Global Advances in Business Studies (GABS), 2026, Vol. 5 No. 1, 31-39
GLOBAL ADVANCES IN BUSINESS STUDIES (GABS)
http://journal-gabs.org/gabs

Efficiency analysis of banks included in the BIST Banking Index

Hasan Hüseyin Yildirim[1*], Cevriye Yüksel Yildirim[2], Ömer Faruk Rençber[3]

[1]Burhaniye Faculty of Applied Sciences, Balıkesir University, Türkiye
[2]Burhaniye Vocational School, Balıkesir University, Türkiye
[3]Faculty of Economy and Business, Gaziantep University, Türkiye

Article info

Article history:
Received: 8 January 2026
Accepted: 20 March 2026
Published: 24 April 2026

Keywords:
banking;
efficiency;
data envelopment analysis;
Borsa Istanbul

Abstract

In the globalized economy, the financial sector is a cornerstone of national economic stability. Within this sector, banks hold a predominant position, and their performance is critically linked to overall economic health. Given its substantial economic weight and deep interconnections with other industries, inefficiency in the banking sector can have significant repercussions. Therefore, measuring efficiency is paramount. Efficiency, defined as the effectiveness with which an institution achieves its predetermined goals, is often analyzed in banking using data envelopment analysis (DEA). This method not only measures the relative efficiency of banks but also provides a roadmap for underperforming ones to improve by identifying optimal resource allocation. By evaluating how effectively banks utilize their inputs to generate outputs, DEA highlights strengths and weaknesses, enabling more efficient operations and a stronger competitive position. This study employs DEA to investigate the efficiency of 10 banks listed on the BIST Bank Index from 2017 to 2023. The analysis uses the size of assets, number of employees, and revenues as input variables, while return on assets, return on equity, and net profit margin serve as the output variables. The results reveal distinct performance patterns: A group of banks, namely Akbank, Garanti Bank, İş Bank (C), and Yapı ve Kredi Bank, maintained a state of full efficiency throughout the entire 2017-2023 period; In contrast, Albaraka Türk and Şekerbank exhibited significant fluctuations in their efficiency scores over time; TSKB experienced a notable period of serious inefficiency, particularly in 2022. In conclusion, DEA serves as a vital analytical tool for the banking sector, offering clear insights into performance levels and providing actionable guidance for inefficient banks to enhance their operations.

JEL classifications: G21

Citation:
Yildirim, H.H., Yildirim, C.Y., & Rencber, O.F. (2026). Efficiency analysis of banks included in the BIST Banking Index. *Global Advances in Business Studies*, 5(1), 31-39, https://doi.org/10.55584/Gabs.005.01.3

*Corresponding author: H.H. Yildirim
hhyildirim@balikesir.edu.tr

E-ISSN: 2828-8394
doi.org/10.55584/Gabs.005.01.3

1. Introduction

The word "bank" comes from the Italian word "banco," meaning table or bench (Yetiz, 2016). As economies grew, the volume of banks also began to expand. The financial system is based on two parties: those who supply funds and those who demand funds. Fund transfers can take place in two ways: direct and indirect financing. In direct financing, the parties provide financing without using an intermediary, while in indirect financing, financing is provided with the help of intermediary institutions.

Banks are institutions that act as intermediaries in indirect financing (Reis et al., 2016). In financial systems formed by bringing together those with excess funds and those with a shortage of funds with the help of intermediary institutions, funds are transferred indirectly and efficiently (Aydın et al., 2012). Banks provide many services within the financial system. Today, in addition to their basic function of converting deposits into loans, banks also engage in activities such as brokering capital market activities, participating in forward transactions, providing collateral, facilitating money transfers between economic units, and acting as a collection agent for transactions such as bill and tax payments (Sarıtaş et al., 2016). Furthermore, banks assist in the implementation of monetary and fiscal policy, which are components of economic policy. The success of banks' activities affects the success of the financial system, and the success of the financial system affects the country's overall economy (Çağıl and Mukhtarov, 2014). Therefore, banks are of great importance for a strong economy and financial system (Kartal, 2018).

Today, all sectors operate under intense competitive conditions. Technological innovations in the banking sector and changes in the customer and investor structure have made efficiency in the sector crucial. Efficiency in banking refers to a bank's efforts to increase its profitability and service quality by using its resources in the most efficient manner. Economic efficiency is decisive in determining the performance of banks. The concept of efficiency can be defined as achieving the targets set by institutions or organizations in advance. If we look at different definitions of the concept of efficiency, it can be defined as achieving predetermined goals or activities at the lowest possible cost. Effectiveness is accepted as the degree of achievement of strategic goals and a performance indicator. Banks strive to increase effectiveness by minimizing input parameters and maximizing output parameters, which are performance criteria. Effective banks gain a competitive advantage and are able to conduct their activities in an uninterrupted and sustainable manner.

In banking, efficiency is also critical in operational processes, risk management, and financial analysis. By effectively monitoring their risks, banks become more resilient to financial crises. In this context, efficiency should also be seen as part of the long-term value creation process. For financial stability, sustainable growth, and customer confidence, banks' efficiency strategies must be continuously reviewed and updated. In this way, banks can both demonstrate a more robust stance against economic fluctuations and increase their competitive strength in the sector.

Ratio analysis and frontier efficiency analysis are used to measure the efficiency of banks. Ratio analysis is a temporal examination of the ratio between a single input and output. Frontier efficiency is the calculation of the distance between the current situation of banks and the targeted frontier. It is divided into parametric and non-parametric approaches.

As of June 2025, the Turkish banking sector consists of 67 banks, including 38 deposit banks, 9 participation banks, and 20 development and investment banks by functional groups. In terms of ownership structure, there are 12 public, 27 domestic private, and 28 foreign banks operating in the sector. The total number of employees decreased by 10 compared to the

previous quarter, reaching 210,703. Deposit banks employ 182,218 people with 9,234 branches, participation banks employ 21,972 people with 1,499 branches, while development and investment banks employ 6,513 people with 77 branches. Compared to the previous quarter, the total number of personnel in the banking sector decreased by 10, reaching 210,703 employees, while the total number of branches declined by 31, standing at 10,810. In the banking sector's income statement, net interest income amounted to TRY 682 billion. As of June 2025, the Turkish banking sector's net profit for the period is TRY 422 billion (BDDK, 2025).

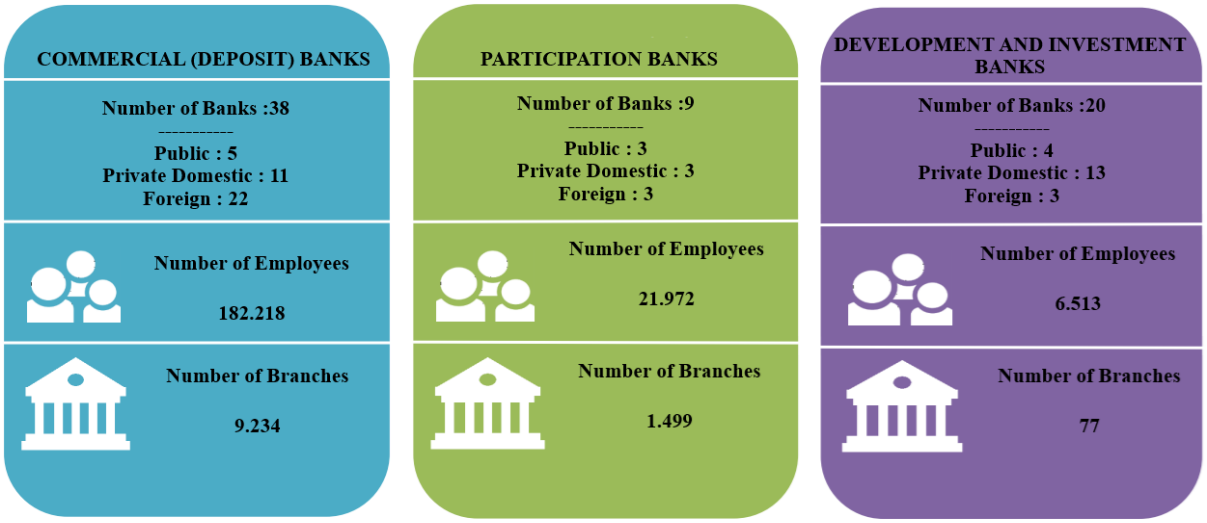

Figure 1. Overview of the Turkish banking sector (June, 2025)
Sources: Turkish Banking Sector Main Indicators June 2025

2. Purpose

In this study, Data Envelopment Analysis (DEA) was performed using the annual data of 10 banks traded on the Istanbul Stock Exchange between 2017 and 2023. The aim of this study is to determine whether there are annual changes in the efficiency of banks. The time period was chosen to determine whether the COVID-19 pandemic caused a change in the efficiency of the banking sector. The introduction of the study attempts to explain the importance of the banking sector for the economy and why efficiency is necessary for banks. The purpose of the study is stated in the objective section. The literature section of the study refers to similar studies and their findings. The methodology section of the study discusses Data Envelopment Analysis and attempts to evaluate the findings. The results section of the study provides a general evaluation of the findings and makes recommendations for future studies.

3. Literature review

Literature studies on efficiency in banking generally examine areas such as banks' operational efficiency, digitalization, cost optimization, service quality, and risk management. Efficiency studies using Data Envelopment Analysis (DEA) in banking are a frequently preferred method for measuring the efficiency and performance of banks. DEA allows for an objective comparison of banks' efficiency levels by considering multiple input and output variables.

Pasiouras et al. (2007) used DEA, Tobit, and regression analysis to determine the efficiency boundaries of 16 banks in Greece and measure their cost efficiency. The study concluded that the efficiency of these banks could be improved and that bank size had an impact on efficiency measures.

Gishkori and Ullah (2013) analyzed the efficiency and productivity of banks in Pakistan

using DEA and Tobit Regression analysis in their study. The study concluded that 5 banks were efficient in 2007, 8 banks in 2008, 10 banks in 2010, and 23 banks in 2011. Moualhı (2015) analyzed the efficiency of 33 Islamic banks in the MENA region using DEA. The study concluded that 2008 was the year with the lowest bank productivity. Wong and Deng (2016) analyzed the differences between the efficiency and productivity of banks operating in Asian countries using DEA and concluded that banks in Malaysia were more efficient.

Özdağoğlu et al. (2017) analyzed the efficiency of 34 Turkish deposit banks in Turkey using DEA. The study concluded that despite having fewer inputs, a small number of banks operated more efficiently, and some banks were less efficient than banks that performed extra to achieve high outputs. Öner and Demirel (2018) analyzed the efficiency and productivity of commercial banks in Turkey using the Malmquist Total Factor Productivity Index and DEA. The study concluded that the efficiency of banks in Turkey has declined.

Çalışır and Bengisu (2018) analyzed the performance and efficiency of banks in Turkey using DEA and concluded that bank performance has been lower since 2008 compared to previous years and that participation banks are less efficient than other banks.

Şenel and Şekeroğlu (2019) analyzed the financial performance of development and investment banks in Turkey using DEA. The study concluded that most participation banks were efficient in the 2013-2015 period and tended to increase their efficiency after 2016.

Mustafayeva (2020) analyzed the performance of 13 development and investment banks in Turkey using the CAMELS analysis. The study concluded that the performance of development and investment banks was higher than that of commercial banks.

Çetinbakış and Bektaş (2023) examined the performance of development and investment banks in Turkey using DEA in their studies. The study concluded that banks were not efficient in terms of their average technical efficiency results between 2010 and 2021.

These studies demonstrate that DEA is a very powerful tool for efficiency analysis in the banking sector. DEA measures efficiency by considering both input and output variables when comparing the performance of banks. The literature shows that DEA is an ideal method for evaluating banks' operational efficiency, cost efficiency, profitability, and their ability to benefit from economies of scale. Research using DEA in the banking sector enables more comprehensive analyses by considering local conditions, regulations, technological developments, and macroeconomic factors when measuring bank performance.

4. Research methods

In this study, DEA analysis was performed for 10 banks listed on the BIST Bank Index using 3 input and 3 output variables. Table 1 lists the banks used in the analysis, and Table 2 lists the variables. The data for the study was obtained from the Turkish Banks Association database.

One of the most important methods used for measuring efficiency is Data Envelopment Analysis (DEA). Data envelopment analysis was introduced to the literature in the 1970s by Charnes et al. (1978) in their article titled "Measuring the efficiency of decision-making units." Based on Farrell's propositions in 1957, the authors adapted it for use in organizations. In data envelopment analysis, they formalized the linear programming problem, which forms the basis of the nonparametric determinism approach to performance evaluation. Data envelopment analysis was first applied in non-profit public schools in the United States (Charnes et al., 1978). Later, with the development of computer software, it began to be used in hospitals, banks, and the manufacturing sector to evaluate efficiency and to compare the efficiency of resource use in countries or regions (Donthu and Yoo, 1998).

In short, one of the greatest advantages of data envelopment analysis is that it calculates the efficiency of decision-making units with multiple inputs and outputs. Another advantage is that it allows decision-making units to be compared with fully efficient units rather than units with average efficiency (Coelli et al., 2004).

Table 1. Banks used in the analysis

Company code	Abbreviation	Company name
1	AKBNK	Akbank
2	ALBRK	Albaraka Türk
3	GARAN	Garanti Bank
4	HALKB	T. Halk Bank
5	ICBCT	ICBC Turkey Bank
6	ISCTR	İş Bankası (C)
7	SKBNK	Şekerbank
8	TSKB	T.S.K.B.
9	VAKBN	Vakıflar Bank
10	YKBNK	Yapı ve Kredi Bank.

Table 2. Variables used in the analysis

Variable type	Variables	Variable type	Variable abbreviation
Outputs	ROA	Output1	O1
	ROE	Output2	O2
	Net profit margin	Output3	O3
Inputs	Total assets	Input1	I1
	Number of company employees	Input2	I2
	Net sales	Input3	I3

Table 3. Input and output-oriented BCC and CCR model

Input oriented BCC	Output oriented BCC
$min\ z_0 = \theta$ Subject to $\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_0$ $\theta x_0 - \sum_{j=1}^{n} \lambda_j x_{ij} \geq 0$ $\sum_{j=1}^{n} \lambda_j = 1$ $\lambda_0 \geq 0$ $r = 1,2,\dots,s;\ j = 1,\dots,n, i = 1,\dots,m$	$max\ z_0 = \theta$ $\sum_{j=1}^{n} \lambda_j y_{rj} \leq x_0$ $\theta y_0 - \sum_{j=1}^{n} \lambda_j x_{ij} \leq 0$ $\sum_{j=1}^{n} \lambda_j = 1$ $\lambda_0 \geq 0$ $r = 1,2,\dots,s;\ j = 1,\dots,n;\ i = 1,\dots,m$
Input oriented CCR	**Output oriented CCR**
$min\ z_0 = \theta$ Subject to $\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_0$ $\theta x_0 - \sum_{j=1}^{n} \lambda_j x_{ij} \geq 0$ $\lambda_0 \geq 0$ $r = 1,2,\dots,s;\ j = 1,\dots,n, i = 1,\dots,m$	$max\ z_0 = \theta$ Subject to; $\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_0$ $\theta y_0 - \sum_{j=1}^{n} \lambda_j y_{rj} \leq 0$ $\lambda_0 \geq 0;\ r = 1,2,\dots,s;\ j = 1,\dots,n;\ i = 1,\dots,m$

Data envelopment analysis basically has two models: BCC and CCR. The model called BCC (Banker, Charnes, Cooper) is basically based on variable returns to scale (VRS). This model was developed by Banker, Charnes, and Cooper in 1984. The other model, CCR (also known as CRS), is an input-oriented model based on the assumption of constant returns to scale and is used to obtain qualitative information (Ray, 2004).

When the rate of change in inputs and outputs is the same, constant returns to scale (CRS) can be said to exist. If the rate of change between inputs and outputs is different, variable returns to scale (VRS) exist (Demirci and Tarhan, 2016).

5. Findings

In this study, a BVA analysis based on constant returns to scale was performed for 10 banks listed on the BIST Bank Index, using 3 input and 3 output variables. The analysis results are presented in Table 4.

DEA evaluates the input-output relationship when performing efficiency analysis and assesses each unit, i.e., each bank, in terms of efficiency. In DEA, the efficiency of units can be classified as "fully efficient" or "inefficient." The rows in the table show the efficiency scores for the banks for each year. These scores indicate whether each bank was efficient for the relevant year. A score of 1.000 indicates that the bank was fully efficient for that year, while a score below 1 indicates that the bank was inefficient for that year.

Table 4. DEA results (fixed-return scale – output-focused)

		2017	2018	2019	2020	2021	2022	2023
1	Akbank	1.000	0.798	1.000	1.000	1.000	1.000	1.000
2	Albaraka Türk	1.000	0.402	0.187	0.636	0.265	0.348	1.000
3	Garanti Bank	1.000	0.606	1.000	0.447	1.000	0.944	1.000
4	Turkish Halk Bank	0.683	1.000	0.679	1.000	0.119	0.411	0.684
5	ICBC Turkey Bank	1.000	0.950	0.585	0.817	0.463	0.422	0.564
6	İş Bankası (C)	1.000	0.459	1,000	0.493	0.494	0.971	1.000
7	Şekerbank	0.435	0.230	0.126	0.212	1.000	0.372	1.000
8	TSKB	1.000	1.000	1.000	1.000	1.000	0.254	1.000
9	Vakıflar Bank	0.548	0.555	0.424	0.817	1.000	0.830	0.392
10	Yapı ve Kredi Bank.	0.424	1.000	0.396	1,000	0.495	1.000	1.000
	Average	0.809	0.700	0.627	0.742	0.684	0.655	0.864

Looking at Table 4, Akbank (2017, 2019-2023), Albaraka Türk (2017, 2023), Garanti Bank (2017, 2019, 2023), İş Bank (C) (2017, 2019, 2023), TSKB (2017, 2018, 2019, 2020, 2021, 2023), Yapı ve Kredi Bank (2018, 2020, 2023) generally have high levels of efficiency, but are inefficient in some years. Banks such as Albaraka Türk, Garanti Bank, ICBC Turkey Bank, Şekerbank, and Vakıflar Bank have lower productivity scores in some years. For example, Albaraka Türk had very low scores in 2018 and 2020 (0.402, 0.187), indicating that the bank was inefficient in those years.

Some banks show significant fluctuations over the years. For example, Şekerbank had quite low efficiency scores in 2017, 2018, and 2020, but showed high efficiency (1.000) in 2021, 2022, and 2023. This indicates that the bank was inefficient in some years but showed significant improvement afterwards. T.S.K.B. was fully efficient (1.000) from 2017 to 2021, but showed very low efficiency (0.254) in 2022. Significant inefficiency was observed in 2022.

Banks such as Akbank, Garanti Bank, İş Bank (C), and Yapı ve Kredi Bank generally remained efficient. However, they may have shown inefficiency in some years (for example, Garanti Bank had a low score of 0.447 in 2020). Albaraka Türk experienced significant inefficiency between 2018 and 2022 but returned to full efficiency in 2023. Although Şekerbank

showed inefficiency in years such as 2017 and 2018, it achieved a significant improvement by scoring 1.000 in 2021.

The data in Table 3 reveals the efficiency of banks based on their annual performance. While some banks consistently achieve high efficiency, others show significant fluctuations on a yearly basis. Such analyses can help you determine which banks are more effective and also encourage managers to focus on efficiency when making strategic decisions.

6. Conclusion

The purpose of this study was to analyze the changes in efficiency of 10 banks traded on the Istanbul Stock Exchange between 2017 and 2023 and to determine whether the COVID-19 pandemic had an impact on the efficiency of these banks. The findings of this study, conducted using Data Envelopment Analysis (DEA), show that there are significant fluctuations in the annual efficiency levels of banks.

First, it was observed that some banks generally had high levels of efficiency. For example, banks such as Akbank, Garanti Bank, İş Bank (C), and Yapı ve Kredi Bank remained fully efficient throughout most of the 2017-2023 period. However, even these banks have shown inefficiency in some years, such as Garanti Bank's low efficiency score in 2020. These fluctuations indicate that banks sometimes experience difficulties in using their resources efficiently, but generally maintain their efficiency.

Some banks, such as Albaraka Türk and Şekerbank, have shown significant fluctuations in efficiency. Albaraka Türk experienced difficulties, particularly in 2018 and 2020, with low efficiency scores, but returned to high efficiency scores in 2023. Şekerbank, on the other hand, showed inefficiency in 2017 and 2018 but significantly increased its efficiency in 2021 and beyond. This situation shows that banks have the potential to improve their efficiency over the years through changes in financial management and strategy.

It is also noteworthy that TSKB experienced serious inefficiency in 2022. The bank, which was fully efficient between 2017 and 2021, experienced a marked decline in its efficiency level in 2022. This highlights the sensitivity of banks to external factors (such as economic fluctuations or management changes).

The impact of the COVID-19 pandemic is not directly apparent in this study. Although some banks showed fluctuations in their efficiency before and after the pandemic, it has not been clearly observed whether the pandemic directly affected the efficiency levels of banks. However, more detailed analyses of the performance of banks during this period and long-term data sets offer an important opportunity for future research.

In conclusion, efficiency in the banking sector is influenced not only by financial results but also by a range of factors, including banks' strategic management, technological adaptation, and responses to external factors. The findings of this study emphasize the importance of banks continuously reviewing their strategies to increase their efficiency, as well as demonstrating flexible and sustainable performance in the face of economic fluctuations and crisis periods.

Future studies could make better comparisons using longer-term data sets to examine in more detail the impact of the COVID-19 pandemic on banks' performance. However, analyzing the impact of banks' digital transformation processes on their performance could be an important area of research for measuring banks' sustainable performance in the future. Furthermore, the impact of macroeconomic variables, such as interest rates, exchange rates, and economic growth, on banks' efficiency could be examined in greater depth.

These recommendations will enable the development of strategies that can help

banks increase their effectiveness and maintain their competitive advantage in the sector.

References

Aydın, N., Delikanlı İ. U., Çabukel R., Erdal L. Erdal F., Ergeç E. H. (2012). Introduction to banking and insurance, *Anadolu University Publication*, Eskişehir.

Banking Regulation and Supervision Agency (BDDK) (2025). Turkish banking sector main indicators June 2025, https://www.bddk.org.tr/Veri/EkGetir/8?ekId=506 (Accessed: July 20, 2025).

Charnes A, Cooper W., and Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research* 2(6): 429–444.

Coelli, T., Rao, D.S.P., and Battese, G.E. (2004). An introduction to efficiency and productivity analysis, *Kluwe Academic Publishers*, Boston.

Çağıl, G., & Mukhtarov, S. (2014). Performance analysis of azerbaijan's commercial banking sector using the CAMELS method, *Öneri Dergisi*, 11(41), 77-94. https://doi.org/10.14783/od.v11i41.5000011406

Çalışır, M. and Bengisu, B. (2018). Analysis of the performance of banks operating in the financial sector in Turkey using the data envelopment method. Kastamonu University *Journal of Economics and Administrative Sciences*, 20(4), 172-200.

Çetinbakış, M., & Bektaş, S. (2023). Evaluation of the efficiency performance of selected development and investment banks using data envelopment analysis: The case of Turkey in the period 2010-2021. *Gazi Journal of Economics and Business*, 9(1), 51-65.

Demirci, A., and Tarhan, D. B. (2016). Port operations in Turkey and the measurement of their efficiency using the data envelopment analysis method. *International Journal of Economic and Administrative Sciences*, 2(2), 144-160.

Donthu, N., and Yoo, B. (1998). Retail productivity assessment using data envelopment analysis. *Journal of Retailing*, 74(1), 89-105.

Farrell, M. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society* 120(3): 253–290.

Gishkori, M. A. and Ullah N. (2013). Technical efficiency of Islamic and commercial banks: evidence from Pakistan using DEA model (2007-2011). *IOSR Journal of Business and Management* (IOSR-JBM), 7(4), 68-76.

Kartal, M. T. (2018). The importance of banks in the financial sector, financial economics, *Orion Publishing House*, Istanbul.

Moualhı, M. (2015). Efficiency in Islamic banking: evidence flrom MENA region. *International Journal of Islamic Economics and Finance Studies*, 1(2), 5-21.

Mustafayeva, Z. (2020). Performance analysis of investment and development banks: 2013-2018 period, (unpublished master's thesis). *Uludağ University.* Institute of Social Sciences, Bursa

Öner, M. and Demirel Arıcı, N. (2018). Efficiency and productivity analysis of the Turkish banking sector: 2012-2017 DEA and Malmquist TFV index application. *Bankacılar Dergisi*, 106, 18-36.

Özdağoğlu, A., Yakut, E., and Sezai B. (2017). Performance evaluation of the Turkish banking sector with data envelopment analysis using entropic weights. *Dokuz Eylül University Faculty of Business Administration Journal*. 18(1), 1-28.

Pasiouras F., Sifodaskalakis, E., and Zopounidis, C., (2007). Estimating and analyzing the cost efficiency of Greek cooperative banks: An application of two-stage data envelopment analysis. *University of Bath School of Management*, *Working Paper Series,* 2007.12.

Ray, S. (2004). Data envelopment analysis: theory and techniques for economics and operations

research, Cambridge *University Press, New York*.
Reis, Ş. G., Kılıç, Y., & Buğan, M. F. (2016). Factors affecting bank profitability: the case of Turkey. *Accounting and Finance Journal*, (72), 21-36. https://doi.org/10.25095/mufad.396715
Sarıtaş, H., Uyar, S. K., & Gökçe, A. (2016). Analysis of the relationships between bank profitability and financial ratios and macroeconomic variables using a system dynamics panel data model: a study on Turkey. *Journal of the Faculty of Economics and Administrative Sciences*, Eskişehir Osmangazi University, 11, 87-108.
Şenel, C. and Şekeroğlu, S. (2019). Analysis of the effectiveness of investment and development banks using the DEA method and an application in the Turkish banking sector. *Third Sector Social Economy Journal*, 54(1), 565-580.
Wong, W. P., and Deng, Q. (2016). Efficiency analysis of banks in ASEAN countries. *Benchmarking: An International Journal*, 23(7), 1798–1817.
Yetiz, F. (2016). The birth of banking and the Turkish banking system. Niğde University *Journal of Economics and Administrative Sciences*, 2(9), 107-117.