additional variables in a country-specific model can significantly enhance classification accuracy (Paolone & Rangone, 2015). The practical examinations in this research validate that both the initial Z-Score Model and its modified version, including the four variables from Altman's (1983) investigation and coefficients recalibrated using an extensive dataset from Europe, consistently demonstrate strong international performance and are simple to apply and understand.

Altman et al. (1998) introduced a modified version of Altman's method, known as the Emerging Market (EM) Score, which was specifically designed for both manufacturing and non-manufacturing companies operating in developing markets. To do this, Altman and others suggested adding a constant value (+3.25) to standardize the results and consider scores equal to or below zero as the default condition. They conducted a study using a sample of Mexican companies to validate the EM Score. The method utilized the same variables as the revised Z-Score

but with the inclusion of a constant value (+3.25) to filter out potential distortions associated with the sector and country (Paolone & Rangone, 2015).

More than five decades after the first version of Z-score bankruptcy models was introduced, it has emerged as the predominant approach for offering advance alerts about bankruptcy or financial challenges in numerous research studies conducted by scholars and professionals worldwide (Hasan, Hadi, & Jasim, 2021).

When compared to other sectors or countries, there is a noticeable lack of studies regarding the implementation or utilization of Z-Score in the banking sector of Türkiye. First, some of these existing studies and then global study examples will be chronically presented in this section.

A comparison of CBs and PBs by applying the Z-Score model in Türkiye indicated that major IBs exhibit lower financial stability when compared to prominent CBs. However, both large IBs and CBs demonstrate greater financial strength when compared to their smaller counterparts (Elbadri & Bektaş, 2017).

Aksoy and Göker (2018) applied the Z-Score model and the Bankometer model to a sample of commercial banks listed on Borsa Istanbul from 2012 to 2016. The results from the Bankometer model showed that all commercial banks had high debt-paying capacity and low financial risk levels. However, the results from the Z-Score model revealed the opposite, indicating that all commercial banks had a high level of financial risk. The discrepancy in results was attributed to the usage of parameters in the Z-Score model, particularly the X1 variable (Net Working Capital/Total Assets), which had a consistently negative and low value across all banks and years. This was due to the mismatch between the maturity of deposits and loans in the Turkish banking sector. According to the authors, this situation demonstrates that the Z-Score model has weakened its status as an applicable model in the Turkish banking sector.

The financial soundness and debt repayment capacity of five PBs in Türkiye (three private and two state-owned) were empirically analyzed again by using the Z-Score and Bankometer methods by Çalış et al. (2022). The results indicate that both private and state-owned PBs have a significant potential for bankruptcy according to the Z-Score method commonly used for predicting

bankruptcy risk. According to the study, the Z-Score results for both bank groups were below 1.1, indicating a high potential for bankruptcy.

Kınalı and Karasioglu (2022) undertook an analysis of financial data from 34 companies listed on Borsa Istanbul between 2014 and 2019, employing the Z-Score model to scrutinize their financial performance. Their findings revealed that out of the 34 companies, 12 were classified as risky, 16 as uncertain, and 6 as low risk. This classification provides valuable insights into the financial health and risk levels of these companies in the market.

Only application of the EM Score with original Z-Score and Springate in the Turkish banking sector was conducted by Tekin and Gör (2022). The findings of this study, based on Altman Z-Score and Springate results, suggest that the Z-Score alone may not be a suitable predictor of financial failure in the Turkish banking sector. However, incorporating a constant of +3.25 in Z-Score calculations improves its effectiveness, resulting in most banks being classified as financially sound and successful.

There are many global studies about the Altman Z-Score model for IBs. Some of them are comparative studies between countries or between CBs and IBs. Now, IB-related studies will be reviewed.

The first cross-country comparative empirical analysis of CBs and IBs that focused on implementing the Z-Score was conducted by Čihák & Hesse (2010) to assess the financial stability of IBs. They analyzed financial data from 77 IBs across multiple countries including Bahrain, Bangladesh, Iran, Yemen, UAE, Saudi Arabia, Kuwait, Qatar, Jordan, Malaysia, and Sudan from 1993 to 2004. The results of the study represent that smaller IBs are financially more robust than smaller commercial banks, while larger commercial banks tend to be financially stronger than larger IBs. It's noteworthy that smaller IBs display higher stability compared to larger IBs as well. According to the authors, this could be because of challenges in adapting their credit risk monitoring system as they expand, difficulties in standardizing credit risk management, and growing issues linked to making safe choices and managing behavior when dealing with larger operations.

Zaabi (2011) suggested that adopting the modified Z-score or EM Score can be an effective evaluation approach for financing long-term partnership projects, including small and medium-sized enterprises (SMEs). The findings of the study concluded that IBs in the UAE are financially sound and healthy, and the EM Score can be a beneficial analytical tool to monitor the financial stability of financial institutions.

Following the 2008-2009 financial crisis, an analysis to figure out the corporate solvency of companies listed on the Alt-X (an alternative public equity exchange for small and medium-sized companies in South Africa) by the implementation of the Z-Score and the EM Score was conducted. The finding revealed a temporary increase in corporate failure risk in 2009, which subsequently declined by 2012. However, despite the marginal increase in risk, a significant proportion of companies maintained low corporate failure likelihood, mainly due to their conservative capital structures and low financial leverage. Overall, the study indicates a generally stable solvency trend for companies listed on the Alt-X during the specified period (Coelho, 2014).

Jan and Marimuthu (2015) utilized the Z-Score model to carry out a comparative analysis of 25 selected IBs originating from the five leading Islamic banking nations, which were determined based on global Islamic banking assets. The results showed that Saudi Arabian banks performed the best, followed by Iranian banks, while the performance of UAE, Kuwaiti, and Malaysian banks was comparatively weaker. The study also analyzed performance indicators related to bankruptcy and found significant relationships in terms of liquidity, profitability, and insolvency, but not productivity. The study suggests the adoption of more specific models and techniques for diagnosing bankruptcy in different countries within the IFIs.

Abdullah M. (2015) aimed to confirm the effectiveness of the Z-Score model in predicting the failure of banks in Bangladesh. The research findings concluded that 7 banks were financially sound, while 22 banks were facing insolvency for the period of 2009 to 2014. Additionally, the study pointed out that IBs exhibited stronger performance compared to CBs, and state-owned banks demonstrated enhanced performance compared to their previous performance levels.

Through the examination of fifteen non-bank financial institutions using the Z-Score model, Hamid et al. (2016) concluded that a majority of these institutions are positioned within the "Distress" zone. Despite their notable performances and contributions to economic development,

they fail to meet the minimum score required by the model. This indicates a significant level of bankruptcy risk. They emphasize as an important point that the model may not be entirely suitable for countries like Bangladesh.

Jan and Marimuthu (2016) aimed to examine the bankruptcy rates of foreign and domestic IBs in Malaysia and analyze the impact of various performance indicators on bankruptcy. The findings revealed that the sample of foreign IBs had a lower bankruptcy rate compared to domestic IBs. The higher liquidity ratios of foreign IBs were identified as a significant factor contributing to their lower bankruptcy rates. These results are consistent with previous research that suggests more liquid firms have lower chances of default.

Ghosh and colleagues (2017) emphasized the practical importance of conducting comparative bankruptcy investigations in the domain of asset management companies in India. They underlined the identification of key performance indicators that influence the bankruptcy risk of these firms. Their findings concluded that the ratios utilized in calculating the EM Score hold significant value as indicators for assessing the financial health and bankruptcy risk of these companies.

Hendra (2018) investigated to explore the quality of earnings and the probability of bankruptcy among IBs both before and following the adoption of the International Financial Reporting Standards (IFRS). The research revealed that there was no observable difference in earnings quality among IBs in Indonesia, while a notable disparity was observed in Malaysia. Interestingly, the adoption of IFRS did not significantly impact the potential bankruptcy of IBs. The study also noted that the risk of bankruptcy for IBs in Indonesia was comparatively lower than that in Malaysia.

Manaseer and Oshaibat (2018) conducted a study to assess the reliability of the Z-Score model in predicting the financial health of banks in Jordan. They suggested that a model is a useful tool for anticipating company insolvency and mitigating risks. This approach can aid credit providers and investors in evaluating a company's financial standing and making informed choices. However, the model was found to be not the sole method to gauge financially troubled companies.

Saha and Navila (2018) identified a substantial number of Private Commercial Banks (PCBs) in Bangladesh that were at high risk of financial distress after applying the Z-score model. The findings revealed that Non-conventional PCBs show better Z-scores compared to Conventional PCBs, indicating that they have a lower risk for future financial distress.

Sule et al. (2018) investigated the concept of Corporate Social Responsibility (CSR) practice in Nigeria and explored its potential relationship with bankruptcy by using the EM Score method. Based on the results, even though the empirical evidence in the Nigerian context is limited, there are indications of a strong negative effect of CSR on bankruptcy risk.

The impact of operating structure on the stability and insolvency risk of selected IBs in Malaysia was conducted by using the EM Score. Findings of the study indicated that development financial institutions are more stable and less likely to become insolvent compared to other banks. Most locally incorporated and foreign IBs in Malaysia had higher EM Score values than domestic IBs. However, certain domestic IBs, such as Bank Islam and Maybank Islamic, were classified as being in the safe zone. Development financial institutions ranked higher in terms of stability compared to other banks (Zainudin, Shahida, & Sulaiman, 2019).

The financial stability of selected commercial banks and IBs in Saudi Arabia was evaluated with the Z-Score. The findings reveal that, in general, CBs have relatively higher Z-Score results (Ghassan & Guendouz, 2019).

Kholifah et al. (2019) focused on measuring the risk of bankruptcy for BPRS (Islamic Rural Banks) in Central Java from 2011 to 2016 with the implementation of the Z-Score model. The findings indicated positive and negative trends in the analysis of various ratios. The liquidity condition, management performance, operational ability, and debt guarantee ability were assessed. The majority of BPRS in Central Java experienced bankruptcy, with the number increasing each year. Some banks moved to the gray zone, indicating improved financial health than previous years. Three BPRS remained healthy in 2011 but encountered financial issues in subsequent years.

Putri and Gandakusuma (2019) conducted a sample of manufacturing companies in Indonesia from 2012 to 2016 by using the Z-Score, the EM Score, and the Ohlson models that produced varied outcomes when predicting bankruptcy within the sample. Notably, the EM Score

demonstrated the highest percentage of accurate predictions for both bankruptcies and healthy companies. Researchers indicated that the EM Score exhibits greater consistency and is more suitable for accurately predicting bankruptcy in Indonesian companies.

Fakhri et al. (2019) conducted a comparative analysis of CBs and IBs in Indonesia by using the Z-Score for the period from December 2014 to May 2017. According to the results, Sharia banks are considered to be in the gray zone, indicating that their financial condition is moderately good for supporting business development but weak in anticipating risks due to economic changes. On the other hand, CBs was in the safe zone, implying that its financial condition is very good for supporting business development and anticipating changes in the economy and the financial industry. The study also inference that the Z-Score method is suitable for predicting the financial performance of banking services and can aid in investment decisions.

Kittur (2019) examined the financial health of the Indian public and private sector over the period 2009 to 2018, employing two distinct Z-Score models. Despite having varying cutoff limits, both models categorized all banks as safe from bankruptcy. However, the study found that the prevailing distress caused by non-performing assets (NPAs) in the Indian banking sector was only marginally reflected in the ratios used by the Altman model. The Z-Scores did not show major deviations during the pre-NPA crisis period, indicating that they may not be reliable predictors of future NPAs. The study suggests caution in solely relying on Z-Scores for early indication of potential distress through NPAs. Researchers proposed that the Z-Score model should incorporate NPAs as a direct variable to better assess the stability of banks, particularly in emerging markets like India where NPAs may be undermining the banking structure and the country's economy.

Arshed (2020) employed the Z-Score and Springate models. Through a comparison of these models and an assessment of companies' financial conditions from 2013 to 2019, the research findings suggested that the Z-Score model surpasses the Springate model in its ability to predict company bankruptcy. The researcher concluded that the approach alerts companies and underscores the importance of improving their performance.

By utilizing Z-Score, Qasim (2020) demonstrated that among the three banks in Jordan, one bank displayed the highest Z-score, signifying a stable financial position. Jordanian IBs have exhibited overall improvement since 2013. The study affirmed the validity of the Z-Score model

in assessing performance. The ratios employed for Z-Score calculations were considered effective indicators and were also utilized by Jordanian IBs for funding both short-term and long-term projects. The study recommends combining the Z-score with other financial analysis techniques to establish industry benchmarks.

Majumder and Moonmoon (2020) indicated a variation in the Z-score of financial distress, suggesting that the Z-Score model for emerging economies is effective in predicting financial distress within the Islamic banking industry of Bangladesh.

Rahman et al. (2020) applied the Z-Score model to evaluate the risk of bankruptcy of Non-Bank Financial Institutions (NBFIs) in Bangladesh. The outcomes revealed that 90% of NBFIs were in financial distress in 2018.

The research conducted on 50 firms in the construction sector in Indonesia used three bankruptcy prediction models: the Z-Score model, the EM Score, and the S-Score model. The results of the model's predictions for the years 2014 and 2018 indicate that different presidency periods in Indonesia influenced the models' outcomes. Changes in political and economic policies under different presidents can impact the performance of bankruptcy prediction models. The study also highlights the importance of the debt-to-equity ratio (DFL) variable in the Z-Score model and the significant influence of independent and control variables in the EM Score method (Ar-Rasyid & Gandakusuma, 2020).

An assessment of Pakistan's banking sector's financial condition was carried out using the Z-Score test. The findings indicated that local banks demonstrated stability, while foreign banks faced distress. Moreover, the study deduced that the Z-Score model is accurate and valuable for predicting financial stability in the context of Pakistan's banking sector (Ullah, Wang, & Abbas, 2021).

The EM Score utilized by Hasan et al. (2021) evaluates the stability of Iraqi banks and assesses their dependability within the Iraqi business environment. Nevertheless, the research discovered that the outcomes produced by the model were challenging to interpret. Regarding the banks that experienced failure, the model suggested that they did not face substantial difficulties initially but eventually led to failure.

Based on the implementation of the Z-Score model to IBs in Indonesia, most of these banks were financially sound between 2017 and 2019, except one bank in a cautious financial position. Several banks demonstrated improvements in their financial performance, while others experienced a decline (Swissa, 2021).

According to the Z-Score model, all IBs were placed in the safe zone. Only one firm was flagged as distressed, and another landed in the inconclusive zone out of the total of twenty firms examined. The results regarding IBs in Pakistan were quite encouraging (Ahmad & Hussain, 2021).

Tran (2021) examined the EM Score and six financial ratios to predict financial distress in Vietnam. The EM Score showed impressive capability in accurately anticipating financial troubles in the Vietnamese market. The model achieved an accuracy rate of 91.58% for one year and 83.77% for five years. What's noteworthy is that the model could foresee financial distress up to 4 years before a company got delisted.

When assessing the level of financial distress using the Z-Score method to 4 Foreign Exchange Sharia Banks and 4 Non-Foreign Exchange Sharia Banks from 2014 to 2018, results concluded that there is no significant difference between the Z-Score value of the two groups. Both types of banks exhibit similar scores, indicating a relatively healthy state (Safitri & Sholikha, 2022).

After implementing Z-Score, Asmadi et al. (2023) found three companies with potential bankruptcy with values below 1.1. Additionally, three other companies were identified as prone to bankruptcy, with values falling between 1.1 and 2.6. In contrast, 24 companies were categorized as healthy, primarily owing to their substantial total assets and manageable debt. The study affirmed the effectiveness of the Z-Score method in evaluating performance, predicting bankruptcy, and assessing the financial health of Indonesian companies.

The effect of COVID-19 on the financial stability of IBs in Indonesia was analyzed by the implementation of Z-Score. The results showed that IBs are stable during the pandemic for the short term, however, the long-term impact requires more observations (Amaroh, 2023).

According to Hamid et al. (2023), the financial health of most Iraqi banks is inconsistent, positioning them within the third risk category, signifying a heightened risk of bankruptcy due to

their Z-Score results. Hence, the researchers recommended to use of alternative bankruptcy prediction models in conjunction with Z-Score.

The effect of corporate governance on the health of Indonesian banks was examined by the utilization of Z-Score. The findings revealed a positive relationship between the frequency of board meetings and the financial health of these banks, indicating that more frequent meetings enhance managerial monitoring and contribute to better financial health. However, other variables, including the board of commissioners, independent board of commissioners, and educational background, showed no significant influence on bank health (Susanto & Walyoto, 2023).

Hussein and Idris (2023) applied the EM Score to forecast financial distress in manufacturing companies that had gone bankrupt and were listed on the Amman Stock Exchange from 2003 to 2019. The results highlight the EM Score value's proficiency in recognizing potential financial challenges within otherwise stable industrial firms, demonstrating its capacity to identify vulnerabilities before they escalate into distress.

The Z-Score model and its various improved versions have been extensively studied in the field of financial analysis. These studies have produced diverse and sometimes conflicting results, indicating a lack of correlation in their findings. Notably, when focusing on emerging markets and economies, the research outcomes tend to exhibit a predominance of negative results or inconsistent findings regarding the application of the original Z-Score model.

However, it is important to note that a modified version of the Z-Score model, specifically designed for emerging markets and known as the EM Score, has shown consistency in its results (Altman, Hartzell, & Peck, 1998) and has been utilized by many researchers on emerging markets. This modified model takes into account the unique characteristics and challenges faced by emerging markets, providing a more accurate assessment of financial stability within these contexts. Therefore, to get a more accurate assessment and study results for the Tuekish market, this model will be used.

2.6 Previous Research Related to the Credit Risk Management of Banks

NPL ratio is a method that is commonly used as a proxy for credit risk (Kabir & Worthington, 2017) and provides insights into a bank's asset quality and potential vulnerability to financial distress (Christaria & Kurnia, 2016). The NPL ratio reflects the proportion of loans not being serviced according to their scheduled payments, typically defined as loans with payments overdue by 90 days or more (Karapappas, 2023). For IBs, which employ non-interest-based financing methods, a loan is considered non-performing when the borrower fails to repay the full debt amount on time. Additionally, in certain Islamic contracts like *mudarabah* and *musharakah*, a loan is classified as non-performing if the counterparty fails to pay the bank's share (Elgari, 2018).

An increasing number of non-serviced loans and a higher NPL ratio can indicate declining asset quality and potential financial instability (Özçim & Kaya, 2021). Therefore, it could elevate the likelihood of the bank facing bankruptcy (Kabir & Worthington, 2017).

This section will provide a chronological overview of previous domestic and global studies on risk management in the banking sector, with a specific focus on NPL and NPL ratio studies. Reviewing these studies will contribute to a better understanding of credit risk management practices and underscore the significance of NPL ratios in the assessment and management of credit risk, particularly in the context of Islamic banking.

Yağcılar and Demir (2015) focused on determining the factors influencing NPL ratios in both macroeconomic and bank-related contexts. The findings indicated that macroeconomic factors such as economic growth and interest rates significantly affect NPL ratios in banks. Specifically, a negative relationship was observed between economic growth and NPL ratios, suggesting that a decline in economic activity leads to an increase in NPL. Additionally, it was found that higher interest rates exacerbate the risk of non-repayment. Moreover, the study revealed that banks listed on the stock exchange tend to have lower NPL ratios, indicating that capital markets play a role in managing risks and enhancing bank profitability. Banks with high liquidity and asset profitability were also found to have lower NPL ratios, highlighting the importance of credit management. Furthermore, foreign banks exhibited higher credit risk compared to domestic banks, and strong capital structures were associated with more aggressive lending practices and higher NPL ratios.

Selimler (2015) emphasizes that NPL poses significant challenges to the Turkish banking sector. The elevated NPL ratio and the need to allocate special provisions indicate the potential negative impact on banks' profitability. NPL impacts the balance sheet, income statement, profitability, liquidity, capital adequacy, and asset quality ratios of banks, both in terms of their amount and the ratios they are included in. However, the inability to eliminate NPL necessitates a focus on slowing down the transfer of loans and improving the collection process.

Büyükkara (2015) examined the loan default rates of companies that received loans from PBs and CBs in Türkiye using analysis techniques. The data covered the period from January 2011 to December 2012. The results suggest that loans from PBs are more likely to default, even after considering factors like borrower details, loan terms, and bank characteristics. Interestingly, loans exclusively from PBs have a lower chance of default compared to loans from both PBs and CBs. For firms borrowing from both types of banks, the default rate of PBs' loans was found to be higher than that of CBs' loans.

Özkan and Işıl (2016) analyzed data from four active banks in Türkiye covering the period from 2006 to 2014. They utilized an analytical approach to identify factors affecting the NPL ratio. The results indicated that as banks allocate a larger proportion of their overall funds to potential loan losses, the NPL ratio increases. In contrast, larger banks with a smaller percentage of their funds allocated to loans tend to experience a decrease in the NPL ratio.

The factors influencing NPL in the Turkish banking sector after the global crisis were examined by Us (2016). The findings indicated that before the crisis, NPLs in Turkish banks were primarily influenced by bank-specific variables such as capital adequacy, lending, inefficiency, and bank size. Inflation and exchange rate were the only macroeconomic indicators affecting the NPL ratio during this period. However, after the crisis, the influence of bank-specific factors diminished, with lending being the only significant variable. The effectiveness of macroeconomic and policy-related factors also varied, with real Gross Domestic Product (GDP) growth, inflation, and exchange rate playing a role in shaping NPL dynamics. Additionally, the persistence of the NPL ratio emerged as a crucial factor, as evidenced by the significance of the dependent variable.

Yüksel (2017) investigated the factors influencing credit risk in developing nations, specifically examining the Turkish banking sector in the aftermath of the 2001 crisis. Utilizing

annual data from 23 Turkish deposit banks spanning 2004 to 2014, the study employed a statistical model. The NPL ratio was identified as the dependent variable, and the research revealed that the industry production index played a significant role in affecting NPL. A negative correlation was demonstrated, implying that a decrease in the industry production index results in an increase in NPL. This suggests that economic downturns could lead to higher NPL ratios as companies grapple with financial challenges and job losses that impact their ability to repay loans.

Alkhawaja and Görmüş (2019) focused on investigating credit problems in Turkish banks, especially in IBs, and how they differ from regular banks. They analyzed data from three IBs over a decade, comparing their findings with research on regular banks. They used NPL as a measure of credit risk. Their results showed that in IBs, increasing reserves for possible loan issues Loan Loss Provision (LLP), and Provision for Possible Losses (PPL) raised the credit risk, while having more money for loans (PLA) lowered it. Factors like bank size and loan earnings had less impact. For regular banks, the outcomes were somehow different. The study revealed that higher reserves for loan problems (LLP), how much they earn from loans (NIM), and how much money they have compared to loans increased the credit risk. However, setting aside money for fewer loans (PLD and PLA) or having a larger bank reduced the credit risk. The research highlighted that Islamic and regular banks were largely similar concerning LLP and PLA.

Kakaç (2019) focused on assessing credit risk in Turkish banks by examining NPLs with two models which are Logit and Probit. The analysis included both public and private capital deposit banks over the period from 2007 to 2017. In the Logit model, banks were categorized based on their NPL, and the results revealed a 90.91% correct classification rate. The probit model considered credits and receivables accounts, showing an 84.30% correct classification rate.

İncekara and Çetinkaya (2019) presented a comparative analysis of banking characteristics for CBs and PBs in Türkiye. The study examined the factors influencing liquidity risk in Islamic and CBs in Türkiye between 2014 and 2018. The results showed that NPL and liquid assets were significant factors in both banking types. Increasing NPL decreased liquidity risk in conventional banking but increased it in Islamic banking. Additionally, higher liquid assets reduced liquidity risk in both types of banks. Return on equity (ROE), return on assets (ROA), gross domestic product (GDP), and inflation were not significant factors.

Özçim and Kaya (2021) focused on analyzing the relationship between credit risk in PBs and macroeconomic variables. From the perspective of the consumption sector, changes in private consumption expenditure affect the NPL of PBs. Considering that changes in GDP are larger and longer, it can be said that there is a stronger interaction between NPL and the production sector of the macroeconomy. The study concluded that the majority of loans provided by PBs are evaluated in the production sector.

Kayhan and İslamoğlu (2022) aimed to assess the impact of bank-specific variables on loans granted to Small and Medium Enterprises (SMEs) in Türkiye. The findings reveal that an increase in the overall loans-to-assets ratio has a positive effect on the ratio of SME cash loans to total loans. However, an increase in the NPL ratio leads to a decrease in the SME cash loans ratio.

Özel (2022) suggested that vulnerabilities in the banking sector, including factors specific to banks and macroeconomic variables, have a significant impact on NPL. The study emphasizes that adverse developments in the banking sector can have negative consequences not only for the sector itself but also for the entire financial system and the overall economy. It highlighted the importance of maintaining the continuity of credit flow from the financial system to the economy and the need for timely and adequate credit repayments. Furthermore, the study suggested that models considering both NPL and loans under close monitoring can provide a more comprehensive understanding of credit risk. The findings emphasized the interplay between NPL, bank-specific factors, and macroeconomic variables and underscored the significance of implementing appropriate policies to ensure a sustainable credit system and financial stability.

The profitability of five Turkish PBs has been examined by Dağılğan (2023) for the period between 2016 and 2021, focusing on bank-specific determinants. ROA and ROE are taken as dependent variables, while bank-specific variables such as capital adequacy, asset quality, and NPL ratio are considered independent variables. From the findings, it is observed that an increase in the total loan amount positively affects asset profitability but does not significantly impact equity profitability. The continuous growth of the loan portfolio for PBs implies an increase in overall profitability. However, an increase in NPL has a negative effect on equity profitability, reducing it. Lower levels of NPL lead to higher equity profitability. Therefore, managing and reducing the level of NPL should be a priority for Turkish PBs to enhance their equity profitability.

Thus far, I have provided illustrative instances of research from Türkiye. Now, I am going to present some global studies in the field of banking, with a particular focus on IBs. Those are:

Ahmad and Ariff (2007) aimed to explore the factors that influence credit risk in two distinct types of banking systems, making a comparison between emerging economies and developed economies. Previous research on credit risk determinants had primarily concentrated on individual countries, but this study sought to identify the primary contributors to credit risk in these diverse banking systems. The results indicated that in each banking system, two to four factors significantly influence credit risk. Regulatory capital was found to be important in banking systems offering multiple products, while management quality played a critical role in loan-dominant banks, particularly in emerging economies. Surprisingly, leverage was found to be irrelevant to credit risk in several economies during the test period. However, an increase in LLP consistently emerged as a significant determinant of potential credit risk. The study also highlighted that credit risk is higher in emerging economy banks compared to developed economies, and a larger number of bank-specific factors contribute to this risk in emerging economies.

Empirical evidence is presented by Boumediene (2012) about lower credit risk in IBs than in CBs. The article highlighted the challenge in managing credit risk for IBs, which is not due to the lack of risk management tools, as there are many Sharia-compliant techniques available. Instead, the fundamental issue lies in attempting to manage credit risk using approaches similar to CBs, which is inconsistent due to the different nature of contracts in both banking systems.

Chusaini and Ismal (2013) investigated the relationship between Islamic modes of financing, credit risks, and future earnings in Indonesian IBs. The research employed a sample consisting of eleven fully transparent IBs that had disclosed their financial data to the Bank of Indonesia between 2008 and 2013. The main objective is to examine how different modes of Islamic financing, NPF, and profitability are interrelated. The findings indicated that equity financing has a positive and significant relationship with NPF. Additionally, debt financing, specifically through Murabahah, is found to have a significant positive relationship with future earnings.

Sadiq et al. (2015) aimed to analyze the firm-specific factors that influence risk management practices in IBs operating in Pakistan from 2006 to 2014. The dependent variables

examined were liquidity risk and operational risk. The study assessed the impact of bank size, capital adequacy ratio, NPL ratio, leverage, and asset management on these risks. The results revealed that bank size had a significant negative relationship with operational risk but no significant impact on liquidity risk. The capital adequacy ratio had a positive and significant effect on both risks. The NPL ratios showed a significant and positive relationship with liquidity risk. Asset management had a significant impact on both risks, with a positive effect on operational risk and a negative effect on liquidity risk. The leverage ratio was only significant for liquidity risk, showing a negative relationship.

Firmansyah (2015) examined the monthly data of all Syariah Rural Credit Banks (SRCB) in Indonesia. The researcher used a method called multiple regression analysis to understand how different factors affect NPL. The study looked at both macroeconomic and bank-specific variables. The findings showed that the country's GDP and inflation harmed NPL, meaning they reduced the problem. However, liquidity had a positive effect, meaning more liquidity was linked to higher NPL. Interestingly, the size of the banks and inefficiency didn't show any significant impact on NPL.

Havidz et al (2015) focused on bank efficiency and NPL using Data Envelopment Analysis. This research involved four IBs in Indonesia and looked at data spanning from 2008 to 2014. The results indicated that the NPL ratio was influenced by the operational efficiency ratio, the size of the banks, and the country's GDP growth rate. On the other hand, factors like PLD (possibly provision for loan decrease), CAR (capital adequacy ratio), inflation, and ROE (return on equity) didn't show a significant impact on NPL.

Nurul et al. (2015), aimed to contrast the credit risk of IBs and CBs using a combination of market-based and accounting-based metrics. They investigated a substantial number of banks across 13 countries over the period from 2000 to 2012. The market-based measure suggested that IBs have lower credit risk, while the accounting-based measures indicated higher credit risk for IBs. The research also found no significant difference in credit risk between the two banking systems during the recent financial crisis, debunking the claim that IBs performed better. The study emphasized the need for tailored regulations for IBs and acknowledged the cross-country variation in credit risk.

Ahmed E. (2016) highlighted the significance of understanding the interrelationship between NPL and credit risk management in Sudan's Islamic banking industry. They came up with the following results. Firstly, the legal and regulatory framework of supervisory authorities was found to be reasonable and did not significantly contribute to the NPL problem. Secondly, the credit risk management frameworks in the studied banks were deemed to be not weak, indicating that they did not significantly spur the NPL problem. However, the primary factor identified as contributing to the NPL problem was adverse macroeconomic conditions surrounding various economic sectors in Sudan. He emphasized the importance of addressing adverse macroeconomic conditions, strengthening enforcement of regulations, implementing proactive measures, and exploring remedial interventions to mitigate the NPL problem.

According to Sukmana et al. (2016), although the NPL is significantly higher for CBs compared to IBs, the result of their research shows that the return on assets (ROA) of CBs is significantly higher as well and a higher NPL negatively affects profitability. However, in this case, the higher NPL in CBs suggests that the management of conventional banking is more efficient.

Salim et al. (2017) centered their attention on Iranian banks and their management of credit risk during the period from 1998 to 2012. In this paper, NPL was utilized as a proxy for credit risk. The empirical findings indicated that while banks, in general, enhanced their efficiency over time, their credit risk performance notably declined following regulatory changes in 2005. These findings highlighted the importance of actively monitoring credit quality across Iranian banks.

Waqas et al. (2017) directed their attention to the analysis of credit risk in the banking sectors of Pakistan, India, and Bangladesh, with NPL serving as a proxy. The empirical results deduced that Pakistan exhibits a higher NPL ratio in comparison to India and Bangladesh, while India records the lowest ratio. The study highlighted the significant contribution of bank-specific factors, such as inefficiency, profitability, capital ratio, and leverage, to credit risk. Additionally, macroeconomic variables are found to have a notable impact on NPL. However, the results for Bangladesh suggest contradictions, as these variables do not have a significant effect on NPL at various levels. The overall results emphasized that credit risk is influenced not only by external factors but also by internal factors such as poor management and cost-cutting measures.

Regarding the investigation by Supiyadi et al. (2017) to assess profitability and identify the factors influencing the performance of IBs in Indonesia. The credit risk, capital adequacy ratio, firm size, and liquidity risk significantly influence profitability. However, inflation does not have a significant impact. They suggested that IBs should increase prudence in lending, enhance capital adequacy, and manage liquidity risk effectively.

Zolkifli et al (2018) compared NPL in CBs and IBs in Malaysia from 2008 to 2016. In regular banks, NPL was linked to bank size, funding cost, and PLD, while it was affected by leverage, management efficiency, and risky loans. In IBs, only the ratio of loans to safe assets and PLD had an impact on NPL; factors like bank size, management efficiency, and risky loans were not significant.

Wiryono and Effendi (2018) employed a panel data regression analysis to explore the influence of macroeconomic variables and bank-specific factors on the NPL of IBs in Malaysia. The results reveal that financing quality, financing expansion, GDP, and inflation exert a statistically significant and negative impact on NPL.

Rasheed and Siddiqui (2019) examined the determinants of NPL in eight CBs and four IBs in Pakistan from 2008 to 2017. The findings of the research revealed interesting patterns. In conventional banking, the number of staff was found to hurt the amount of NPL, while in IBs, it had a positive effect on this number. Moreover, the relationship between the capital adequacy ratio and NPL was insignificant yet positive in conventional banking, but negative in Islamic banking. Additionally, the loan portfolio size was identified as a positive and significant factor contributing to the credit risk of CBs in Pakistan, whereas it harmed NPFs in IBs. When it comes to gross interest income and markup, both CBs and IBs exhibited a positive relationship with NPL. Furthermore, the number of branches had a positive effect on NPL in CBs, whereas it had a negative but insignificant relationship in Islamic banking.

Rezina et al. (2020) aimed to determine internal bank variables that influence NPL ratios. They deduced that while internal bank variables do have an impact on the NPL ratio, they may not be as substantial as anticipated, partly due to the limited sample size. Interestingly, IBs appear to be more dependent on these variables compared to CBs on the other hand, but further analysis is needed.

According to Mdaghri (2022), there is a significant negative impact of bank liquidity on NPL in both the short and long term which means that when banks engage in activities that generate liquidity, both on and off the balance sheet, it leads to a decrease in NPL. These findings support the perspective that increased liquidity creation has a positive effect on the economy. Additionally, the study conducted a regression analysis to examine whether this relationship holds for both IBs and CBs. The results indicated that liquidity creation contributes to the reduction of NPL in both types of banks, implying that the positive effect of liquidity creation on NPL applies to IBs as well as CBs.

Badawi et al. (2022) focused on analyzing the factors that influence the financial performance of IBs, with a specific emphasis on the role of competitive advantage. The findings revealed that the Non-Operating Income Margin (NOM) and NPL variables do not have a significant effect, while the Operating Expense to Operating Income Ratio (BOPO) variable has a significant negative effect on financial performance. However, the competitive advantage variable does not moderate the effects of NOM, NPL, and BOPO on ROA. The conclusions indicated that NPF and NOM do not significantly affect the ROA of IBs, and the competitive advantage variable does not moderate the effects of NPF and NOM on ROA.

Murtiadi et al. (2023) examined the impact of NPF, NPL, Fee-based Income (FBI), and Financing Deposit Ratio (FDR) on the profitability of Islamic commercial banks compared to conventional commercial banks in Indonesia. The research analyzes data from six samples, consisting of three IBs and three CBs, from 2014 to 2018. The findings indicated that NPF, FBI, and FDR collectively influence profitability in IBs, while NPL, FBI, and Loan-to-Deposit Ratio (LDR) collectively affect profitability in CBs. However, when considering individual variables, NPF significantly affects profitability in IBs, while FBI and FDR have no significant impact. In CBs, NPL and LDR have a significant effect on profitability, while FBI does not. The tests revealed differences between the two types of banks in terms of NPF, NPL, and FBI, but no significant differences in profitability and FDR.

Safarda et al. (2023) directed their attention to financial performance indicators of IBs and CBs during the COVID-19 pandemic. Their findings suggested that there are no significant disparities in indicators such as CAR, FDR, and NPL/NPFs. Nevertheless, substantial variations are noted in indicators like ROA, ROE, and Operating Profit to Operating Income (OP/OI).

The COVID-19 period is related to another example held by Asykarulloh and Sultoni (2023) compares the performance of IBs and CBs during the COVID-19 pandemic. The results indicated significant differences in the CAR and BOPO performance between the two types of banks, with IBs having higher scores. However, the NPL/NPF, ROE, and LDR/FDR ratios didn't show significant differences.

Bhuiya et al. (2023) examined the impact of credit risk on the profitability of commercial banks in Bangladesh. The findings indicated that the NPL ratio has a significant negative effect on both ROE and ROA. Additionally, factors such as LLP, Loan-to-Asset (LATD), PPL, and GDP also influence profitability. The study highlighted the importance of managing credit risk and suggested measures such as regulations, employee training, and credit rating systems to ensure financial soundness.

Chowdhury et al. (2023) explored the impact of bank-specific and macroeconomic variables on the NPL of IBs in Bangladesh. The results uncovered that factors such as loans, loan-to-assets (LOTA) ratio, and net interest margin (NIM) have a significant and negative effect on NPL, while the CAR exhibits a positive relationship with NPL. On the macroeconomic front, GDP exhibits a positive correlation, while inflation has a negative association with NPL. Improving net interest margins and considering the growth of GDP can also help reduce NPL. The impact of the capital adequacy ratio on NPL is not significant, suggesting the need for additional information such as reserves for NPL.

2.7 Previous Research Related to the Relationship between Financial Stability and Credit Risk

Financial stability and credit risk management are closely intertwined because the stability of a financial system relies heavily on the effective management of credit risks (Belás, Mišanková, Schönfeld, & Gavurová, 2017). Therefore, the relationship between financial stability and credit risk management is of paramount importance in the realm of banking and financial institutions.

In the context of Islamic finance, financial stability, and credit risk management take on a distinctive perspective due to the underlying principles and features of Islamic banking. The

relationship between these two aspects is essential for maintaining the resilience and sustainability of the Islamic banking industry as well (Saleem, Daragmeh, Zahid, & Sági, 2023).

In this section, I draw attention to a collection of studies that highlight the intricate relationship between financial stability and credit risk. Specifically, I focus on research within the domain of Islamic finance and banking, mostly featuring a combination of the Z-Score model and the NPL ratio. Notable exemplars comprise:

Rajhi & Hassairi (2013) conducted a study comparing the risk of insolvency between IBs and CBs in the Middle East and North Africa (MENA) and Southeast Asian countries. The study found that, on average, IBs exhibit higher stability than CBs, except for small IBs. Credit risk and income diversity were identified as common causes of insolvency in IBs.

Nurul and Worthington (2014) discussed whether IBs face higher credit risk compared to CBs. The study utilized both Z-Score and NPL. The results revealed that reaching a definitive conclusion regarding the credit risk of IBs is challenging. On average, IBs exhibited lower credit risks than CBs according to the NPL ratio. However, when considering the Z-Score, IBs show significantly higher credit risk.

Kumar and Sayani (2015) indicated that all IBs from the Gulf Cooperation Council (GCC) have a Z-score higher than 2.6, indicating their resilience to the global financial crisis. The study also suggested that NPL in IBs requires attention, and it recommends conducting a detailed study in the future to explore the prevalence and reasons behind NPL, as well as their management and its effect on financial stability.

Otieno et al. (2016) highlighted the importance of efficient credit risk management for the financial performance of microfinance banks in Kenya. The findings demonstrated that lower levels of the portfolio at risk and loan loss provision coverage ratio (LLPCR) are associated with improved financial performance. Additionally, the results deduced that favorable macroeconomic conditions, such as increased GDP and moderate inflation, have a positive impact on credit risk management and the overall performance of microfinance banks.

Saeed and Alam (2018) found that the volatility in IBs was relatively high compared to CBs in Pakistan according to Z-Score. However, both banking systems exhibited a likelihood of

bankruptcy, but it was found to be higher in IBs as compared to CBs. This suggests that there may be higher credit risk associated with IBs. Additionally, the study considered the magnitude of NPL as an indicator of credit risk. The findings suggested that the ability of CBs in Pakistan to recover overdue amounts has weakened over time.

Hassan et al (2018) examined the relationship between liquidity risk and credit risk in IBs and compared their performance with CBs in terms of liquidity, credit risk, and bank stability. The findings revealed a negative relationship between liquidity risk and credit risk in IBs during the financial crisis period, but this relationship exists not only in IBs but also in CBs during the post-financial crisis period. This could be attributed to varying levels of credit and liquidity risk in banks. Furthermore, the study found a positive relationship between liquidity risk and bank stability in CBs during the post-financial crisis period, while IBs showed a negative relationship between liquidity risk and stability, as measured by Z-Score, in both crisis and post-crisis periods. Additionally, IBs outperformed CBs in terms of credit and liquidity risk, while CBs exhibited greater stability.

Misman and Bhatti (2020) analyzed the determinants of credit risk in IBs within the ASEAN (Association of Southeast Asian Nations) and GCC regions, using data from the period 2000 to 2011. The analysis findings indicated that financing quality and stability exhibit a positive and significant relationship with credit risk in IBs, irrespective of the model specifications and datasets utilized.

According to Kamsani et al. (2022), IBs have higher credit risk when compared to CBs, as evidenced by methods like Z-Score and market-based approaches. However, the Non-Performing Finance (NPF) and NPL ratios do not exhibit a significant difference between the two bank groups. This suggests that while IBs might be effectively managing their insufficient financing, it remains uncertain whether the overall stability of these banks is guaranteed, and their distance from potential default is not clear.

CHAPTER 3: METHODOLOGY

An overview of the methodology employed in this study to examine the financial stability and the credit risk of PBs and CBs. The research design and approach incorporate two crucial models: the EM Score and NPL ratios.

3.1 Research Design and Approach

To achieve our research objectives of analyzing the financial stability and credit risk soundness of Turkish PBs, I adopted a mixed-model research design. This design allowed us to combine quantitative approaches from both models to provide a comprehensive understanding of the subject matter.

3.1.1. Emerging Market (EM) Score Method

The EM Score is a Multiple Discriminant Analysis (MDA) model, which is a statistical method utilized to categorize an observation into specific pre-defined groups based on the individual characteristics of the observation. It is primarily employed for classification and prediction purposes in situations where the dependent variable is qualitative, such as bankrupt or non-bankrupt firms or other binary characteristics (Ndiege, 2017).

The EM Score produced by Altman et al. (1998) is an improved and modified version of the statistically proven Z-Score model. This model can be applied to manufacturers and non-manufacturers and is suitable for both listed and privately owned companies. That means the EM Score offers an advantage over the original Z-Score as it can be applied to non-traded companies and is not limited to manufacturing companies alone.

This modified method includes the special characteristics of firms for developing markets. The model was initially applied in Mexico and then applied to many developing market companies

in different countries, and the model has proven its effectiveness and success in non-American environments (Hussein & Idris, 2023).

The EM Score takes a specific form with the formula:

$$\text{“EM Score} = 6.56 * X1 + 3.26 * X2 + 6.72 * X3 + 1.05 * X4 + 3.25\text{”}$$

$$EM\ Score = A1X1 + A2X2 + \dots + ANXN,$$

Where *EM Score* = Overall Score

A1... AN = Discriminant Coefficients

X1...XN = Discriminant Variables

A5 (+3.25) = Constant Value

The definitions of the formula variables will be given with details as follows:

X1: Net Working Capital / Total Assets

X2: Retained Earnings (Undistributed) / Total Assets

X3: Earnings Before Interest and Taxes / Total Assets

X4: Book Value of Equity / Total Liabilities

A5: Constant Value (+3.25)

X1: Working Capital / Total Assets

In the Z-Score or EM Score method, the initial factor is the ratio of working capital to total assets. This ratio assesses the bank's capacity to meet its short-term obligations and represents the proportion of the firm's liquid assets to its overall capitalization. A rising liquidity value indicates a favorable indication, while a declining value implies increased liabilities and potential distress for the bank (Tran, 2021).

X2: Retained Earnings / Total Assets

The second variable of the model measures the bank's capability to generate earnings through its assets. A higher ratio is preferred, as it indicates the bank's ability to accumulate profits. However, typically a young firm like Türkiye Emlak PB in our study will exhibit a low ratio of retained earnings to total assets because it has not had sufficient time to accumulate substantial profits. Therefore, Altman (1968) emphasized that the likelihood of failure is considerably higher during the early years of a firm.

X3: Earnings before Interest and Taxes / Total Assets

The ratio of earnings before interest and tax (EBIT) to total assets reflects the relationship between a company's profitability and its assets. It measures the efficiency of the firm's assets without considering tax or leverage factors.

X4: Book Value Equity / Total Liabilities

The fourth variable represents financial leverage, which is the proportion of equity in the firm's total assets. This measure indicates how much the firm's assets can decline in value before the liabilities exceed the assets, resulting in insolvency. A higher value of this ratio suggests that the firm is more aggressive in financing its growth through debt (Chieng, 2013).

X5: Constant Value

Where the first four variables are still without a format change, the last numerical constant value (+3.25) was added by Altman et al (1998) to standardize the model.

The zones of discrimination depend on the formula result from the EM Score arranged as below:

If the EM-Score > 2.6 it means the firm is in the "Safe" zone

If the EM-Score is between 1.1 and 2.6 it's called the "Grey" zone ($1.1 \leq Z\text{-score} \leq 2.6$)

Lastly, if EM-Score < 1.1 it's in the zone called the "Distress" zone.

These zones categorize the financial stability of firms based on their EM Score values. If it is above 2.6 indicates a safe financial position, while a score between 1.1 and 2.6 represents a grey area where the firm's financial stability is less certain. An EM Score below 1.1 indicates a distress situation, suggesting potential financial difficulties for the firm.

On the other hand, once the EM Score has been calculated, it can be used to determine a bond rating equivalent for the company. The bond equivalent rating table is derived from an analysis of financial statements (Altman, Hartzell, & Peck, 1998; Coelho, 2014). The table provides a concise and clear representation of bond ratings corresponding to different ranges of the Emerging Market System (EMS). In the table, the bond ratings are categorized from the highest credit quality "AAA" to the lowest "D". Companies with an EMS above 8.15 are classified as "AAA," indicating a very low risk of default. On the other end, companies with an EMS below 1.75 receive a rating of "D," indicating a high risk of default.

The decision to employ the EM Score in our study is based on several factors. Firstly, the inconsistent findings observed in previous studies using the traditional Z-Score model highlight the need for a more tailored approach in the context of emerging markets. Secondly, utilizing the EM Score has demonstrated improved consistency in assessing financial stability within emerging markets according to previous studies. Furthermore, its application accounts for the specific dynamics, risk profiles, and structural characteristics of such developing economies, providing a more nuanced understanding of their financial landscape. By employing the EM Score, I aim to enhance the reliability and relevance of the study and contribute to the existing body of knowledge regarding the financial stability of Turkish PBs and CBs.

3.1.2. Non-Performing Loans (NPL) Ratio

The second measure I examine to assess banking stability is the NPL ratio, which serves as an indicator of asset quality and risk soundness issues within banks. This ratio is derived from accounting data and is calculated by dividing the non-performing loans by the total value of loans (NPL/TL) in which the borrower has not made scheduled payments for at least 90 days (Karapappas, 2023).

In other words, the NPL ratio indicates the percentage of loans that are at risk of not being repaid by borrowers, either due to overdue payments or default. These loans are considered non-performing because they are not generating the expected income for the bank (Rahman & Jahan, 2018). A higher NPL ratio indicates a higher level of credit risk and potential financial distress for the bank.

With the abundance of various models and approaches in credit risk management, I focused on analyzing the NPL ratio as a key indicator and making it a proxy for the financial stability of Turkish PBs. By narrowing our focus, I aimed to gain deeper insights into the credit risk dynamics and challenges faced by those banks. Also, I aimed to deliver relevant and targeted findings that could offer practical implications for credit risk soundness and management strategies for the Turkish banking sector.

$$\text{NPL ratio can be easily found by formula} = \frac{\text{Non-Performing Loans}}{\text{Total Loans}} \times 100 \%$$

There are some general criteria that researchers, analysts, and regulators often use to assess the health of a bank based on its NPL ratio (Saleh & Winarso, 2021). These are:

If the NPL ratio is < 5%, it means the firm is healthy.

If the NPL ratio is between 5 and 10, it means a moderate zone ($5 \% \leq \text{NPL ratio} \leq 10\%$).

If the NPL ratio is > 10%, it means the firm is in an unhealthy status.

The NPL ratio below 5% is generally considered low and indicates a healthy loan portfolio. Banks with NPL ratio below this threshold are often viewed positively in terms of asset quality and risk management. The NPL ratio between 5% and 10% is considered moderate. It suggests that a bank has a certain level of NPL, but it might still be able to manage the credit risk effectively. Lastly, the NPL ratio exceeding 10% is generally seen as high and raises concerns about the bank's asset quality. A high NPL ratio indicates a significant portion of NPL, which may impact the bank's profitability and capital adequacy.

However, regulations and industry standards may also play a role in defining what is considered a healthy NPL ratio. Therefore, regulators in different countries might set specific guidelines or thresholds to monitor and control credit risk in banks.

3.2 Scope of the Study

The scope of this thesis extends to a comprehensive examination of both the financial stability and credit risk soundness of Turkish PBs. I focused on the period from 2016 to 2022, covering 7 years, to gain an understanding of the banks' performance over time. Also, I aimed to compare the financial stability and credit risk profiles of Turkish PBs with those of CBs in Türkiye, considering a wider range of variables. Additionally, the study investigates the relationship between financial stability and credit risk within the framework of the banking sector. The research also involves a comprehensive examination of the methodology, including the application of the EM Score and the analysis of NPL ratios.

3.3 Data

I have gathered secondary data from reliable sources, such as the TKBB and BRSA official websites, to ensure data credibility. This data comprises financial information of Turkish PBs and CBs from audited financial reports. These reports are prepared by external auditors and adhere to accounting standards.

The financial data includes key statements like income statements, balance sheets, and cash flow statements for each of the PBs, covering the years 2016 to 2022. To compare PBs and CBs, I utilized annual average data for each sector spanning from 2005 to 2022.

For assessing financial stability, I collected the necessary financial ratios and indicators for calculating the EM Score. To analyze credit risk, I obtained data on NPL ratios for each PB and the annual sector data. I conducted the analysis using the Stata statistical software developed by StataCorp.

CHAPTER 4: FINDINGS AND RESULTS

In this chapter, results and discussions of the EM Score and NPL of Turkish PBs and a comparison of PBs and CBs for both models will be presented.

4.1 Descriptive Statistics Regarding EM Score for PBs

Table 4.1 provides the descriptive statistics of EM Score between 2016 and 2022 for each bank, as well as an average across these variables. Appendix Table A.1 provides detailed information about each variable of the overall EM Score for each PB in each year between 2016 and 2022.

Table 4.1 Descriptive Statistics based on the EM Score results of PBs from 2016 to 2022.

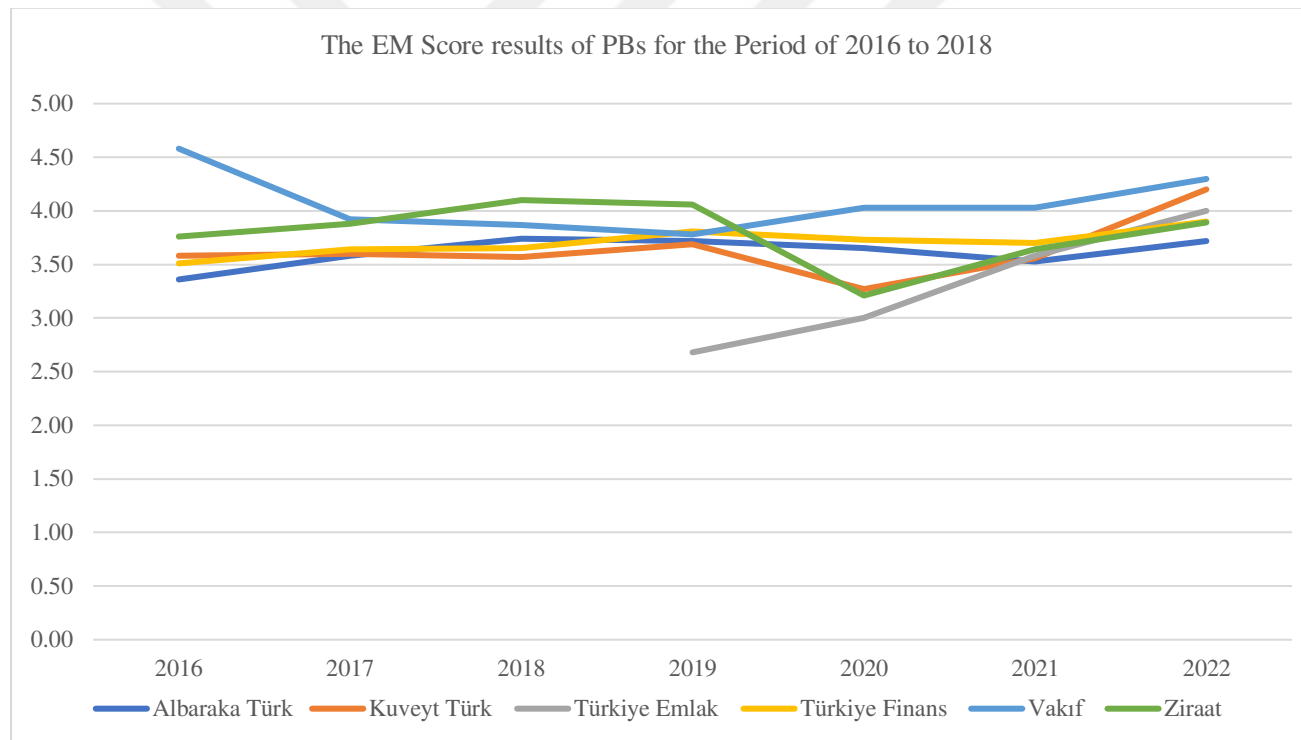
Variable	Obs.	Mean	Std. Dev.	Min	Max
Albaraka Türk	7	3.61	.14	3.36	3.74
Kuveyt Türk	7	3.64	.28	3.27	4.2
Türkiye Emlak	4	3.31	.59	2.68	4.0
Türkiye Finans	7	3.70	.13	3.51	3.9
Vakıf	7	4.07	.28	3.78	4.58
Ziraat	7	3.79	.30	3.21	4.1
Average	7	3.72	.16	3.48	4.00

According to Table 4.1, the mean EM Scores for these banks show some variation, ranging from 3.31 for Türkiye Emlak PB to 4.07 for Vakıf PB. On average, the EM Score for all the PBs is 3.72, indicating a reasonably stable level of financial health. The minimum EM Score is 2.68 for Türkiye Emlak PB, and the maximum is 4.58 for Vakıf PB. While there are minor variations over the years, most of these Turkish PBs seem to maintain a stable financial position during the

specified time frame. In terms of standard deviation, Türkiye Finans PB exhibits the lowest variability with a value of 0.13, meaning their EM Score results are tightly clustered around the mean. In contrast, Türkiye Emlak PB has a relatively high standard deviation of 0.59, suggesting that their scores are more spread out over a wider range.

To gain a deeper understanding of the factors influencing the EM Score results, it's essential to conduct a trend analysis over time for these PBs.

Figure 4.1 The EM Score results of PBs from 2016 to 2022.



Source: Calculated by the author based on the Participant Banks Association of Türkiye (TKBB) reports accessed July 31, 2023, from

<https://tkbb.org.tr/sayfa/sektor-bilgileri/denetim-raporlari>

The EM Score results of Turkish PBs for the period of 2016 to 2022 are given in Figure 4.1. Among the observed banks, Albaraka Türk PB consistently demonstrated financial success, evidenced by positive trends in key metrics, reflecting robust liquidity, retained earnings, high

profitability, and sound financial structure by remaining over 2.6. Kuveyt Türk PB maintained a resilient financial performance during the same period. Even though a slight decline emerged in 2020, the bank's financial stance remained robust in subsequent years. Notably, the EM Score consistently exceeded 2.6, reaching 4.2 in 2022, reinforcing the bank's resilience. Türkiye Emlak PB doesn't have data for the period of 2016 to 2018 as its operations started in 2019. However, the bank overcame initial challenges, demonstrating significant financial improvement. EM Score consistently surpassed 2.6, reaching a reassuring 3.99 in 2022, showcasing the bank's resilience. Türkiye Finans PB displayed a consistent positive financial trajectory from 2016 to 2022, as signified by a cumulative score of 3.90 in 2022, further emphasizing the bank's stability. Vakıf PB consistently demonstrated favorable financial performance throughout the observed period, sustaining a strong financial stance. Although minor fluctuations were observed, the bank consistently maintained positive values across variables, solidifying its financial stability. EM Score consistently exceeded the 2.6 threshold, reaching an impressive 4.30 in 2022, reaffirming the bank's sound health and minimal distress risk. Lastly, Ziraat PB exhibited variable financial performance over the entire span, marked by fluctuations. Even though the score decreased in 2020, subsequent years witnessed positive variable trends, leading to a consistently strong EM Score exceeding 2.6, underscoring the bank's sturdy financial position and low risk of distress.

Overall, from 2016 to 2022, the six PBs showcased generally positive financial performance based on the EM Score results. Across the years, the Score consistently remained above the threshold of 2.6, indicating that all banks maintained a stable financial position with a low enough risk of distress.

4.2 Descriptive Statistics Regarding the EM Score of PBs vs. CBs

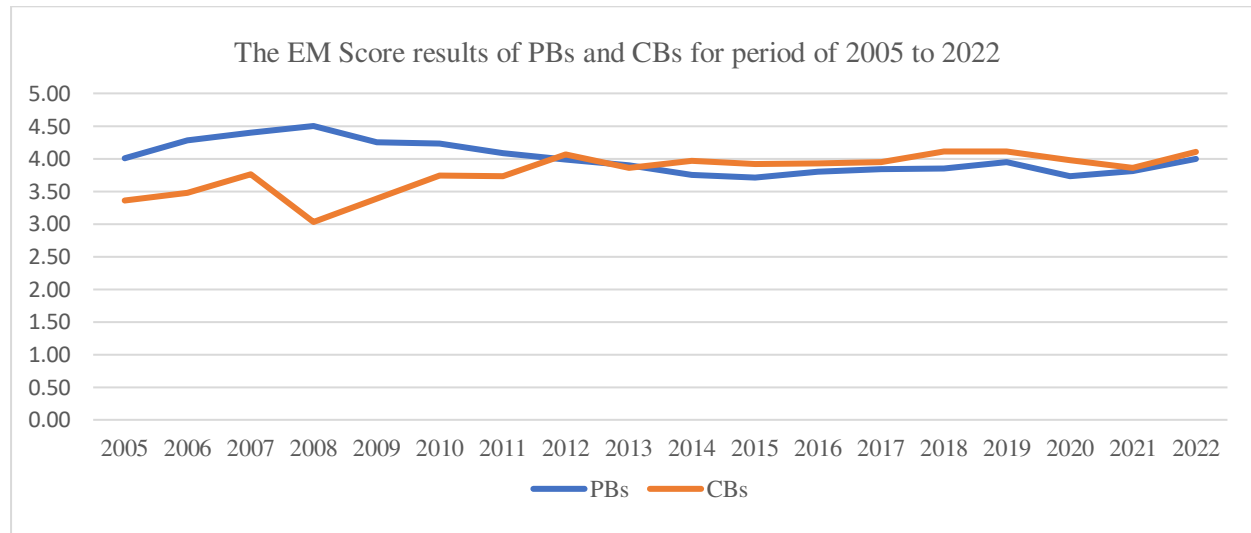
Descriptive statistics and results of EM Scores for PBs and CBs are given in Table 4.2.

Table 4.2 Descriptive Statistics of the EM Score results of PBs and CBs from 2005 to 2022.

Variable	Obs.	Mean	Std. Dev.	Min	Max
PBs	18	4.00	.23	3.71	4.50
CBs	18	3.80	.30	3.03	4.11

For CBs the average EM Score is 3.80, showcasing a moderate level of financial health. The standard deviation of 0.30 indicates that the EM Score for CBs has some variability around this mean. The scores range from 3.03 to 4.11, suggesting diversity in financial health levels within this category. PBs present a higher average EM Score of 4.00, indicating a comparatively stronger financial health status. The standard deviation of 0.23 points toward a more consistent distribution of scores around the mean. The range of scores spans from 3.71 to 4.50, showcasing relatively stable financial health levels among PBs.

Figure 4.2 The EM Score results of PBs and CBs from 2005 to 2022.



Source: Calculated by the author based on the BRSA website annual data accessed July 31, 2023, from <http://www.bddk.org.tr/BultenAylik/>

According to Figure 4.2, both sectors generally maintained positive financial performance and stability over the period from 2005 to 2022. Throughout the years, CBs showcased impressive improvement, steadily increasing their EM Score, reaching a peak of 4.11 in 2018. This growth demonstrates their ability to navigate through economic crises and adapt to changing market conditions. On the other hand, Turkish PBs demonstrated consistent financial stability, with EM Score remaining above 3.80 throughout the years. While their growth trajectory was more modest compared to CBs, their stable performance reflects their resilience in the face of economic challenges. Moreover, both sectors had almost intersection points in 2012, 2013, and 2021. Overall, they consistently maintained an EM Score above 2.6, indicating financial stability and a lower risk of distress.

4.3 Descriptive Statistics and Comparison of NPL among PBs

Table 4.3 shows the descriptive statistics and NPL ratios of PBs from 2016 to 2022.

Table 4.3 Descriptive Statistics of the NPL ratios of PBs from 2016 to 2022.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Albaraka Türk	7	5.22	1.81	1.90	7.20
Kuveyt Türk	7	2.75	.80	1.64	3.71
Türkiye Emlak	4	1.33	1.08	.21	2.80
Türkiye Finans	7	5.28	1.46	3.15	8.01
Vakıf	7	1.48	1.12	.14	3.04
Ziraat	7	1.57	1.08	.21	2.80
Average	7	3.05	.96	1.51	4.47

The average NPL ratio of Albaraka Türk PB stands at 5.22, demonstrating a significant portion of the NPL ratio within the bank's portfolio. The standard deviation of 1.81 indicates variability in the NPL ratio around this mean. The scores vary from 1.90 to 7.20, signifying diverse levels of NPL ratio. On the other hand, Kuveyt Türk PB exhibits a lower average NPL ratio of

2.75, reflecting a relatively healthier loan portfolio. The standard deviation of 0.80 suggests a moderate level of variability around the mean. The NPL ratios range from 1.64 to 3.71, indicating a narrower spread compared to Albaraka Türk PB. Türkiye Emlak PB has a smaller sample size (Obs. 4), with an average NPL ratio of 1.33. The standard deviation of 1.08 reveals higher dispersion around the mean, while the NPL ratios range from 0.21 to 2.80, indicating a wide range of NPL ratios. Türkiye Finans PB shows a relatively high average NPL ratio of 5.28, accompanied by a standard deviation of 1.46. The NPL ratios range from 3.15 to 8.01, suggesting a considerable variability in the NPL ratio. Both Vakıf and Ziraat PBs have average NPL ratios of 1.48 and 1.57, respectively, with standard deviations of 1.12 and 1.08. The NPL ratios span from 0.14 to 3.04, reflecting varying degrees of NPL within these banks.

The overall average for all banks is 3.05, with a standard deviation of 0.96. This indicates an average level of NPL ratio across the combined dataset. The minimum and maximum NPL ratios are 1.51 and 4.47, respectively, providing a range of NPL ratio levels within the considered banks over the specified period.

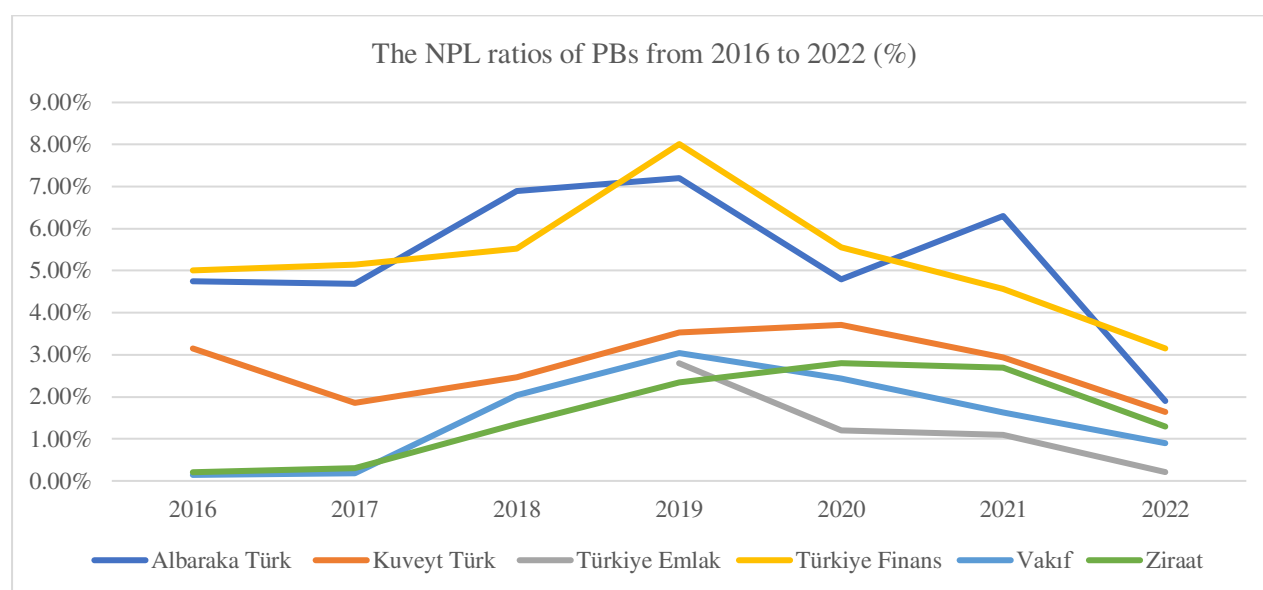


Figure 4.3 The NPL ratios of PBs from 2016 to 2022 (%)

Source: Calculated by the author based on the Participant Banks Association of Türkiye (TKBB) reports accessed July 31, 2023, from <https://tkbb.org.tr/sayfa/sektor-bilgileri/denetim-raporlari>

According to Figure 4.3, starting with Albaraka Türk PB, the NPL ratio fluctuated over the years. It increased from 4.75% in 2016 to 7.20% in 2019, suggesting credit quality concerns possibly due to economic challenges or sector-specific factors affecting borrowers' ability to repay loans. However, the bank demonstrated resilience by decreasing the NPL ratio to 4.80% in 2020, possibly a result of proactive credit risk management measures even during the COVID-19 pandemic. The ratio increased again to 6.30% in 2021 before significantly declining to 1.90% in 2022, indicating successful efforts in managing credit risk and enhancing asset quality in the last year. Kuveyt Türk PB maintained relatively stable NPL ratios ranging from 1.85% to 3.71% over the years. The slight upward trend in recent years might be attributed to economic challenges, including the effects of the COVID-19 pandemic. However, the bank's NPL ratios remained at manageable levels, reflecting sound credit risk management practices. Türkiye Emlak PB stood out with remarkable NPL performance, maintaining low NPL ratios and making them lower each year throughout its life. This indicates excellent credit risk management and minimal NPAs, reflecting the bank's focused approach and prudent lending. Türkiye Finans PB witnessed fluctuations in its NPL ratio, with a peak of 8.01% in 2019 over the sector. The bank managed to improve its NPL ratio in subsequent years, possibly through enhanced credit risk management and loan restructuring efforts during the pandemic's economic impact. Vakıf PB displayed consistently strong credit risk management, maintaining NPL ratios ranging from 0.14% to 0.90%. Exceptionally low NPL ratios indicate effective risk management and a healthy asset portfolio, further solidified by the bank's conservative financial structure and prudent lending practices. Ziraat PB maintained relatively stable NPL ratios between 0.21% and 2.80%. The bank's conservative approach and diverse customer base likely contributed to its stable performance and effective credit risk management.

Overall, most of the PBs maintained relatively low NPL ratios, suggesting their ability to manage credit risks effectively and maintain financial stability. Vakıf and Türkiye Emlak PBs showcased exceptional performance with the lowest NPL ratios, reflecting their credit risk management practices. While the NPL ratios for Albaraka and Türkiye Finans PBs surpassed the 5% threshold for a couple of years, they signified a good credit risk management portfolio in 2022. The analysis also indicates that the COVID-19 pandemic might have influenced NPL ratios for some banks, but overall, the banks demonstrated resilience and effective risk management.

4.4 Descriptive Statistics and Comparison of NPL between PBs and CBs

Examination of the descriptive statistics and outcomes of the NPL ratio for PBs and CBs are presented in Table 4.4.

Table 4.4 Descriptive Statistics of the NPL ratios of PBs and CBs from 2005 to 2022.

Variable	Obs.	Mean	Std. Dev.	Min	Max
PBs	18	3.75	.92	1.43	5.40
CBs	18	3.65	.95	2.25	5.74

For the CBs, the data indicates an average NPL ratio of 3.65, signifying a moderate level of NPL within their loan portfolios. The standard deviation of 0.95 suggests some variability around this mean, while the NPL ratios range from 2.25 to 5.74, indicating diverse levels of NPL across these banks. Conversely, PBs display a slightly higher average NPL ratio of 3.75, reflecting a comparable degree of NPL ratio within their portfolios. The standard deviation of 0.92 suggests a relatively consistent distribution of NPL ratios around this mean. The NPL ratios span from 1.43 to 5.40, demonstrating varying levels of NPL among the participating banks.

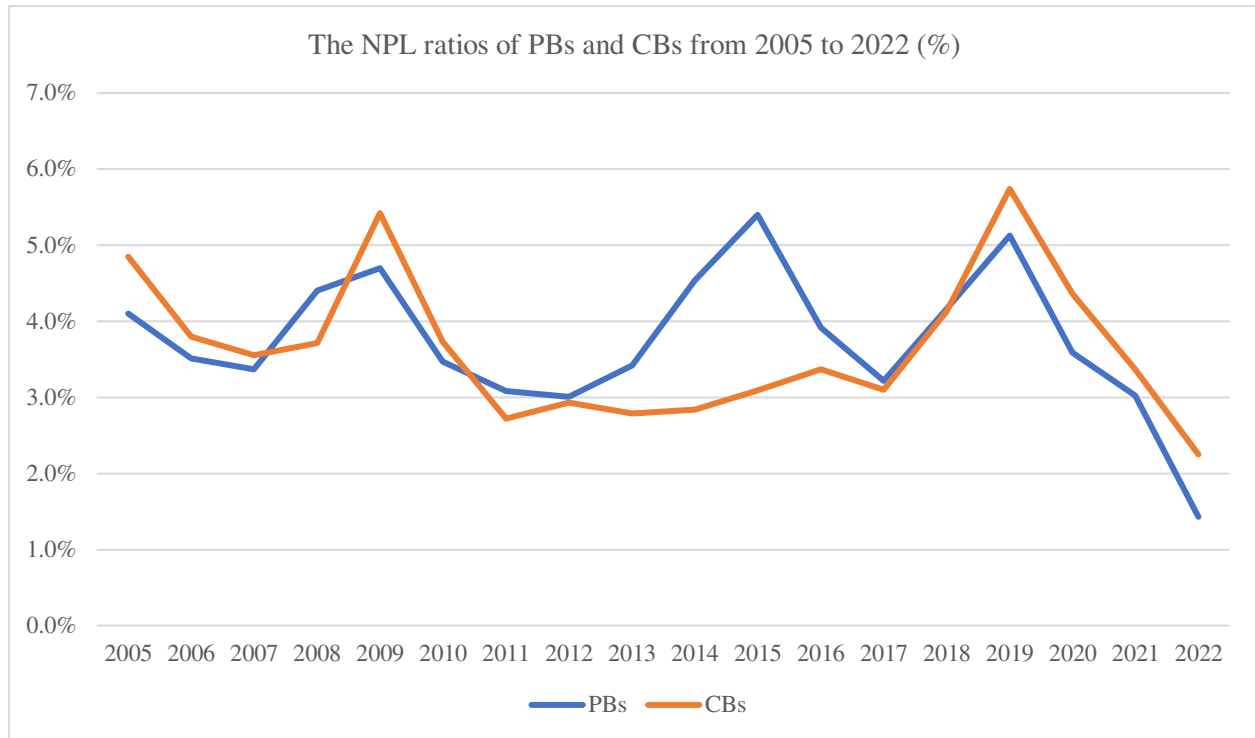


Figure 4.4 The NPL ratios of PBs and CBs from 2005 to 2022 (%)

Source: Prepared by the author based on the BRSA website annual data accessed July 31, 2023, from <http://www.bddk.org.tr/BultenAylik/>

Based on Figure 4.4, between 2005 and 2008, both PBs and CBs experienced relatively stable NPL ratios. PBs consistently maintained slightly lower ratios compared to CBs during this period. In 2008, the NPL ratio for PBs rose to 4.40%, indicating a notable impact on their loan quality and a higher risk of loan defaults. On the other hand, CBs showed a relatively modest increase in their NPL ratio, which reached 3.71% in the same year.

From 2009 to 2014, the NPL ratios for both PBs and CBs fluctuated. In 2009, PBs' NPL ratio increased to 4.70%, while CBs' ratio increased to 5.42%. This year has the potential to show the effects of the global 2008 economic crisis considering to NPL ratio. Hence, the NPL ratios of CBs have increased more than the NPL ratio of PBs in the year 2009. However, both sectors gradually reduced their NPL ratios over time.

In 2015, both PBs and CBs experienced an increase in their NPL ratios, with PBs reaching 5.40%, having more value than CBs' NPL ratio may show the possibility of economic challenges

during this period. In 2016 and 2017, both PBs and CBs experienced a decline in their NPL ratios. This improvement in asset quality can be attributed to a combination of factors. A stable macroeconomic environment, stringent regulatory measures, and improved banking practices likely played key roles in reducing the likelihood of loan defaults. Additionally, government support and favourable global economic conditions may have contributed to borrowers' ability to meet their financial obligations. The collective impact of these factors resulted in a healthier loan portfolio for Turkish banks. In 2018, the slight increase in NPL ratios for both PBs and CBs may have been influenced by global economic challenges or specific regional events impacting borrowers' financial stability. The more significant increase in NPL ratios for both sectors in 2019 could be attributed to heightened global economic uncertainties and challenges during that period, affecting businesses and individuals alike. The disparity between CBs' higher NPL ratio of 5.74% compared to PBs' 5.13% suggests varying impacts on different banking sectors. The subsequent resilience demonstrated in 2020 by both PBs and CBs, with a reduction in NPL ratios, indicates effective risk management and conservative lending practices amid economic uncertainties induced by the COVID-19 pandemic. In 2021, the sustained low NPL ratios for both PBs and CBs showcase adaptability to ongoing pandemic-induced economic uncertainties. The notable improvement in PBs' credit risk management in 2022, leading to a low NPL ratio of 1.43%, signifies effective strategies implemented over the years. Although CBs also improved, their slightly higher NPL ratio of 2.25% indicates ongoing challenges.

Recent unconventional monetary policies and interventions in market prices in Türkiye, particularly affecting loan interest rates and bond yields, have led to diverse impacts on financial markets. For instance, in 2022 despite uncontrollable factors such as rising inflation and regulatory changes, financial markets, notably commercial banks, achieved short-term gains. However, the closely monitored future reactions of interest rates, exchange rates, and credit risks, influenced by macroeconomic policies, remain crucial. Potential risks, such as interest rates surpassing inflation and subsequent increases in credit risk, must be considered.

On the other hand, over the last five years, the consistent trend of CBs having higher NPL ratios than PBs suggests differing vulnerabilities or risk exposures between the two sectors. These variations could be attributed to sector-specific dynamics, diverse clientele, or distinct risk management practices adopted by PBs and CBs in response to evolving economic conditions.

4.5 Statistical Analysis Using the Wilcoxon Signed-Rank Test

The Wilcoxon signed-rank test is a non-parametric statistical test used to assess whether there is a significant difference between paired observations within a dataset (Oyeka & Ebuh, 2012). Because of the interdependencies between banks due to systematic risk (the performance of one bank has an unavoidable impact on the performance of other banks), the Wilcoxon signed rank is selected. I will employ this test to determine whether there are statistically significant variations in EM Scores and NPL ratios between the two bank types from 2005 to 2022.

✓ For the EM Score, our hypothesis is:

H₀: $\mu_{PB} = \mu_{CB}$ EM Score of PBs is equal to the EM Score of CBs.

H_a: $\mu_{PB} \neq \mu_{CB}$ EM Score of PBs is not equal to the EM Score of CBs.

The Wilcoxon Signed Rank Test Z statistic is -0.893 (p value:0.37)

Number of the observations is 18. From those observations, 10 of them have positive sign values and 8 have negative signs. There are no observations that have the same sign which results in have zero value. The p-value is 0.3720 and the test yielded a test statistic (z) of -0.893. This test statistic does not suggest that there could be meaningful differences in EM Score values between the two bank types.

✓ For NPL ratios, our hypothesis is:

H₀: $\mu_{PB} = \mu_{CB}$ NPL ratio of PBs is equal to the NPL ratio of CBs.

H_a: $\mu_{PB} \neq \mu_{CB}$ NPL ratio of PBs is not equal to the NPL ratio of CBs.

The Wilcoxon Signed Rank Test Z statistic is -0.196 (p value:0.84)

Number of the observations is 18. From those observations, 9 of them have a positive sign value and 9 have a negative sign. There are no observations that have the same sign which results in have zero value. The p-value is 0.8446 and the test yielded a test statistic (z) of -0.196. This test statistic does not suggest that there could be meaningful differences in EM Score values between the two bank types.

4.6 Correlation Assessment between Results of EM Score and Results of NPL

Correlation analyses were conducted for the EM Score and the NPL ratio of both PBs and CBs over the period from 2005 to 2022 to see if there is any significant correlation between the EM Score value and the NPL ratio of each type of bank. As a higher EM Score represents better financial stability and a higher NPL ratio represents more credit risk, I expect to observe a negative correlation between the EM Score and NPL ratio of each group.

Table 4.5 Correlation Analysis of the EM Score and the NPL ratios of PBs and CBs from 2005 to 2022.

PBS	 	EM-S	NPL	CBS	 	EM-S	NPL
EM-S	 	1.0000		EM-S	 	1.0000	
NPL	 	-0.0813	1.0000	NPL	 	-0.2806	1.0000

The correlation coefficient of -0.0813 between the EM Score and NPL of PBs indicates a weak negative correlation, implying that as the EM Score of PBs increases, the NPL ratio tends to decrease. However, the correlation is close to zero, suggesting a minimal linear relationship between these variables. Similarly, for CBs, the correlation coefficient of -0.2806 suggests a weak negative correlation between the EM Score and NPL, aligning with the observed pattern in PBs. This supports our anticipated negative relationship, indicating that an improvement in financial stability (EM Score) is associated with a decrease in credit risk (NPL ratio). In essence, well-managed banks with better financial stability are generally at a lower risk of non-performing loans.

CHAPTER 5: DISCUSSION

5.1 Interpretation of the Results

Within the realm of PBs, variations in financial health and credit risk management were noted. When considering the average EM Score of the PBs, Vakıf PB leads with the highest EM Score of 4.07, indicating significant financial stability within a relatively narrow range. Ziraat PB follows closely with an EM Score of 3.79, signifying a moderate level of financial stability. Türkiye Finans, Kuveyt Türk, and Albaraka Türk PBs showcase relatively similar trends in EM Score values, all ranging from around 3.60 to 3.70, suggesting comparable levels of financial stability. In this context, Türkiye Emlak PB demonstrates a relatively stable financial position with an EM Score of 3.31, reflecting prudent financial stability. On average, the EM Score for all banks stands at 3.72, collectively displaying a moderate level of financial stability. Importantly, all these scores are comfortably above 2.60, indicating that they are well within the safe zone for financial health.

On the NPL front, among the PBs, Türkiye Emlak PB stood out with the most effective credit risk management, boasting consistently low NPL with an average NPL ratio of 1.33, showcasing the best credit portfolio performance. Vakıf PB showcased a relatively stable credit risk profile with an average NPL ratio of 1.48, ranking third. Ziraat PB ranked fourth, displaying varying credit risk levels within its portfolio with an average NPL ratio of 1.57. which means Public PBs have comparatively less credit risk and credit default. Following closely to public PBs, Kuveyt Türk PB demonstrated a resilient loan portfolio with relatively lower NPL ratios, averaging 2.75. Albaraka Türk PB ranked fifth, presenting potential fluctuations in credit risk with an average NPL ratio of 5.22, while Türkiye Finans PB ranked sixth, exhibiting relatively higher NPL with an average NPL ratio of 5.28, indicating a diverse range of credit risk levels within their respective portfolios. The average NPL ratio for all banks is 3.05, with a standard deviation of 0.96, signifying moderate NPL levels across the dataset. Indeed, while there were instances when Albaraka Türk and Türkiye Finans PBs exceeded the 5% threshold in some years, their overall performance indicates a sound credit risk portfolio. The majority of their NPL ratio levels are below 5%, aligning with a prudent credit risk portfolio.

A notable comparison emerged between PBs, and CBs based on their average EM Scores. CBs recorded an average EM Score of 3.80, while PBs exhibited a higher average EM Score of 4.00, suggesting a relatively stronger financial position. In terms of NPL ratio, PBs and CBs showcased comparable stable, and resilient NPL ratios. Even though PBs have a slightly higher NPL ratio of 3.75, since 2019 they have had less NPL ratio than their conventional counterparts.

The Wilcoxon signed-rank test was conducted to assess significant variations in EM Score and NPL ratio between PBs and CBs from 2005 to 2022. The test results revealed that there are no meaningful differences in EM Score values between the two bank types. The NPL ratios did not show statistically significant differentiation between PBs and CBs as well.

The correlation analysis reveals that there is a correlation between the EM Score and the NPL ratio, although the strength of this relationship varies between PBs and CBs. For PBs, the correlation is weak, indicating that there is very little linear relationship between financial stability, as measured by the EM Score, and credit risk, as represented by the NPL ratio. In contrast, for CBs, the correlation is more pronounced, suggesting that changes in the EM Score have a stronger likelihood of being associated with changes in the NPL ratio. Overall, the analysis suggests a connection between financial stability and credit risk within the dataset, with a moderate correlation observed for CBs and a weak correlation noted for PBs. This implies that there is a discernible yet not very robust connection between these crucial financial indicators.

5.2 Comparison of the Findings with Previous Studies

In comparing our study's findings with those of previous research, it is evident that the cross-country applicability of the EM Score extends beyond the USA, as demonstrated by various studies. While each of these studies utilized the EM Score as a central tool, they were conducted in unique contexts. Our research aligns with the outcomes of some of these previous studies, underscoring the versatility of the EM Score.

For instance, Zaabi's (2011) investigation into UAE Islamic Banks, which employed the EM Score, corroborates our use of this scoring system in assessing stability. Similarly, Coelho (2014) conducted a solvency evaluation of South African firms listed on the Alt-X exchange after

the financial crisis, and his findings are in harmony with our own. Ghosh et al. (2017) emphasized that the ratios used in calculating the EM Z-Score can serve as valuable indicators, further substantiating our findings.

Zainudin et al. (2019) highlighted the relevance of the EM Score in assessing stability among Malaysian Islamic Banks, reinforcing our conclusions. Likewise, Ar-Rasyid and Gandakusuma (2020) applied the EM Score to the Indonesian construction sector, mirroring our use of the EM Score, and their findings echoed our results. Even in a study where Putri and Gandakusuma (2019) applied three different models, they found that the EM Score demonstrated the highest percentage of accurate predictions, strengthening the case for its effectiveness.

Furthermore, Tran (2021) extended the application of the EM Score to predict financial distress in the Vietnamese market, highlighting its predictive capability in a distinct financial environment. Finally, Hussein and Idris (2023) emphasized the model's ability to identify financial vulnerabilities in the Jordanian manufacturing sector, reiterating the significant role of the EM Score in measuring the financial stability of emerging markets. In summary, these studies collectively support the broad utility and reliability of the EM Score in various international settings.

In contrast, Hasan et al. (2021) conducted a study to assess the ability of the EM Score to predict the financial health of Iraqi private banks, especially during challenging economic conditions. Their analysis covered both successful and failed banks, utilizing the EM Score specifically designed for emerging markets and private companies. However, the results of their study were inconclusive and challenging to interpret. It did not provide early warnings for either failing or non-failing banks. When comparing their findings with our own, Hasan et al. concluded that the EM Score is not an effective tool for predicting financial issues in Iraqi private banks. Sule et al. (2018), on the other hand, delved into the relationship between corporate social responsibility (CSR) and the risk of bankruptcy in Nigerian businesses using the EM Score. However, their paper primarily engaged in theoretical discussions rather than presenting empirical findings.

Numerous studies have investigated the use of the NPL ratio in both a global context and in Türkiye. In this comparison, I will primarily focus on our study and how it relates to previous research on the Turkish banking sector.

For instance, Büyükkara (2015) examined loan default rates in Türkiye, particularly for companies that received loans from four PBs and 40 CBs during the years 2011-2012. Their analysis focused on monthly loan data, specifically business loans denominated in Turkish Lira issued between January 2011 and December 2012. Their findings indicated a higher likelihood of loan default for loans from PBs, even after accounting for various factors. In contrast, our study analyzed the NPL ratios of Turkish PBs from 2016 to 2022, providing insights into specific banks' NPL performance and attributing fluctuations to economic challenges and risk management efforts. Additionally, our study extended the comparison of NPL ratios between PBs and CBs over a broader period from 2005 to 2022, revealing that PBs generally maintained lower NPL ratios, even during economic crises, compared to CBs. Our research's specialized focus on Turkish PBs and the comparison of PBs and CBs deepened the understanding of credit risk management practices within this subset of banks.

Our study is in alignment with previous research, such as Yağcılar and Demir (2015) (2015) and Us (2016), in recognizing the influence of macroeconomic factors and external economic shocks on NPL ratios. However, our study goes a step further by providing a unique perspective on NPL ratios and their implications for credit risk mitigation, especially within the context of PBs and CBs.

Similarly, Özkan and Işıl (2016) explored factors influencing NPL, our research provides a unique perspective by delving into NPL ratios, revealing implications for credit risk mitigation in the context of PBs and CBs. Comparing our NPL ratio findings with existing studies, notable similarities and distinctions have been observed. Alkhawaja and Görmüş (2019) analysis aligns with the focus on NPL as a measure of credit risk, and they used the model for IBs and regular banks for comparison. Our study's examination of NPL ratios within a defined timeframe aligns with the paper of Özçim and Kaya (2021) but they analyzed the relationship between credit risk and some macroeconomic variables. However, previous studies about the NPL ratio for the Turkish banking sector generally focus on how certain, such as macroeconomic factors and bank-specific factors, affect the NPL ratio, which differentiates from our study.

In summary, while previous studies on the NPL ratio in the Turkish banking sector have predominantly explored factors affecting NPL ratios, such as macroeconomic and bank-specific elements, our study offers a unique perspective by focusing on the performance of Turkish PBs

and their comparison with CBs, deepening our understanding of credit risk management practices in this specific subset of banks.

5.3 Implications of the Study

Our findings have several implications for the banking sector. These are:

The comparative analysis of the EM Score highlights variations among different banks. This means that when examining the EM Scores of various banks, we observe differences in the levels of financial stability. These variations could stem from a range of factors, including differences in management practices, risk exposure, asset quality, or economic conditions in the regions where these banks operate.

The variability in the NPL ratio among different banks indicates differences in their approaches to credit risk management. Some banks consistently maintain a low NPL ratio, while others demonstrate greater fluctuations in this measure. However, overall, most of these banks appear to have a convenient level of NPL ratio.

The comparison between PBs and CBs highlights that PBs tend to have higher EM Score values, reflecting better financial stability. However, both PBs and CBs exhibit similar NPL ratios. For both bank categories, financial stability, and credit risk portfolio are in a reasonable and convenient level.

The correlation analysis reveals a low degree of negative correlation between EM Score and NPL ratios, indicating that there may be some other factor that affects our correlation.

These implications aim to guide banks towards maintaining a healthy financial position while effectively managing their credit risk.

5.4 Limitations of the Study

While our study offers valuable insights, it is important to acknowledge its limitations. These are:

The most important limitation observed during calculating the EM Score. One of the variables with one of the two biggest coefficients of the overall equation is X1, which represents the ratio of net working capital to total assets. This variable has been found to have consistently negative and very low values across all years and banks as deposits tend to be short-term, while granted credits are largely long-term. More importantly, it's very difficult to calculate Net Working Capital (NWC) for banks as they have different balance sheets than regular firms. Since NWC represents current assets / short-term liabilities, there are no such categories for the bank's balance sheet. Even if they may follow their short-term liabilities in some other ways, there will be no current asset or short-term and long-term liability categories in the bank's balance sheet when I check their financial statements and reports. Therefore, it is very difficult to figure out the overall NWC ratio. As a result, this either negative or missing value of net working capital impacts the X1 variable, which in turn affects the overall Z-Score value in the discriminant analysis.

Our analysis is confined to a specific timeframe, potentially missing broader trends and variations. Some influence of external factors, such as global economic events, may not be fully captured in our study.

Financial data alone may not capture all relevant risk factors, such as operational risks or market conditions, limiting the study's scope.

CHAPTER 6: CONCLUSION AND POLICY RECOMMENDATION

6.1 Conclusion

This study delved into the intricate landscape of Turkish PBs and CBs. The analysis of EM Score and NPL ratios provided a deep understanding of the financial stability and risk resilience of these banks. The study revealed that PBs demonstrated commendable financial performance with EM Score consistently exceeding the threshold of 2.6. This stability was maintained even during periods of economic turbulence, such as the global financial crisis and the COVID-19 pandemic. Comparing PBs with CBs, even PBs exhibited a higher average EM Score, but statistically, it does not make any meaningful difference. Both sectors have an acceptable value of EM Score.

Based on NPL findings, even though there are some fluctuations and diverse values among PBs, overall performance indicates a sound credit risk portfolio. In terms of comparison, PBs and CBs showcased comparable stable and resilient NPL ratios on average. Even though PBs have slightly higher NPL ratios, since 2019 they have had less NPL ratio than their conventional counterparts.

The Wilcoxon Signed-Rank Test did not suggest any meaningful differences between both bank categories regarding the EM Score and NPL ratio. On the other hand, the correlation analysis showcases a moderate negative correlation between the EM Score and the NPL ratio.

These findings hold significant implications for the Turkish banking industry, regulators, and policymakers. The study underscores the capacity of PBs and CBs to navigate economic downturns while maintaining financial stability. The research contributes valuable insights to decision-making processes, fostering a more stable and resilient banking ecosystem in Türkiye. As the financial landscape continues to evolve, these findings offer a guiding light for the industry's future endeavors, promoting sustained growth and risk mitigation.

6.2 Policy Recommendations

I have some recommendations to enhance credit risk management practices, strengthen financial stability, and improve overall risk resilience within the Turkish PBs. These are:

Banks, particularly PBs, can utilize EM Score results to evaluate their financial stability position and should prioritize strengthening their financial stability measures accordingly. This could involve optimizing capital structures, liquidity management, and asset quality to improve overall financial health as the dependent variable of the EM Score based on these elements.

Banks with relatively higher NPL variability should consider diversifying their loan portfolios to mitigate credit risk concentration.

Banks should align their asset allocation strategies with their financial stability goals. This involves balancing higher-return assets with lower-risk assets to optimize financial stability and credit risk management simultaneously.

The low negative correlation between EM Score and NPL ratios underscores the need for a holistic approach that integrates financial stability and credit risk to see the other factors that may affect this correlation. Moreover, banks should perform regular economic scenario analyses to assess the potential impact of macroeconomic changes on both financial stability and credit risk. This helps in preparing proactive strategies to navigate uncertainties effectively.

Banks should strike a balance between financial stability and credit risk as these two have significant importance for sustainable growth and resilience. They should establish a robust monitoring and analysis system to continuously assess their financial health and credit risk management performance.

As proactive identification and management of potential vulnerabilities can enhance overall stability, regular monitoring of EM Score value and NPL ratios is essential. These regular reviews can help identify trends, areas for improvement, and potential early warning signals.

Finally, investment in continuous training for bank staff involved in credit risk assessment and management can be very useful. A well-trained team can contribute to effective risk identification, mitigation, and management strategies.

6.3 Suggestion for Future Research

To contribute to a deeper understanding of financial stability and credit risk, I propose the following areas for future research:

Exploring alternative methods for analyzing the financial stability of banks, taking into account the challenges associated with computing the net working capital ratio for banks. It may be worthwhile to investigate adaptations or modifications of the formula that can accurately represent the financial health of banks while accommodating their unique balance sheet structures.

Conducting a longitudinal study over an extended period to capture long-term financial trends and dynamics with a comprehensive perspective will be more beneficial

It's a good idea to undertake a cross-border comparative study involving international banks to offer a broader and more global view of financial stability and credit risk.

Recognizing that financial data alone may not encompass all relevant risk factors affecting banks, future studies could benefit from a multi-dimensional approach, which includes incorporating non-financial risk factors such as operational risks, regulatory changes, and market conditions. This approach might involve qualitative data analysis, sentiment analysis of industry reports, or seeking expert opinions to complement quantitative analysis.

REFERENCES

- AAOIFI. (2023). *Accounting and Auditing Organization for Islamic Financial Institutions*. Retrieved from AAOIFI: <https://aaoifi.com/?lang=en>
- Abdullah M., X. (2015). An Empirical Analysis of Liquidity, Profitability and Solvency of Bangladeshi Banks. *Journal of Business & Financial Affairs*, 5(1), 157. doi:10.4172/2167-0234.1000157
- Ahmad, F., & Hussain, R. T. (2021). Measuring Financial Longevity of Firm in Emerging Economy: A Study on Islamic Financial Institutions of Pakistan. *MINHAJ Journal of Economics Organization Science*, 1(2), 9-27.
- Ahmad, N. H., & Ariff, M. (2007). Multi-Country Study of Bank Credit Risk Managements. *The International Journal of Banking and Finance*, 5(1), 135-152.
- Ahmed, E. A. (2016). Credit Risk Management in Islamic Banks: With Special Reference to Non-performing Finance in the Sudanese Banks, 2002-2014. *Doctoral Thesis*. Wad Madani, Sudan: University of Gezira.
- Ahmed, H., & Khan, T. (2007). 10 Risk management in Islamic banking. In M. K. Lewis, & M. K. Hassan, *Handbook of Islamic Banking* (pp. 144-158). Massachusetts, USA: Edward Elgar Publishing Limited.
- Akram, H., & Rahman, K. u. (2018). Credit risk management A comparative study of Islamic banks and conventional banks in Pakistan. *ISRA International Journal of Islamic Finance*, 10(2), 185-205.
- Aksoy, E. E., & Göker, İ. E. (2018). Bankacılık Sektöründe Finansal Risklerin Z-Skor Ve Bankometer Metodları İle Tespiti, Bist'te İşlem Gören Ticari Bankalar Üzerine Bir Araştırma. *Muhasebe Bilim Dünyası Dergisi*, 20(2), 418-438. doi:DOI: 10.31460/mbdd.377424
- Alam, T., Hussain, I., & Saqib, A. (2023). Net Stable Funding and Liquidity Coverage Influence on Islamic Bank Financial Stability: Evidence from Malaysian Islamic Banking. *International Journal of Economics, Management and Accounting*, 31(1), 153–176.
- Al-Binali, T. (2023). Assessing the Financial Impact of Mergers on Islamic Banks: A Case Study of Sustainable Finance and Maqasid. *Academic Platform Journal of Halal Lifestyle*, 5(1), 1-21.
- Aldoseri, M., & Worthington, A. C. (2022). Credit Risk Management and Practices in Islamic and Conventional Banks: an Emerging Market Perspective. In D. K. Nguyen, *Handbook of Banking and Finance in Emerging Markets* (pp. 366-392). Cheltenham, UK: Edward Elgar Publishing Limited.
- Ali, M. A. (2023). An Assessment of Islamic Banking in Asia, Europe, USA, and Australia. *European Journal of Islamic Finance*, 10(1), 1-15.
- Alkhawaja, M. M., & Görmüş, Ş. (2019). Credit Risk Management: A Comparative Study between Islamic and Conventional Banks in Turkey. *International Journal of Islamic Economics and Finance Studies*, 5(3), 45-64. doi:10.25272/ijisef.634607
- Allen, F., & Carletti, E. (2013). What is Systemic Risk? *Journal of Money, Credit and Banking*, 45(1), 121-127.
- Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, 23(4), 589-609. doi:<https://doi.org/10.2307/2978933>
- Altman, E. I. (1983). Multidimensional Graphics and Bankruptcy Prediction: A Comment. *Journal of Accounting Research*, 21(1), 297-299. doi:<https://doi.org/10.2307/2490950>
- Altman, E. I., Haldeman, R. G., & Narayanan, P. (1977). ZETATM analysis A new model to identify bankruptcy risk of corporations. *Journal of Banking & Finance*, 1(1), 29-54. doi:[https://doi.org/10.1016/0378-4266\(77\)90017-6](https://doi.org/10.1016/0378-4266(77)90017-6)
- Altman, E. I., Hartzell, J., & Peck, M. (1998). Emerging market corporate bonds-a scoring system. *Emerging Market Capital Flows: Pr Conference held at the Stern School of Business* (pp. 391-400). New York: New York University.
- Altman, E. I., Iwanicz-Drozowska, M., Laitinen, E. K., & Suvas, A. (2014, 6 May). *Distressed Firm and*

- Bankruptcy Prediction in an International Context: A Review and Empirical Analysis of Altman's Z-Score Model*. Retrieved from SSRN 2536340: <https://ssrn.com/abstract=2536340> or <http://dx.doi.org/10.2139/ssrn.2536340>
- Amaroh, S. (2023). Measuring Financial Distress of Islamic Banks Under Pandemic and Its Determinants: Random Effect Approach. *Jurnal Ekonomi Islam*, 12(1), 71-86.
doi:<https://doi.org/10.54471/iqtishoduna.v12i1.2092>
- Ar-Rasyid, R., & Gandakusuma, I. (2020). Are there differences in the bankruptcy Risk of Indonesian's Construction Firm During Different Presidency Regimes?, (pp. 564-571).
- Arshed, N. (2020). Prediction of Islamic Banking Bankruptcy in Indonesia: Comparative Study of Altman Z-Score and Springate Models. *IKONOMIKA: Jurnal Ekonomi dan Bisnis Islam*, 5(2), 231-248.
- Arslan, M. F. (2020). Türkiye'deki Katılım Bankalarının Ekonomiye ve Finansal Gelişmeye Etkisi. *Master's Thesis*. Institution of Social Science.
- Askari, H. (2023). Islamic Capital Market and Products. In I. H, Y. Chiu, & I. G. MacNeil, *Research Handbook on Global Capital Markets Law* (pp. 269-284). Edward Elgar Publishing.
- Asmadi, D., Rahmawati, S., & Ihsan, M. (2023). Performance of Sharia Public Companies During the Covid-19: An Altman Z Score Analysis. *Share Jurnal Ekonomi dan Keuangan Islam*, 12(1), 27-43.
doi:DOI: 10.22373/share.v12i1.14884
- Asykarulloh, A., & Sultoni, H. (2023). Comparative Study of Financial Performance (Islamic vs Conventional Bank During Covid-19. *Journal of Sharia Economics*, 3(1), 1-11. Retrieved from <http://journal.umpo.ac.id/index.php/musyarakah>
- Badawi, A., Nurgroho, L., & Hidayah, N. (2022). Determinant Factors of Islamic Bank Financial Performance and Competitive Advantage as Moderating Variables in Islamic Banks In Indonesia. *International Journal Of Environmental, Sustainability, And Social Science*, 4(1), 37-44.
- Beaver, W. H. (1966). Financial Ratios As Predictors of Failure. *Journal of Accounting Research*, 71-111.
doi:<https://doi.org/10.2307/2490171>
- Belás, J., Mišanková, M., Schönfeld, J., & Gavurová, B. (2017, September). Credit Risk Management: Financial Safety and Sustainability Aspects. *Journal of Security and Sustainability Issues*, 7(1), 79-93. doi:[http://dx.doi.org/10.9770/jssi.2017.6.1\(7\)](http://dx.doi.org/10.9770/jssi.2017.6.1(7))
- Bhuiya, M. M., Miah, M., & Chowdhury, T. U. (2023). The Impact of Credit Risk on the Profitability of Selected Commercial Banks of Bangladesh. *Asian Journal of Managerial Science*, 12(1), 19-25.
doi:DOI: <https://doi.org/10.51983/ajms-2023.12.1.3438>
- Boumediene, A. (2012). Is Credit Risk Really Higher in Islamic Banks?
doi:<http://dx.doi.org/10.2139/ssrn.1689885>
- BRSA. (2023). *BRSA: Banking Regulation and Supervision of Agency*. Retrieved from www.bddk.org.tr
- Büyükkara, M. (2015). Comparison Of Loan Default: Participation Versus Conventional Banks In Turkey. *Doctoral Thesis*. Ankara: Bilkent University.
- Chieng, J. R. (2013). Verifying the Validity of Altman's Z" Score as a Predictor of Bank Failures in the Case of the Eurozone. *Doctoral Thesis*. National College of Ireland.
- Chowdhury, A. I., Uddin, M. S., Ullah, H., Ahmmmed, M., & Shadek, J. (2023). What Causes Non-Performing Loans? Evidence from The Islamic Banking Sector of Bangladesh. *International Journal of Accounting & Finance Review*, 14(1), 11-21. Retrieved from <https://www.cribfb.com>Journalhomepage:<https://www.cribfb.com/journal/index.php/ijaf>
- Christaria, F., & Kurnia, R. (2016). The Impact of Financial Ratios, Operational Efficiency and Non-Performing Loan Towards Commercial Bank Profitability. *Accounting and Finance Review*, 1(1), 43-50.
- Chusaini, A., & Ismal, R. (2013). Credit Risk Management in Indonesian Islamic Banking. *Afro Eurasian Studies*, 2(1), 41-55.
- Čihák, M., & Hesse, H. (2010). Islamic Banks and Financial Stability: An Empirical Analysis. *Journal of*

- Financial Services Research*(38), 95-113.
- Coelho, M. (2014). Predicting Corporate Failure: an application of Altman's Z Score and Altman's EMS models to the JSE Alternative Exchange from 2008 to 2012. *Master Thesis*. South Africa: University of Cape Town. doi:http://hdl.handle.net/11427/8561
- Çalış, N., Kevser, M., & Sakarya, Ş. (2022). Katılım Bankalarının Finansal Sağlamlığının Bankometer ve Z-Skor Yöntemleriyle Analizi. *Adam Academy Journal of Social Sciences*, 12(2), 301-321.
- Çınar, F. (2021). *Regulatory Landscape and Shariah Governance in Turkey*. IFN 2021 Annual Guide. Retrieved from IFN 2021 Annual Guide.
- Dağılgan, G. (2023). Türkiye’de Katılım Bankacılığının Performans Değerlendirmesi: Panel Veri Analizi. *Journal of Soceity, Economics and Managament*, 4(1), 51-64.
- Delice, G., & Karadaş, H. A. (2022). The Effects of Global Economic Crises on Performance of Participation Banks: The Case of The Covid-19 Outbreak. *DergiPark*(62), 87-119.
- Dell’Atti, S., Tommaso, C. D., & Pacelli, V. (2023, July 3). NPLs Securitizations, CDS Spreads and Spillover Effect: Evidence from the European Banking System. *Global Business Review*, 24(4), 16-17. doi:https://doi.org/10.1177/09721509231159738
- Dolgun, M. H., & Ng, A. (2019). Liquidity Risk Management in Islamic Banks: Evidences from Malaysia. In M. Zulkhibri, T. A. Manap, & A. Muneeza, *Islamic Monetary Economics ans Institutiones* (pp. 159-179). Switzerland: Springer. Retrieved from https://link.springer.com/chapter/10.1007/978-3-030-24005-9_10#:~:text=Short%2Dterm%20excess%20liquidity%20is,manage%20liquidity%20while%20stayi ng%20profitable.
- Elbadri, M., & Bektaş, E. (2017). Measuring the Financial Stability of Islamic and Conventional Banks in Turkey. In *New Challenges in Banking and Finance: 2nd International Conference on Banking and Finance Perspectives* (pp. 115–137). Springer Internation. doi:https://doi.org/10.1007/978-3-319-66872-7_10
- Elgari, M. A. (2018). Credit Risk in Islamic Banking and Finance. *Islamic Economic Studies*, 10(2), 1-24. Retrieved from Elgari, Mohamed Ali, Credit Risk in Islamic Banking and Finance (March 1, 2003). Islamic Economic Studies, Vol. 10, No. 2, 2003, Available at SSRN: https://ssrn.com/abstract=3164227
- Emek, Ö. F. (2021). Türkiye’de Katılım Bankacılığı Alanındaki Gelişmeler İle Ekonomik Büyüme Arasındaki Nedensellik İlişkilerinin İncelenmesi: Toda-Yamamoto Yaklaşımı. *Hitit İlahiyat Dergisi*, 20(3), 1-28.
- Erdoğan, A. (2019). Sukuk’s Journey in to the Islamic Securitization Market. In *Finance and Accounting I* (pp. 31-46). Ankara: Academician Publishing House Inc. Retrieved May 2023
- Fakhri, U. N., Anwar, S., Ismal, R., & Ascarya, a. (2019). Comparison of Sharia and Conventional Banking Bankruptcy Rates in Indonesia. *Tazkia Islamic Finance and Business Review*, 13(2), 125-141.
- Farahani, Y. G., & Dastan, M. (2013). Analysis of Islamic Banks' Financing and Economic Growth: a Panel Cointegration Approach. *International Journal of Islamic and Middle Eastern Finance and Management* 6, no. 2, 6(2), 156-172.
- Firmansyah, I. (2015). Determinant of Non Performing Loan: The Case of Islamic Bank in Indonesia. *Bulletin of Monetary and Banking*, 17(2), 241-258. doi:https://doi.org/10.21098/bemp.v17i2.51
- Ghassan, H. B., & Guendouz, A. A. (2019). Panel modeling of z-score: evidence from Islamic and conventional Saudi banks. *International Journal of Islamic and Middle Eastern Finance and Management*, 12(3), 448-468. doi: https://doi.org/10.1108/IMEFM-04-2018-0122
- Ghosh, P. U., Adhikari, D. C., & Neogi, M. A. (2017). Study of Risk Evaluation in Asset Management Companies Through EMZ-Score Model. *Journal of Advance Management Research*, 5(5), 225-243. Retrieved from http://www.jamrpublication.com
- Grassa, R., Moumen, N., & Hussainey, K. (2020). Is bank creditworthiness associated with risk disclosure behavior? Evidence from Islamic and conventional banks in emerging countries. *Pacific-Basin*

- Finance Journal*, 61, 07-27.
- Greuning, H. v., & Bratanovic, S. B. (2020). *Analyzing Banking Risk A Framework for Assessing Corporate Governance and Risk Management* (3 ed.). Washington: World Bank Publications.
- Hamda, I., & Sudarmawan, B. N. (2023). Capital, Efficiency, Management Risk on Islamic Bank Stability During Covid-19 Pandemic. *Tazkia Islamic Finance and Business Review*, 17(1), 50-62.
doi:<https://doi.org/10.30993/tifbr.v17i1.309>
- Hamid, G. M., Mohammed, G. A., Omar, K. M., & Haji, S. M. (2023). Using Altman and Sherrod Z- Score Models to Detect Financial Failure for the Banks Listed on the Iraqi Stock Exchange (Ise) Between 2009–2013. *International journal of Proffesional Business Review*, 8(4), 01-22.
doi:<https://doi.org/10.26668/businessreview/2023.v8i4.1329>
- Hamid, T., Akter, F., & Rab, N. B. (2016). Prediction of Financial Distress of Non-Bank Financial Institutions of Bangladesh using Altman's Z Score Model. *International Journal of Business and Management*, 11(12), 261-270. doi:<http://dx.doi.org/10.5539/ijbm.v11n12p261>
- Hasan, M. F., Hadi, H. S., & Jasim, N. A. (2021). The Validity of Altman's Models in Predicting Iraqi Private-Banks Soundness. *Journal of Management and Accounting Studies*, 9(1), 79-89.
doi:<https://doi.org/10.24200/jmas.vol9iss01pp79-89>
- Hasman, A., & Samartín, M. (2023). Government intervention, linkages and financial fragility. *Economic Modelling*, 126, 1-2. doi:<https://doi.org/10.1016/j.econmod.2023.106429>.
- Hassan, K., Kayed, R. N., & Oseni, U. A. (2020). *Introduction to Islamic banking & finance : principles and practice*. Harlow, Essex, England : Pearson Education Limited, 2013.
- Hassan, M. K., Khan, A., & Paltrinieri, A. (2018). Liquidity Risk, Credit Risk and Stability in Islamic and Conventional Banks. *Research in International Business and Finance*, 48, 17-31.
doi:<https://doi.org/10.1016/j.ribaf.2018.10.006>
- Havidz, Hazrati, S. A., & Setiawan, C. (2015). Bank Efficiency and Non-Performing Financing (NPF) in The Indonesian Islamic Banks. *Asian Journal of Economic Modelling*, 3(3), 61-79. Retrieved from <http://repository.president.ac.id/xmlui/handle/123456789/10665>
- Hendra, G. I. (2018). Earning Quality And Potential Bankruptcy Of Islamic Banks: Indonesia Versus Malaysia. *Jurnal Ekonomi dan Keuangan Islam*, 7(2), 116-145. doi:10.22373/share.v7i2.3370
- Hussain, M., Shahmoradi, A., & Turk, R. (2016). Islamic banking and financial development. *Journal of International Commerce, Economics and Policy*, 7(1), 47-60. doi:doi:10.1515/rmeef-2015-0018
- Hussein, R., & Idris, M. (2023). Detecting Financial Distress of Companies listed on Amman Stock Exchange Using the Models of Altman and Jones. *Calitatea*, 24(194), 196-201.
doi:DOI:10.47750/QAS/24.194.23
- IMF. (2017). *Ensuring Financial Stability in Countries with Islamic Banking*. 5. International Monetary Fund.
- İncekara, A., & Çetinkaya, H. (2019). Liquidity Risk Managment: A Comparative Analysis of Panel Data Between Islamic And Conventional Banking In Turkey. *Procedia Computer Science*(158), 955-963.
doi:<https://doi.org/10.1016/j.procs.2019.09.136>
- ISDB. (2022). *ISDB Developers Platform*. Retrieved from www.isdb.org:
<https://www.isdb.org/strategy/corporate-transformation/isdb-developers-platform>
- Islam, K. M., & Barghouthi, O. A. (2017). Risk Management of Islamic Banking: An Islamic Perspective. *International Journal of Islamic Banking and Finance Research*, 1(1), 25-28.
doi:<https://doi.org/10.46281/ijibfr.v1i1.35>
- Jan, A., & Marimuthu, M. (2015). Altman Model and Bankruptcy Profile of Islamic Banking Industry: A Comparative Analysis on Financial Performance. *International Journal of Business and Management*, 10(7), 110-119. doi:: <http://dx.doi.org/10.5539/ijbm.v10n7p110>
- Jan, A., & Marimuthu, M. (2016). Bankruptcy Profile of Foreign versus Domestic Islamic Banks of Malaysia: A Post Crisis Period Analysis. *International Journal of Economics and Financia Issues*,

- 6(1), 332-346.
- Kabir, M. N., & Worthington, A. C. (2017). The 'competition–stability/fragility' nexus: A comparative analysis of Islamic and conventional banks. *International Review of Financial Analysis*(50), 111-128. doi:<https://doi.org/10.1016/j.irfa.2017.02.006>
- Kakaç, B. (2019). Türkiye’de Bankacılık Türleri Açısından Kredi Risk Yönetiminin Analizi. *Master Thesis*. Çorum: Hitit University.
- Kamsani, N. F., Hussin, S. A., & Zahid, Z. (2022). Credit Risk Analysis Of Islamic Bank VS Conventional Bank In Malaysia. *Journal of Pharmaceutical Negative Results*, 13(10), 264-270. doi:<https://doi.org/10.47750/pnr.2022.13.S10.027>
- Kaplan, F. (2023). *Using Islamic Finance for Infrastructure Projects in Turkey: A Study of the Potentials, Challenges and Current Situation*. Retrieved from Central and Eastern European Online Library: <https://www.ceeol.com/search/chapter-detail?id=1170712>
- Karapappas, A. (2023, 5). Banking Stability and efficiency in the MENA region: Disentangling the impact of distress, competition and regulation. *Doctoral Thesis*. Hull, UK: University of Hull.
- Kayhan, F., & İslamoğlu, M. (2022). Bank-Specific Determinants of SME Loans: Empirical Evidence from Turkish SME Market. *Bankacılık ve Sigortacılık Araştırmaları Dergisi*(16), 41-56.
- Khandelwal, I. A. (2008). *Financial Risk Management for Islamic Banking and Finance*. New York: Palgrave Macmillan London. doi:<https://doi.org/10.1057/9780230598751>
- Kholifah, U., Alfie, A. A., & Ayuningtyas, R. D. (2019). Analysis of bankruptcy prediction with Altman Z-Score method in Shariah rural bank in Central Java period 2011-2016. *Proceeding of Conference on Islamic Management, Accounting, and Economics*, 1(2), 56-65.
- Kınalı, F., & Karasioglu, F. (2022). Mali Tablolar Yardımıyla Finansal Başarısızlığın Tespiti: Borsa İstanbul’da Bir Uygulama. *Eurasian Journal of Researches in Social and Economics*, 9(3), 197-221.
- Kittur, A. H. (2019). Effectiveness of the Altman Z-Score model: Does the Altman Z-Score model accurately capture the effects of Non-Performing Assets (NPA) in the Indian banking sector? *Linnaeus University Thesis*. Sweden.
- Kumar, V., & Sayani, H. (2015). Application of CAMEL model on the GCC Islamic Banks: 2008-2014. *Journal of Islamic Banking and Finance*, 3(2), 1-14. doi:DOI: 10.15640/jibf.v3n2a1
- Maali, B., & Napier, C. (2010). Accounting, Religion and Organisational Culture: the Creation of Jordan Islamic Bank. *Journal of Islamic Accounting and Business Research*, 1(2), pp. 92-113.
- Majumder, B. I., & Moonmoon, S. F. (2020). Predicting Financial Distress of the Islamic Banking Sector of Bangladesh. *Journal of Banking & Financial Services*, 12(2), 55-70.
- Malim, N. A. (2015). Islamic Banking and Risk Management: Issues and Challenges. *Journal of Islamic Banking and Finance Oct*, 64-70.
- Manaseer, S., & Oshaibat, S. A. (2018). Validity of Altman Z-Score Model to Predict Financial Failure: Evidence From Jordan. *International Journal of Economics and Finance*, 10(8), 181-189. doi:<http://doi.org/10.5539/ijef.v10n8p181>
- Mdaghri, A. A. (2022). How does bank liquidity creation affect non-performing loans in the MENA region? *International Journal of Emerging Markets*, 17(7), 1635-1658. doi:<https://doi.org/10.1108/IJOEM-05-2021-0670>
- Misman, F. N., & Bhatti, M. I. (2020). The Determinants of Credit Risk: An Evidence from ASEAN and GCC Islamic Banks. *Journal of Risk and Financial Management*, 13(5), 89-107. doi:[doi:10.3390/jrfm13050089](https://doi.org/10.3390/jrfm13050089)
- Murtiadi, Raprayogha, R., Prilmayanti, S., DM, R., & Nur, K. (2023). Non Performing Financing/Loan (NPF/NPL), Fee Based Income, Financing to Deposit Ratio (FDR/LDR) dan Profitabilitas Bank. *Islamic Banking Economic and Finance Journal*, 3(2), 1-17.
- Ndiege, J. (2017). Statistical Approach to prediction of Financial Distress of Listed Firms in the Nairobi Securities Exchange. *Doctoral thesis*. Kisumu, Kenya: Maseno University.

- Nistor, I., & Ongena, S. (2023). The Impact of Policy Interventions on Systemic Risk across Banks. *Journal of Financial Services Research*, 64(1), 1-52. doi:<https://doi.org/10.1007/s10693-023-00404-8>
- Nurul, K. M., & Worthington, A. (2014). *Do Islamic Banks Have Higher Credit Risk?* doi:<http://dx.doi.org/10.2139/ssrn.2479136>
- Nurul, K. M., Worthington, A. C., & Gupta, R. (2015). Comparative Credit Risk in Islamic and Conventional Banks. *Pacific-Basin Finance Journal*(34), 327-353. doi:<https://doi.org/10.1016/j.pacfin.2015.06.001>
- Oliver, R. M. (2015). Combining systemic and non systemic risk scores. *Journal of the Operational Research Society*, 66(1), 148-159.
- Otieno, S., Nyagol, D. M., & Onditi, D. A. (2016). Relationship between Credit risk management and financial performance: empirical evidence from microfinance banks in Kenya. *Research Journal of Finance and Accounting*, 7(6), 115-142.
- Oyeka, I. C., & Ebuh, G. U. (2012). Godday Uwawunkonye Ebuh. *Open Journal of Statistics*, 2, 172-176. doi:[doi:10.4236/ojs.2012.22019](https://doi.org/10.4236/ojs.2012.22019)
- Özal, A. K. (2022). *İslâm Kalkınma Bankası*. Retrieved March 2023, from Türkiye Diyanet Vakfı İA: <https://islamansiklopedisi.org.tr/islam-kalkinma-bankasi>
- Özçim, H., & Kaya, F. (2021). Türkiye’de Makroekonomik Göstergelerin Katılım Bankalarının Kredi Riski Üzerindeki Etkisi. *Electronic Journal of Social Sciences*, 20(78), 646-659.
- Özel, Ö. (2022). Türkiye Bankacılık Sektörü Sorunlu Kredilerinin Yapısı VE Belirleyicilerinin Ardl Sınır Testi Yöntemi İle Analizi. *Doctoral Thesis*. Ankara: T.C. Ankara Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı.
- Özkan, N., & Işıl, G. (2016). İslami Bankalarda Kredi Riskini Belirleyen Faktörler: Panel Veri Analizi ile Türkiye’de Katılım Bankacılığı Üzerine Ampirik Bir Uygulama. *Journal of Finance Letters*(105), 153-176. doi:<https://doi.org/10.33203/mfy.312141>
- Paolone, F., & Rangone, A. (2015). The Application of the Emerging Market Score Model in China During the Global Crisis Period: A Countertrend. *Chinese Business Review*, 14(10), 484-498.
- Putri, A. M., & Gandakusuma, I. (2019). Bankruptcy Prediction of Manufacturing Companies using Altman and Ohlson Model. In I. Tringroho, & E. Lau, *Business Innovation and Development in Emerging Economies* (pp. 101-105). London: Taylor & Francis Group.
- Qasim, Y. (2020). Z Score Application for Jordanian Islamic Banks. *Journal of Public Administration and Governance*, 10(1), 289-297. doi:<https://doi.org/10.116335>
- Radzi, R. M., & Lonik, K. A. (2016). Islamic Banks’ Risks: It’s Rating Methodology and Shariah Assessment Solutions. *Journal of Islamic Banking and Finance*, 4(2), 48-60.
- Rahman, B., & Jahan, N. (2018). Non-Performing Loans (NPLs) in Islamic Banks of Non-Performing Loans (NPLs) in Islamic Banks of. *World Review of Business Research*, 8(3), 12-23.
- Rahman, M. R., Rahman, M. M., & Subat, A. (2020). Measuring Financial Distress of Non-Bank Financial Institutions of Bangladesh Using Altman’s Z-score Model. *International Business Education Journal*(13), 15-28. doi:<https://doi.org/10.37134/ibej.vol13.sp.2.2020>
- Rajhi, W., & Hassairi, S. A. (2013). Islamic Banks And Financial Stability: A Comparative Empirical Analysis Between Mena And Southeast Asian Countries. *Région et Développement*, 37(3), 149-179.
- Rasheed, H. u., & Siddiqui, D. A. (2019). A Comparative Analysis of Non-Performing Financing in Islamic and Conventional Banks of Pakistan. Karachi, Pakistan. doi:<http://dx.doi.org/10.2139/ssrn.3382162>
- Refinitiv . (2023). *Sukuk Perceptions and Forecast Study 2022: Navigating a New Environment* . Retrieved from www.refinitiv.com: <https://www.refinitiv.com/en/resources/special-report/sukuk-perceptions-2022-new-economic-environment>
- Refinitiv. (2023). *Islamic Finance Development Report 2023*. Retrieved from www.refinitiv.com: https://www.refinitiv.com/content/dam/marketing/en_us/documents/gated/reports/ifdi-

- report-2022.pdf
- Refinitiv. (2023). *Islamic Financial Services Industry Stability Report 2023*. Retrieved from https://www.ifsib.org/preess_full.php?id=637&submit=more
- Rezina, S., Chowdhury, R. S., & Jahan, N. (2020). Non-Performing Loan in Bangladesh: A Comparative Study on the Islamic Banks and Conventional Banks. *Indian Journal of Finance and Banking*, 4(1), 76-83.
- Routledge. (2023). Introduction. In B. Çıkıryel, & T. Azrak (Eds.), *The Islamic Finance Industry: Issues and Challenges* (p. 178). New York, USA: Taylor& Francis.
- S&P Global Ratings. (2023). *Islamic Finance 2023-2024: Growth Beyond Core Market Remains Elusive*. Retrieved October 10, 2023, from S&P Global Ratings: <https://www.spglobal.com/ratings/en/research/articles/230501-islamic-finance-2023-2024-growth-beyond-core-markets-remains-elusive-12712350>
- Sadiq, R., Mushtaq, A., & Hussain, T. (2015). Empirical Analysis of Liquidity Risk and Operational Risk in Islamic Banks: Case of Pakistan. *Islamic Banking and Finance Review*, 2(1), 93-104.
- Saeed, M. K., & Alam, W. (2018). The Relentlessness of Credit Risk in Islamic and Conventional Banking of Pakistan. *Abasyn Journal of Social Sciences*, 11(1), 180-200.
- Safarda, R. N., Wahyudi, R., & Mubarak, F. K. (2023). Islamic and Conventional Banking: A Comparison of Financial Performance During the Covid-19 Pandemic. *Journal of Islamic Economic and Business Research*, 3(1), 83-96. doi:<https://doi.org/10.18196/jiebr.v3i1.113>
- Safitri, C. Y., & Sholikha, A. F. (2022). Comparative Analysis of Financial Distress Risk in Sharia Foreign Exchange Bank and Non-Foreign Exchange Sharia Bank in Indonesia in 2014-2018 Using the Method Altman Z-Score Modification. *Wealth Journal of Islamic Banking and Finance*, 1(2), 83-96.
- Saha, D., & Navila, R. K. (2018). *Bankruptcy Risk Prediction Using Altman Z-Score Model: An Empirical Study on Private Commercial Banks of Bangladesh*. doi:<http://dx.doi.org/10.2139/ssrn.3772403>
- Saleem, A., Daragmeh, A., Zahid, R. M., & Sági, J. (2023). Financial intermediation through risk sharing vs non-risk sharing contracts, role of credit risk, and sustainable production: evidence from leading countries in Islamic finance. *Environment, Development and Sustainability*. doi:<https://doi.org/10.1007/s10668-023-03298-7>
- Saleh, D. S., & Winarso, E. (2021). Analysis of Non-Performing Loans (NPL) and Loan to Deposit Ratio (LDR) towards Profitability. *International Journal of Multicultural and Multireligious Understanding*, 8(1), 423-436. doi: <http://dx.doi.org/10.18415/ijmmu.v8i1.2387>
- Salem, R. A. (2013). *Risk Managment for Islamic Banks*. Edinburg: Edinburg Universty Press.
- Salim, R., Arjomandi, A., & Dakpo, K. H. (2017). Banks' Efficiency and Credit Risk Analysis Using by Production Approach:The CAse of Iranian Banks. *Applied Economics*, 49(30), 2974-2988. doi:10.1080/00036846.2016.1251567
- Schinasi, G. J. (2004). *Defining Financial Stability*. IMF Working Paper No. 04/187. Retrieved from IMF Working Paper .
- Selimler, H. (2015). Sorunlu Kredilerin Analizi, Banka Finansal Tablo ve Oranlarına Etkisinin Değerlendirilmesi. *Finansal Araştırmalar ve Çalışmalar Dergisi* •, 7(12), 131-172. doi:10.14784/jfrs.74107
- Shah, S. A., Sukmana, R., & Fianto, B. A. (2021). Integration of Islamic bank specific risks and their impact on the portfolios of Islamic Banks. *International Journal of Islamic and Middle Eastern Finance and Management*, 14(3), 561-578. Retrieved from Emerald Insight : <https://www.emerald.com/insight/1753-8394.htm>
- Sukmana, R., & Febriyati, N. A. (2016). Islamic Banks vs Conventional Banks in Indonesia: An Analysis on Financial Performances. *Jurnal Pengurusan*, 47(1), 81-90. doi:<http://dx.doi.org/10.17576/pengurusan-2016-47-07>

- Sule, I., Monye-emina, H. E., & Oladutire, E. (2018). An Assessment of CSR Practices in Nigeria: the Bankruptcy Risk Perspective. *The Social and Management Scientist*, 10(3), 60-80.
- Supiyadi, D., Mulyadi, D., Fithriani, M., Syaiful, S., Ikhsan, Z., & Rahman, L. (2017). Credit Risk Management and Islamic Banking Performance Evidence from Indonesia. *1st International Conference on Islamic Economics, Business, and Philanthropy (ICIEBP)*, (pp. 193-199).
- Susanto, J., & Walyoto, S. (2023). The Effect of Corporate Governance on Financial Stability Sharia Bank in Indonesia. *Journal of Management and Islamic Finance*, 3(1), 132-143.
- Sutrisno, Hakim, A., & Panuntun, B. (2023). LIQUIDITY RISK AND FACTORS DETERMINANT: A CASE STUDY ON ISLAMIC RURAL BANKING IN INDONESIA. *Journal of Southwest Jiaotong University*, 58(1), 354-367.
- Swissa, E. M. (2021). Prediction of Bankruptcy in Islamic Banking in Indonesia: Modified Altman Z-Score Method Approach. *Al-Masharif: Jurnal Ilmu Ekonomi dan Keislaman*, 9(2), 152-167.
- Syadali, M. R., Segaf, S., & Parmujianto, P. (2023). Risk management strategy for the problem of borrowing money for Islamic commercial banks. *Enrichment : Journal of Management*, 13(2), 1227-1236.
- Tapsir, N. A., & Talib, M. K. (2012). Risk and Risk Management of Takaful Industry. *Journal of Global Business And Economics*, 4(1), 29-39.
- Tekin, B., & Gör, Y. (2022). Finansal Başarısızlık Tahmin Modelleri Ve Bankacılık Sektörü Mali Tabloları Üzerinden Bir Uygulama: Altman Ve Springate Modeller. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*(40), 373-404. doi:<https://doi.org/10.14520/adyusbd.992296>
- Tenekeci, M. (2017). Katılım Bankacılığının Finansal İstikrara Etkisi: Türkiye Örneği. *Master Thesis* , 25.
- The World Bank. (2023, June). *The World Bank- IBRD-IDA*. Retrieved from www.worldbank.org: <https://www.worldbank.org/en/publication/gfdr/gfdr-2016/background/financial-stability>
- TKBB. (2020). *Participation banking Strategy Update Report (2021-2025)*. Retrieved from www.tkbb.org.tr: https://tkbb.org.tr/Documents/Yonetmelikler/EY_TKBB_Rapor_ENG_v16_WEB_2021-2025.pdf
- TKBB. (2023, October). *Financial Reports Archive*. Retrieved from www.tkbb.org.tr: <https://tkbb.org.tr/veri/bilancoarsiv>
- TKBB. (2023). *Sukuk İhraç Hacimleri Raporu*. Türkiye Katılım Bankaları Birliği.
- TKBB. (2023, June 14). *TKBB Advisory Board Presentation*. Retrieved October 12, 2023, from TKBB: Türkiye Katılım Bankaları Birliği: [https://en.tkbbdanismakurulu.org.tr/uploads/documents/TKBB-ADVISORY-BOARD-\(EN\)-PRESENTATION-14.06.2023.pdf](https://en.tkbbdanismakurulu.org.tr/uploads/documents/TKBB-ADVISORY-BOARD-(EN)-PRESENTATION-14.06.2023.pdf)
- TKBB. (2023, June). *Turkish Financial System and Participation Banking*. Retrieved March 2023, from TKBB Türkiye Katılım Bankaları Birliği: https://tkbb.org.tr/uploads/presentations/1692714783_42f0cba6a895480f64a8.pdf
- TKBB. (2023). *Türkiye Katılım Bankaları Birliği*. Retrieved June 2023, from TKBB: Türkiye Katılım Bankaları Birliği: <https://tkbb.org.tr/>
- Tran, D. A. (2021). A Revision of Altman Z-Score Model in Financial Distress Prediction of Listed Companies in Vietnam. *Doctoral Thesis*. Vietnam: Nova School of Business and Economics.
- Tzouvanas, P. (2023). Can Firm Risk Explain the Systemic Risk? Evidence from the Us Banking Industry. *Journal of Economic Studies*. doi:<https://doi.org/10.1108/JES-12-2022-0664>
- Ullah, H., Wang, Z., & Abbas, M. G. (2021). Association of Financial Distress and Predicted Bankruptcy: The Case of Pakistani Banking Sector. *Journal of Asian Finance, Economics and Business*, 8(1), 573–585. doi:[doi:10.13106/jafeb.2021.vol8.no1.573](https://doi.org/10.13106/jafeb.2021.vol8.no1.573)
- Us, V. (2016). Determinants of Non-Performing Loans in the Turkish Banking Sector: What Has Changed After the Global Crisis? 1-14. Research and Monetary Policy Department, Central Bank of the Republic of Turkey.
- Waqas, M., Fatima, N., Khan, A., & Arif, M. (2017). Determinants of Non-performing Loans: A

- Comparative Study of Pakistan, India, and Bangladesh. *Journal of Finance & Banking Studies*, 6(1), 51-68.
- Warninda, T. D. (2022, July 05). *The Effect of Peer-Banks on Bank Liquidity Management: The Case of Islamic Banks in Indonesia*. Retrieved July 2023, from Institutional Repository UIN Syarif Hidayatullah Jakarta: <https://repository.uinjkt.ac.id/dspace/handle/123456789/22595>
- Washeka, Anjom, & Faruq, A. T. (2023). Financial Stability Analysis of Islamic Banks in Bangladesh. *European Journal of Business and Management Research*, 8(3), 320-326.
- Washington Bankers Association. (2023). *Chapter 3: Risks in banking*. Retrieved from Washington Bankers Association: https://wabankers.com/images/wba/pdfs/Johnson_H.pdf
- Wiryono, S. K., & Effendi, K. A. (2018). Islamic Bank Credit Risk: Macroeconomic and Bank Specific Factors. *European Research Studies Journal*, 21(3), 53-62.
- Yağcılar, G. G., & Demir, S. (2015). Türk Bankacılık Sektöründe Takipteki Kredi Oranları Üzerinde Etkili Olan Faktörlerin Belirlenmesi. *Uluslararası Alanya İşletme Fakültesi Dergisi*, 7(1), 221-229. Retrieved from <https://dergipark.org.tr/en/pub/uaifd/issue/21602/232019>
- Yüksel, S. (2017). Determinants of the Credit Risk in Developing Countries After Economic Crisis: A Case of Turkish Banking Sector. *Global Financial Crisis and Its Ramifications on Capital Markets*, 401-415. doi:10.1007/978-3-319-47021-4_28
- Zaabi, O. S. (2011). Potential for the application of emerging market Z-score in UAE Islamic banks. *International Journal of Islamic and Middle Eastern Finance and Management*, 4(2), 158-173. doi:<http://dx.doi.org/10.1108/17538391111144498>
- Zahra, A. N., & Miranti, T. (2023). The Sharia Bank Stability: How Fintech and Financial Ratio Fixed It? *I-Finance: a Research Journal on Islamic Finance*, 9(1), 51-69.
- Zainudin, N. N., Shahida, S., & Sulaiman, A. A. (2019). Do bankruptcy profiles of Islamic banks differ across organizational structure? evidence from Malaysia. *Economic Journal of Emerging Markets*, 11(2), 195-212. doi:<https://doi.org/10.20885/ejem.vol11.iss2.art7>
- Zolkifli, N. A., Uda, Hamid, M. A., & Janor, H. b. (2018). Determinants of Credit Risk in Islamic and Conventional Bank: Evidence from Malaysia. *International Journal of Academic Research in Business & Social Sciences*, 8(6), 1054-1068. doi:<http://dx.doi.org/10.6007/IJARBS/v8-i6/4301>

APPENDIX

Appendix 1. Ethics Approval



Appendix 2

Table A.1 The EM Score variables and results of the PBs from 2016 to 2022.

PBs	Years	X1*	X2*	X3*	X4*	EM Score
Albaraka Türk	2016	-0.02437	0.00722	0.05399	0.07286	3.35969
	2017	0.05805	0.14231	0.05357	0.07192	3.57585
	2018	0.20311	0.18232	0.02682	0.08110	3.74336
	2019	0.19842	0.18535	0.01141	0.07809	3.72327
	2020	0.18224	0.12671	0.03139	0.06126	3.65160
	2021	0.13028	0.09805	0.00502	0.04459	3.52794
	2022	0.18230	0.12517	0.10632	0.05825	3.72205
Kuveyt Türk	2016	0.08222	0.07564	0.09194	0.08473	3.58453
	2017	0.07921	0.08525	0.09987	0.08439	3.59872
	2018	0.05501	0.08525	0.10194	0.07693	3.56913
	2019	0.18797	0.08820	0.09106	0.06858	3.68581
	2020	-0.19131	0.07278	0.08175	0.05512	3.26835
	2021	0.09441	0.07521	0.09383	0.04322	3.55666
	2022	0.35133	0.20443	0.31569	0.07839	4.19984
Türkiye Emlak**	2019	-0.23165	-0.38473	0.03338	0.00834	2.67534
	2020	-0.07877	-0.21295	0.03442	0.01068	3.00339
	2021	0.19123	0.05900	0.03259	0.04682	3.57964
	2022	0.27122	0.16253	0.24972	0.06311	3.99657
Türkiye Finans	2016	0.00489	0.08930	0.06391	0.09911	3.50721
	2017	0.07638	0.12184	0.07869	0.10910	3.63601
	2018	0.10286	0.11939	0.08133	0.09647	3.65006
	2019	0.26283	0.13848	0.06116	0.09668	3.80914
	2020	0.22592	0.11600	0.07208	0.07091	3.73490
	2021	0.20957	0.11154	0.07026	0.05953	3.70091
	2022	0.20957	0.18086	0.18509	0.07612	3.90165
Vakıf	2016	1.04514	0.04973	0.03852	0.19655	4.57994
	2017	0.44514	0.05007	0.08642	0.08806	3.91969

	2018	0.33154	0.07891	0.13276	0.07652	3.86972
	2019	0.25965	0.10105	0.09790	0.06784	3.77643
	2020	0.48384	0.09681	0.10647	0.09478	4.03191
	2021	0.48857	0.09382	0.11109	0.08983	4.03331
	2022	0.54368	0.16082	0.23864	0.10559	4.29873
Ziraat	2016	0.36976	0.00722	0.03418	0.10087	3.76203
	2017	0.39989	0.03491	0.09365	0.10271	3.88115
	2018	0.55210	0.06884	0.12555	0.10499	4.10148
	2019	0.46342	0.12692	0.13024	0.09137	4.06195
	2020	0.01356	-0.15957	0.08848	0.01375	3.20622
	2021	0.20567	0.08528	0.04991	0.04616	3.63702
	2022	0.28190	0.13338	0.17210	0.05600	3.89338

* X1: Net Working Capital/Total Assets (TA), X2: Retaining Earnings/TA, X3: Earnings Before Interest and Taxes (EBIT)/TA, X4: Book Value/TA

** Türkiye Emlak PB was established in 2018 and started to run in 2019. Therefore, there is no data for the period of 2016 to 2018.

Source: Calculated by the author based on the Participant Banks Association of Türkiye (TKBB) reports accessed July 31, 2023, from <https://tkbb.org.tr/sayfa/sektor-bilgileri/denetim-raporlari>

Table A.2 The EM Score results of PBs and CBs from 2005 to 2022.

Years	CBs	PBs	Years	CBs	PBs
2005	3.36	4.01	2014	3.97	3.75
2006	3.48	4.28	2015	3.92	3.71
2007	3.76	4.40	2016	3.93	3.80
2008	3.03	4.50	2017	3.95	3.84
2009	3.39	4.25	2018	4.11	3.85
2010	3.74	4.23	2019	4.11	3.95
2011	3.73	4.08	2020	3.98	3.73
2012	4.06	3.99	2021	3.86	3.81
2013	3.86	3.90	2022	4.10	4.00

Source: Calculated by the author based on the Banking Regulation and Supervision Agency (BRSA) website annual data accessed July 31, 2023, from <http://www.bddk.org.tr/BultenAylik/>

Table A.3 The NPL ratios of PBs from 2016 to 2022 (%)

Years	Albaraka T.	Kuveyt T.	T. Emlak	T. Finans	Vakıf	Ziraat
2016	4.75	3.15	0.00	5.00	0.14	0.21
2017	4.68	1.85	0.00	5.15	0.18	0.31
2018	6.90	2.47	0.00	5.52	2.03	1.36
2019	7.20	3.53	2.80	8.01	3.04	2.34
2020	4.80	3.71	1.20	5.56	2.43	2.80
2021	6.30	2.93	1.10	4.57	1.63	2.70
2022	1.90	1.64	0.21	3.15	0.90	1.29

Source: Calculated by the author based on the Participant Banks Association of Türkiye (TKBB) reports accessed July 31, 2023, from <https://tkbb.org.tr/sayfa/sektor-bilgileri/denetim-raporlari>

Table A.4 The NPL ratios of PBs and CBs from 2005 to 2022 (%)

Years	PBs (%)	CBs (%)	Years	PBs (%)	CBs (%)
2005	4.10	4.85	2014	4.54	2.84
2006	3.51	3.80	2015	5.40	3.09
2007	3.37	3.55	2016	3.92	3.37
2008	4.40	3.71	2017	3.22	3.10
2009	4.70	5.42	2018	4.16	4.13
2010	3.47	3.73	2019	5.13	5.74
2011	3.08	2.72	2020	3.59	4.36
2012	3.01	2.93	2021	3.02	3.37
2013	3.42	2.79	2022	1.43	2.25

Source: Prepared by the author based on the BRSA website annual data accessed July 31, 2023, from <http://www.bddk.org.tr/BultenAylik/>