

The efficiency of Participation Banking Sector in Turkey: A DEA Approach

Edib Smolo*
Mohamed Ashraf Iqbal*
Ayşe Akdemir**

Abstract

There are six participation banks in Turkey, and they are expected to contribute significantly to the economy in the future. The aim of this study is to assess the efficiency of these participation banks based on financial data from 2010 to 2020. Data envelopment analysis (DEA), a non-parametric efficiency approach, is used in this study with three input variables (profit share expenses, personnel expenses, and total funds), and two output variables (profit share income and net profit). While Kuveyt Türk, Ziraat Katılım, and Türkiye Finans are found to be the most efficient, Albaraka Türk and Vakıf Katılım are inefficient – at least when the most recent observations (2018-2020) and the four-year moving average efficiency score for both outputs and inputs are used. As for the overall average scores, Türkiye Finans is the most efficient participation bank, followed by Ziraat Katılım and Vakıf Katılım. The least efficient participation banks are Kuveyt Türk and Albaraka Türk. For participation banks to gain a larger share of the market and to continue contributing to overall economic growth, policymakers must pay attention to these underperforming banks.

Keywords: Interest-Free Banking; Participation Banking; Data Envelopment Analysis; DEA; Islamic Finance; Productivity; Efficiency; Turkey.

JEL Classification: C67, D57, G20, G29, M21.

1.0 Introduction

Despite the COVID-19 pandemic and ongoing economic uncertainty, the Islamic finance industry continues to grow globally. A number of reports confirm its stable and continuous growth prospects (ICD-REFINITIV, 2021; S&P, 2022). Islamic Banking in Turkey is known as *participation banking*. Participation banking is still in its infancy compared to traditional banking. Nevertheless, the Turkish participation banking sector is also expected to have a bright future, and it is seen as the engine of Turkish economic growth.

* Effat University, Jeddah, Saudi Arabia, edib.smolo@gmail.com; esmol@effatuniversity.edu.sa. Orcid: <https://orcid.org/0000-0002-7645-4581>.

* The Founder of MindSpring Sdn Bhd, ashrafiqbal@mindspringgroup.com.

** Süleyman Demirel University, aysecelik0755@gmail.com, Orcid: <https://orcid.org/0000-0003-0282-0558>.

The Turkish banking sector is composed of 57 banks (35 deposit banks, 16 development and investment banks, and 6 participation banks), of which 28 are foreign-owned. There was double-digit growth in the banking sector between 2002 and 2021. As an example, profitability and asset size grew at a CAGR of 20% and 22%, respectively, while capital ratios remained within regulatory limits.¹

Turkey's participation banking sector is one of its fastest-growing sectors. As opposed to traditional banks, participation banks inject the funds they collect from savers and procure from international markets directly into the real economy under interest-free financing principles, and they share profits and losses with their savers in accordance with Shari'ah principles.

By offering interest-free credit products, participation banking aims to gain a more substantial share of the Turkish financial system. Besides supporting the real sector, participation banks contribute to reducing unemployment and increasing employment in Turkey. As a consequence, participation banks must maintain and efficiently utilize their resources. According to the S&P report, public sector participation banks will be the primary drivers of Turkey's growth (S&P, 2022).

Our study aims to examine the efficiency of participation banks in Turkey by analyzing financial data for six participation banks over the period 2010-2020. In Data Envelopment Analysis (DEA), profit share expenses, personnel expenses, and total funds are input variables, while profit share income and net profit are output variables. In general, our results indicate that Türkiye Finans, Ziraat Katılım and Vakıf Katılım were the most efficient participation banks in Turkey during the study period. Kuveyt Türk and Albaraka Türk, on the other hand, are not as efficient.

This sector has been the subject of previous studies that have provided valuable insights. They differ in their findings depending on the study period, variables included, and methods used. Nonetheless, to ensure that the participation banks stay on track, continuous review and due diligence are needed as the market evolves and new challenges arise. This is why we are conducting this study.

The significance of this study can be summarized as follows. First, Turkish participation banks are one of the fastest-growing Islamic finance sectors (S&P, 2022). While recognizing its importance to overall economic growth, the government allocates substantial resources to its development, which is expected to nearly double by 2025.² Another issue is that most of the studies available are in Turkish, which means they may be difficult for general readers to access. In addition to that, by encompassing all available data from all participation banks, this study provides an even more comprehensive picture with new insights needed by all parties involved.

¹ For a brief overview of the Turkish banking sector, see: <https://www.yapikrediinvestorrelations.com/en/share/detail/Why-Turkish-Banking-System/243/800/0>

² For details see the Finance Office of Presidency of the Republic of Türkiye, <https://www.cbfo.gov.tr/en/participation-finance>.

The study is organized as follows. In addition to this brief introduction, section two presents an overview of the participation banking sector in Turkey. In section three, we discuss the existing literature and their findings. In section four, we discuss data and methodology, while in section five, we present and analyze the results. The final section of the paper concludes with some remarks.

2.0 The Turkish Banking Sector: Participation Banks

Turkish banking sector comprises of three elements: commercial banks, development banks, and investment banks. Participation banks (part of commercial banks) are one of the fastest-growing sectors today. In contrast to traditional banks, participation banks inject the funds they collect from savers and procure from international markets directly into the real economy under interest-free financing principles and share the profit or loss with the savers (Iqbal & Mirakhor, 2007; Smolo, 2013, 2020; Smolo & Mirakhor, 2014). As a result, participation banks operate as financial institutions that finance production, investment, employment, and exports (Pehlivan, 2016). In 1984, Albaraka Türk, Turkey's first participation bank, was established as Private Finance House.³ Since 2005, these institutions have been referred to as "participation banks" and subject to the same regulations as traditional banks.

A bank can be classified as a deposit bank, a development and investment bank, or a participation bank, according to the Banking Regulation and Supervision Agency (BDDK) (Yıldırım, 2020). Turkish banks have a predominantly deposit-based structure, and can also be described as universal banks. In general, apart from 6 participation banks, the Turkish banking system has 51 traditional banks (35 deposit banks and 16 development and investment banks) – as of 13.06.2022. These banks operate through 9,691 domestic and 71 abroad branches.⁴

Turkey's first participation bank was Albaraka Türk Participation Bank, established in 1984, followed by Kuveyt Türk in 1989, and Türkiye Finans in 2005. The first public participation bank, Ziraat Participation, was established in 2015 to increase participation banking's share. Vakıf Katılım was also established in the same year and received an operating license in 2016. Turkey Real Estate Participation Bank is another new bank focusing on the housing industry established in 2019 called. Consequently, there are now six participation banks operating in Turkey as of the end of 2021. Three banks are owned by the government, while the other three are partly owned by GCC financial institutions.⁵ Collectively, they have 1,311 domestic and international branches that represents approximately 12% of the total number of branches in the banking sector. In 2021, 6 participation banks' unconsolidated assets grew by 64.1% to 717.3 billion Turkish Liras. As of 2021, participation banks accounted for 7.8% of the sector, based on active development between 2017 and 2021. However, according to the newly updated strategy issued by the Participation Banks Association of Turkey, its market share is expected to double and reach 15% by 2025.⁶

³ Although established in 1984, it commenced its commercial activities in 1985 as Albaraka Türk Özel Finans Kurumu

⁴ For more information refer to the Banks Association of Türkiye's website <https://www.tbb.org.tr/en/home>.

⁵ Al Baraka Banking Group, Kuwait Finance House, and Saudi National Bank are partly owned by their GCC parent banks.

⁶ See footnote 2 above.

The main objectives of participation banking in Turkey is to utilize the idle funds of savers who do not want to work with classical banks due to interest prohibition, on one side, and to improve Turkey's relations with Islamic countries and to attract funds from oil-rich Islamic countries to the country. In addition, participation banks contribute to the Turkish economy in the following ways: (i) participation banks have brought a new financing method to the banking sector by collecting and using funds within the framework of the interest-free banking; (ii) it enabled interest-sensitive fund owners to enter the banking sector as new customers; (iii) since the funds collected by participation banks are used on a project basis, non-project-based fund requests cannot be answered, so resources are used more efficiently and effectively; and (iv) participation banks have brought some of the idle funds in the hands of fund owners, who stay away from institutions that carry out interest-based banking activities, to the real economy (Aras & Öztürk, 2011). As a result, the Turkish government is aware of the Islamic finance significance for continuous economic growth of the country and hence offers extensive support to the sector (S&P, 2022).

3.0 Literature Review

In recent studies, the effectiveness of Islamic/participation banks has been examined, including scale efficiency, technical efficiency, cost efficiency, profitability efficiency, and income efficiency. A few studies have been conducted in Turkey and around the world on Islamic/participation banks' effectiveness over different periods. In this section, we present some of these studies.

Data envelopment analysis (DEA) was used by Özgür (2008) to measure the financial efficiency of participation banks over the 2001-2005 period. Albaraka Türk is the most efficient bank, while Kuveyt Türk is far from being efficient. In addition, inefficient banks are moving towards efficiency during periods of economic stability. DEA was used by Zor and Çam (2021) to measure the efficiency and effectiveness of participation banks' use of financial resources. Based on the results, Kuveyt Türk, Ziraat, and Vakıf Katılım banks have consistently maintained a high level of technical efficiency. By utilizing DEA data as well as 2016-2017 sample data, Bolat and Metin (2019) found Kuveyt Türk bank to be effective for both years. Based on the 2015-2019 period, Bolat and Akardeniz (2020) found that Albaraka Türk Participation Bank was the participation bank with the fewest activities, while only Kuveyt Türk Bank displayed sufficient efficiency scores. Additionally, Karaca et al. (2019), who studied the 2009-2016 period with DEA, reported that Kuveyt Türk Bank was the most efficient participation bank in Turkey.

Güney (2018) investigated two government-controlled banks, Ziraat participation bank and Vakıf Katılım bank. Data from 2016-2017 suggest that these banks are approaching super efficiency according to DEA analysis. Compared to public participation banks, private participation banks in Turkey have better personnel ratios, more branches, net profits, total assets and better efficiency of funds provided according to Eke and Sevinç (2021).

Additionally, Gürçay and Dadr (2022) investigated the impact of COVID-19 on participation banks. The researchers examined whether 5 participation banks and 5 deposit banks had a different level of impact when compared to the period prior to COVID-19, and in 2020 and 2021 when the pandemic continued. During the pandemic process,

participation banks perform better in terms of asset quality, but in terms of other variables, there is no significant difference.

The efficiency of participation banks and traditional banks has also been compared in studies. Er and Uysal (2012) used DEA to investigate the efficiency levels of commercial and participation banks operating in Turkey between 2005 and 2010. It was concluded that participation banks were more efficient than commercial banks in the analyzed periods based on the total efficiency scores. On the other hand, Aktaş and Avcı (2013) compared the effectiveness of participation and interest-based banks based on data from 2009 to 2011. In the analysis period, public banking ranked highest in efficiency, followed by interest-based private banking and participation banking. Also, participation banking displays the largest efficiency increase according to total factor productivity values.

Using DEA method, Eyceyurt Batir et al. (2017) studied the technical, allocative, and cost efficiency of conventional and participation banks in Turkey. They found that the average participation bank efficiency is higher than the average conventional bank efficiency each year. They further used Tobit regression analysis and found that expenses and loan quality have significantly negative impact on efficiency of conventional banks, they contribute to the efficiency of participation banks. Ertürkmen and Bolat (2020) examined the asset quality and profitability ratios of participation banks and privately owned deposit banks in Turkey. The number of years in which participation banks achieved an efficiency score is higher than the number of years in which they did not. At the same time, most privately-owned deposit banks failed to achieve adequate efficiency ratings. Similarly, Arslan and Bayraktar (2020) compared the performance of participation banks in Turkey for 2010-2018 with traditional banks based on basic financial ratios and indicators. According to the study, participation banks have a positive performance, but their share in the Turkish banking sector and its complementary impact is relatively small.

As Islamic banking develops rapidly in Muslim countries like Saudi Arabia, Qatar, Malaysia, Pakistan, Turkey, Indonesia, and the UAE, researchers are studying this area. The effectiveness of Islamic banks and Islamic windows in Malaysia, for instance, was measured by Mokhtar et al. (2008) using data from 1997-2003. Based on DEA, the study found that Islamic banks are more efficient than Islamic windows, but less efficient than traditional banks. Between 2008 and 2010, Sardar et al. (2011) measured the effectiveness of 15 Islamic banks in Pakistan. According to DEA results, Islamic banks' scale efficiency is higher than their technical and revenue efficiency. In addition, Islamic banks are becoming increasingly effective over time. Furthermore, the study found that pure Islamic banks operate more efficiently than Islamic bank windows operated by traditional banks. Through linear programming Stochastic Frontier Analysis (SFA), Octrina and Mariam (2021) measured the effectiveness of Islamic banks in Indonesia from 2011 to 2019. There are only two Islamic banks in Indonesia that show a high level of efficiency, and the primary factors affecting Islamic banking efficiency are bank size, capital adequacy ratio, and non-performing financing. Meanwhile, Hassan et al. (2009) investigated the differences in average costs, incomes, and profits between traditional and Islamic banks. In comparing the overall efficiency of conventional and Islamic banks between 1990 and 2005 based on financial statements from 40 banks in 11 Organization of the Islamic Conference (OIC) countries, the authors found no significant differences.

Further, a comparative study was conducted on the effectiveness of Islamic/participation banks in different countries. Turkish participation banks and Islamic banks in Malaysia were examined by Yücel et al. (2015) between 2009-2013 to determine the efficiency and performance relationship between them. This study utilized DEA and regression analysis. According to the study, the performance of participation banks in Turkey and Islamic banks in Malaysia is affected by different factors. Capital adequacy has a more significant effect on participation banks in Turkey, while effective use of activities has a greater impact on Islamic banks in Malaysia. Over a period of six years, Moualhi (2015) examined the technical, pure technical, and scale efficiency of 33 Islamic banks in the Middle East and North Africa. It appears that banks are not maximizing their resource efficiency due to pure technical inefficiency that dominates scale inefficiency. Furthermore, based on data from Saudi Arabia, Malaysia, UAE, Kuwait, Turkey, and Bahrain, Elmas and Yetim (2021) found that Islamic banks in these countries have similar financial performance levels and total asset shares.

Additionally, Avcı and Aktaş (2017) compared the performance of Islamic banks in Malaysia, Saudi Arabia, Qatar, Kuwait, Iran, the UAE, and Turkey over the 2011-2015 period. According to the DEA results, Malaysia and Iran were effective in all years, while Qatar and Turkey were not. Furthermore, Qatar, Turkey and Malaysia experienced increased productivity, whereas Kuwait, Iran and the UAE did not. Another study examining 27 Islamic banks from seven countries operating in Turkey and GCC member countries found that none of the countries were fully efficient (Nayman Hamamci & Karkacier, 2022). Karakaya (2018), however, analyzed data from 14 Islamic countries for the year 2015 and found that Islamic banks have relatively high efficiency scores.

The efficiency of participation banks has also been evaluated using different methods. For instance, Yayar and Baykara (2012) applied TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) in their study of Turkey from 2005 to 2011. Among the banks they studied, Albaraka Türk was the most effective. Using the same TOPSIS technique but covering the 2016-2018 period, the results by Özkan (2020) show that Türkiye Finans was the best-performing bank, followed by Albaraka Turk and Kuveyt. In addition to using TOPSIS, Çakar (2020) evaluated the personal financial activities of participation banks in Turkey based on their financial data for 2015-2019. Compared to private participation banks, public participation banks reported better personal financial activities in 2015. A more recent study by Özer and Saygın (2022) evaluated Turkish participation banks' performance from 2011 to 2020 using the Promethee method. Based on the results, Kuveyt Türk is the most successful bank, followed by Türkiye Finans and Vakf Katlam, while Albaraka Türk, Bank Asya, and Emlak Katlam are the worst.

Although the existing literature provides mixed results due to different sample periods, variables, and methods used, most of these studies are not available to English-speaking researchers. Furthermore, we used the longest possible period and included all available data from all participation banks to get a more holistic picture. In this sense, our study contributes to this growing literature and generates new insights.

4.0 Data and Methodology

Since the 1980s, the transition to a free market economy in Turkey has brought competition between the private sector and foreign capital banks, as well as participation banks, which have made effective resource use even more crucial. Thus, the importance of performance evaluation and efficiency measurement for banks cannot be overstated. A higher efficiency level in businesses is beneficial to both business activities and the national economy. While efficiency is defined as the ratio of outputs to inputs, it is actually an indicator of the effectiveness of an enterprise's use of resources.

This study uses the non-parametric efficiency approach initially developed by Farrell (1957) and further improved by Charnes, Cooper and Rhodes (1978). This approach became known as data envelopment analysis or simply DEA. Using this approach, we are able to construct the frontier of the observed input-output ratios by linear programming techniques. For a detailed analysis of DEA methodology, refer to Cooper et al. (2007). For instance, according to Farrell (1957), technical efficiency refers to the ability of a company to obtain maximum output from a given set of inputs. In its simplest form, efficiency is measured as follow:

$$Efficiency = \frac{Output}{Input} \quad (1)$$

In this study, DEA was used to examine how each bank performed in comparison to the other banks in the sample. Efficiency scores are produced by comparing the frontier set by efficient banks with the frontier set by inefficient banks. A bank with a score of one is considered to be completely efficient, while a bank with a score of zero is considered inefficient. It is important to note that the most efficient bank (with a score of one) does not necessarily generate the maximum amount of output from the given inputs.

To determine the efficiency of participation banks operating in Turkey between 2010-2020, the study relies on data for six participation banks, namely: Albaraka Türk, Kuveyt Türk, Türkiye Finans, Ziraat Katılım, Vakıf Katılım, and Türkiye Emlak. The study uses three input variables (profit share expenses, personnel expenses, and total funds) and two output variables (profit share income and net profit). All data are obtained from the financial statements available on the official website of the Participation Banks Association of Turkey. The basic information about the banks and years covered is presented in Table 1 below.

DEA compares Decision Making Units (DMUs) in order to assess their relative efficiency. First, we need to identify which DMUs are fairly similar to each other. Similarity can be either in terms of inputs or outputs. As an example, one can compare two banks that have a similar customer base, similar number of branches, and similar products compared to banks that are dissimilar, such as a local cooperative bank to a multinational bank that operates in that country. As a result, some initial value judgment must be made to ensure the DMUs selected are comparable. An important aspect of the analysis is the homogeneity of DMUs.

Table 1: Information on Decision-Making Units

Participation Banks	Capital Source	Foundation Year	Analysis Years
---------------------	----------------	-----------------	----------------

Albaraka Türk	Private	1984	2010-2020
Kuveyt Türk	Private	1989	2010-2020
Türkiye Finans	Private	2005	2010-2020
Ziraat Katılım	Public	2015	2015-2020
Vakıf Katılım	Public	2016	2016-2020
Türkiye Emlak	Public	2018	2019-2020

Source: Participation Banks Association of Turkey (see <https://tkbb.org.tr/>)

A robust analysis requires a sufficient number of DMUs after determining the pool of selected DMUs. In essence, DEA measures the relative efficiency between a group of DMUs. Due to the fact that each DMU is defined as a point on the efficient frontier, if the number of DMUs under examination is few, each is likely to obtain an efficiency score of 1 (or 100). Despite the fact that the result is correct, it is pointless from the perspective of relative efficiency. Therefore, the heuristic for determining the minimum number of DMUs required is: $m \geq 3$ (inputs + outputs). The minimum number of DMUs for a study involving 3 inputs and 2 outputs is 15. In this study, three inputs and two outputs will be used, but a maximum number of DMU's may range between three and six at any given time (see Table 2).

Table 2: The number of DMUs

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DMUs	3	3	3	3	3	4	5	5	5	6	6

Source: Authors' own calculations.

Our analysis will be conducted as if all banks were operating at the same time, resulting in 46 DMUs for comparison. Using the bank's initials and the actual year that the data represents (bank name: Al Baraka Turk, date for 2013; identifier AT13), some interesting observations can be derived. For AT, KT and TF banks, data is available from 2010 to 2020; whereas for ZK, the data only begins in 2015, VK in 2016, and TE in 2019, resulting in 46 unique data points.

Table 3: Bank Name, Identifier, and Year that data is available

Bank Name	Code	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Albaraka Türk	AT	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
Kuveyt Türk	KT	KT10	KT11	KT12	KT13	KT14	KT15	KT16	KT17	KT18	KT19	KT20
Türkiye Finans	TF	TF10	TF11	TF12	TF13	TF14	TF15	TF16	TF17	TF18	TF19	TF20
Ziraat Katılım	ZK						ZK15	ZK16	ZK17	ZK18	ZK19	ZK20

Vakıf Katılım	VK							VK16	VK17	VK18	VK19	VK20
Türkiye Emlak	TE										TE19	TE20

Source: Authors' own calculations.

DEA can be run either using the CCR model⁷ which assumes a constant return to scale or using the BCC model⁸, which assumes a variable return to scale. In the CCR model, the inputs and outputs are unlimited, while in the BCC model, there are finite minimums and maximums. The BCC model is therefore the most appropriate model for banks.

In addition, the model can be run in an input orientation (I), in which outputs are kept constant while inputs are minimized, or in an output orientation (O), in which outputs are kept constant while inputs are maximized. The input orientation states that, when comparing two banks with similar outputs, the one with fewer inputs is more efficient. In contrast, in the output orientation, for two banks consuming similar inputs, the one that produces higher outputs is more efficient.

Scale efficiency is another key by-product of DEA modeling, which indicates whether a DMU is operating at decreasing returns to scale (DRS), constant returns to scale (CRS), or increasing returns to scale (IRS). A unit increase in inputs with DRS will lead to a lower than a unit increase in outputs. On the other hand, a unit increase in inputs with CRS will lead to a unit increase in outputs. Finally, a unit increase in inputs with IRS will lead to more than a unit increase in outputs. Consequently, scale efficiency measures are useful when deciding how to allocate resources.

5.0 Estimation Results

This section presents and briefly discusses the main findings of our analysis. In Table 4, we present DEA results based on all available data for six banks throughout the study period. Results are provided based on both input (I) and output (O) orientations of the CCR model. The 4-year moving average and corresponding return to scale measures are provided in addition to the individual annual results.

Table 4: DEA Results using CCR model and Input (I) and Output (O) Orientation

DMU	CCR-O	MA CCR-O	CCR-I	MA CCR-I	RtS	DMU	CCR-O	MA CCR-O	CCR-I	MA CCR-I	RtS
AT10	91.57		92.37		IRS	KT10	100		100		CRS
AT11	92.26		92.77		IRS	KT11	94.25		94		DRS

⁷ CCR model refers to the first DEA model developed by Charnes, Cooper and Rhodes (1978) under the assumption of a Constant Returns to Scale production technology, i.e., when an increase in the production resources results in a proportional increase in the output.

⁸ BCC model was introduced by Banker, Charnes and Cooper (1984).

AT12	91.97	92.4		IRS	KT12	84.11	83.67		DRS		
AT13	93.45	92.31	92.99	92.63	DRS	KT13	85.88	91.06	81.65	89.83	DRS
AT14	75.59	88.32	74.97	88.28	DRS	KT14	87.67	87.98	83.2	85.63	DRS
AT15	75.36	84.09	74.53	83.72	DRS	KT15	88.53	86.55	85.25	83.44	DRS
AT16	73.8	79.55	73.88	79.09	DRS	KT16	95.9	89.5	94.88	86.25	DRS
AT17	81.52	76.57	79.91	75.82	DRS	KT17	100	93.03	100	90.83	DRS
AT18	76.77	76.86	74.68	75.75	DRS	KT18	100	96.11	100	95.03	DRS
AT19	68	75.02	61.87	72.59	DRS	KT19	99.54	98.86	99.23	98.53	DRS
AT20	69.89	74.05	62.26	69.68	DRS	KT20	100	99.89	100	99.81	DRS
TF10	100	100			CRS	ZK15	100	100			IRS
TF11	99.93	99.92			CRS	ZK16	80.39	82.66			IRS
TF12	100	100			CRS	ZK17	94.5	94.82			IRS
TF13	98.97	99.73	98.49	99.6	DRS	ZK18	100	93.72	100	94.37	CRS
TF14	100	99.73	100	99.6	CRS	ZK19	100	93.72	100	94.37	CRS
TF15	90.57	97.39	90.77	97.32	IRS	ZK20	100	98.63	100	98.71	CRS
TF16	100	97.39	100	97.32	IRS	VK16	100	100			IRS
TF17	95.25	96.46	95.21	96.5	CRS	VK17	96.5	97.06			IRS
TF18	100	96.46	100	96.5	CRS	VK18	100	100			CRS
TF19	92.06	96.83	89.77	96.25	DRS	VK19	76.09	93.15	75.8	93.22	DRS
TF20	82.7	92.5	77.69	90.67	DRS	VK20	100	93.15	100	93.22	CRS
TE19	60.74	64.06			IRS						
TE20	66.66	68.05			IRS						

Notes: CCR-O – Efficiency of outputs using CCR model by Charnes, Cooper and Rhodes (1978); MA CCR-O – 4-Year Moving average CCR-O; CCR-I – Efficiency of inputs using CCR model; MA CCR-I – 4-Year Moving average CCR-I; RtS – Returns to Scale; DRS – Decreasing returns to scale; CRS – Constant returns to scale; IRS – Increasing returns to scale. **Source:** Authors’ own calculations.

Among the 6 participation banks investigated, it can be concluded that Kuveyt Türk (KT), closely followed by Ziraat Katılım (ZK) and Türkiye Finans (TF), was the most efficient, while the least efficient banks were Albaraka Türk (AT) and Vakıf Katılım (VK).⁹ We reached this conclusion using the four-year moving average efficiency score both for outputs and inputs, taking into account the last three years of observations (2018-2020 period). As an example, KT’s 2020 BCC-O score is 99.89, while ZK’s is 98.63. By contrast, AT’s score is 74.0. Meanwhile, KT’s 2020 BCC-I score is 99.91, ZK’s is 98.71, and AT’s is 69.68.

⁹ The number of observations for Türkiye Emlak (TE) is insufficient, so it has not been counted.

However, KT has been operating at decreasing returns to scale, while ZK, for its first three years, has operated at increasing returns to scale, and then has maintained constant returns to scale. This indicates that ZK's management allocates resources more efficiently than KT's.

Table 5 shows the overall efficiency (based on average scores) of participation banks in Turkey over the study period. In three out of four cases, the private participation bank, TF, is the most efficient participation bank in Turkey. Following it are two publicly owned participation banks, ZK and VK. Turkey's two oldest participation banks, KT and AT, show low-efficiency levels across the board. In terms of efficiency, Türkiye Emlak (TE) comes last. In spite of this, TE's very low-efficiency score is not to be taken as criticism, but as a fact. In the beginning, every bank invests heavily in overhead (office, staff, technology) before generating income. Additionally, despite its low-efficiency results, it is experiencing an increase in returns to scale. Considering that it is new to the market, we expect it to gain momentum in the near future.

As a result of that same efficiency metric, both ZK and VK have done a particularly good job in the early years. It is possible that this is due to the existing infrastructure and experience of their parent banks.

Table 5: The efficiency ranking of participation banks in Turkey

Ranking	Efficiency	4-Year Moving average	Efficiency	4 Year Moving average
	CCR-O	CCR-O	CCR-I	CCR-I
1	TF	TF	ZK	TF
2	ZK	ZK	TF	ZK
3	VK	VK	VK	VK
4	KT	KT	KT	KT
5	AT	AT	AT	AT
6	TE	TE	TE	TE

Notes: The ranking is based on the overall average scores for each participation bank based on all available observations. **Source:** Authors' own calculations.

Table 6: Summary Analysis

	Efficiency CCR-O	Efficiency CCR-I
No. of Observations	46	46
Mean	90.44	89.76
Std. Dev.	11.21	11.91
-1 Std. Dev.	79.24	77.85
<i>Number of:</i>		
Fully efficient observations	16	16

Observations with efficiency higher than the mean	14	14
Observations with efficiency within 1 Std. Dev. below the mean	7	6
Observations with efficiency more than Std. Dev. below the mean	9	10

Source: Authors' own calculations.

In Table 6, we provide a summary analysis of the results presented in Table 4. This dataset contains 32 observations (instances) of banks that are fully efficient in both input and output orientations (16 in each). A mean efficiency of 90.44 was measured in the output orientation and 89.76 in the input orientation, respectively, with standard deviations of 11.21 and 11.91. There were 14 instances where banks operated between the mean and full efficiency. Meanwhile, 7 instances in the output orientation and 6 instances in the input orientation were operating within 1 standard deviation below the mean. In addition, 9 instances in the output orientation and 10 instances in the input orientation were operating more than one standard deviation below the mean.

6.0 Conclusion

In recent years, participation banking has grown rapidly within the Turkish banking sector. In order to maintain this growth trajectory, participation banks must use their resources efficiently and sustainably. In other words, it is important to develop strategic plans in the sector and determine how to increase efficiency and productivity.

The DEA analysis in this study was conducted on the data collected from participation banks over the period 2010-2020. Study results vary over time. Based on the most recent observations (2018-2020) and using the four-year moving average efficiency score both for outputs and inputs, it is evident that Kuveyt Türk, closely followed by Ziraat Katılım and Türkiye Finans, was the most efficient, while the least efficient banks were Albaraka Türk and Vakıf Katılım. Based on overall average scores, however, Türkiye Finans was the most efficient participation bank, followed by Ziraat Katılım and Vakıf Katılım. At the lower end of the efficiency scale are Kuveyt Türk and Albaraka Türk. According to its efficiency score, Türkiye Emlak, which was established in 2019, had the lowest score. In spite of this, it is experiencing a growing return to scale and its current underperformance may be due to high overhead costs in its early years.

Despite the fact that a significant portion of participation banks demonstrate high efficiency, improvements can still be made. In order to reach their target of 15% market share in the Turkish banking sector by 2025, policymakers should pay additional attention to these underperforming participation banks.

The study was limited by the fact that not all banks were open throughout the study period. Furthermore, only two years of data were available for Türkiye Emlak, making it more difficult to draw meaningful conclusions. Having a more complete dataset could improve the results. A different study might be conducted by changing the inputs and outputs for the analysis, expanding the time interval, and comparing it with other countries.

References

- Aktaş, M., & Avcı, T. (2013). Türkiye’de Katılım Bankacılığı ile Faize Dayalı Bankacılığın Etkinlik Açısından Karşılaştırılması. *Finans Politik ve Ekonomik Yorumlar*, 576, 85–0.
- Aras, O. N., & Öztürk, M. (2011). Reel Ekonomiye Katkıları Bakımından Katılım Bankalarının Kullandığı Fonların Analizi. *Ekonomi Bilimleri Dergisi*, 3(2), 167–179.
- Arslan, M. F., & Bayraktar, Y. (2020). Katılım Bankalarının Gelişimi ve Etkinliği Üzerine Bir Değerlendirme: Türkiye Deneyimi. *Maliye Araştırmaları Dergisi*, 6(3), 107–123.
- Avcı, T., & Aktaş, M. (2017). Performance Comparison of The Participating Banking on A Country Basis. *International Journal of Social Science Research*, 6(2), 66–82.
- Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, 30(9), 1078–1092. JSTOR.
- Bolat, İ., & Akardeniz, E. (2020). Türkiye’deki Katılım Bankalarının Etkinlik Analizi. *Journal of Economics and Research*, 1(2), 42–53.
- Bolat, İ., & Metin, M. (2019). Türkiye’deki Katılım Bankalarının Finansal Etkinliklerinin Karşılaştırılması Üzerine Bir Araştırma. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 349–380.
<https://doi.org/10.14520/adyusbd.497871>
- Çakar, R. (2020). Participation Banks Staff Financial Activity Analysis Instance of Turkey. *Journal of Social Sciences Research*, 15(2), 527–535. <https://doi.org/10.48145/gopsbad.726997>
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6), 429–444. [https://doi.org/10.1016/0377-2217\(78\)90138-8](https://doi.org/10.1016/0377-2217(78)90138-8)
- Cooper, W. W., Seiford, L. M., & Tone, K. (2007). *Data envelopment analysis: A comprehensive text with models, applications, references and DEA-solver software* (2nd ed). Springer.
- Eke, V., & Sevinç, H. (2021). Türkiye’deki Katılım Bankalarının Etkinlik Analizi: Özel ve Kamu Bankalarının Karşılaştırılması. *Iğdır Üniversitesi Sosyal Bilimler Dergisi*, 28, 434–451.
- Elmas, B., & Yetim, A. (2021). Katılım Bankalarının Finansal Performanslarının TOPSIS Yöntemi İle Uluslararası Boyutta Değerlendirilmesi. *Uluslararası İslam Ekonomisi ve Finansı Araştırmaları Dergisi*, 7(3), 230–263.
<https://doi.org/10.54427/ijisef.941972>
- Er, B., & Uysal, M. (2012). Türkiye’deki ticari bankalar ve katılım bankalarının karşılaştırmalı etkinlik analizi: 2005-2010 dönemi değerlendirilmesi. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 26(3–4), Article 3–4.

- Ertürkmen, G., & Bolat, İ. (2020). Türkiye'deki Özel Sermayeli Mevduat Bankaları İle Katılım Bankalarının Aktif Kalitesi Ve Kârlilik Oranlarının Karşılaştırılması Üzerine Bir Araştırma. *R&S - Research Studies Anatolia Journal*, 3(1), 19–36.
- Eyceyurt Batir, T., Volkman, D. A., & Gungor, B. (2017). Determinants of bank efficiency in Turkey: Participation banks versus conventional banks. *Borsa Istanbul Review*, 17(2), 86–96.
<https://doi.org/10.1016/j.bir.2017.02.003>
- Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society. Series A (General)*, 120(3), 253. <https://doi.org/10.2307/2343100>
- Güney, G. (2018). Türkiye'de Devlet Eliyle Katılım Bankacılığı Dönemi: Bir Etkinlik Analizi. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 22(3), 1539–1546.
- Gürçay, H. R., & Dağdır, C. (2022). Covid-19 Sürecinde Katılım Bankaları İle Özel Mevduat Bankalarının Performans Değerlendirmesi: Türkiye Örneği. *Uluslararası Finansal Ekonomi ve Bankacılık Uygulamaları Dergisi*, 3(1), 1–25.
- Hassan, T., Mohamad, S., & Khaled I. Bader, M. (2009). Efficiency of conventional versus Islamic banks: Evidence from the Middle East. *International Journal of Islamic and Middle Eastern Finance and Management*, 2(1), 46–65. <https://doi.org/10.1108/17538390910946267>
- ICD-REFINITIV. (2021). *Islamic Finance Development Indicator 2021: Advancing Economies*. The Islamic Corporation for the Development of the Private Sector (ICD) & Refinitiv. <https://www.zawya.com/ifg-publications/report/20211117011204235.pdf/?refKey=IFG-f3c06b43-db66-43fb-9836-ac4d5966524c>
- Iqbal, Z., & Mirakhor, A. (2007). *An Introduction to Islamic Finance: Theory and Practice*. John Willey & Sons (Asia).
- Karaca, S. S., Ekşi, İ. H., & Altemur, N. (2019). Türkiye'deki Katılım Bankalarının Etkinlik Analizi. *Gümüşhane Üniversitesi Sosyal Bilimler Dergisi*, 10(2), 280–290.
- Karakaya, A. (2018). Katılım Bankalarının Teknik ve Ölçek Etkinlikleri. *Anadolu İktisat ve İşletme Dergisi*, 2(2), 109–118.
- Mokhtar, H. S. A., Abdullah, N., & Alhabshi, S. M. (2008). Efficiency and competition of Islamic banking in Malaysia. *Humanomics*, 24(1), 28–48. <https://doi.org/10.1108/08288660810851450>
- Moualhi, M. (2015). Efficiency in Islamic Banking: Evidence from MENA Region. *International Journal of Islamic Economics and Finance Studies*, 1(2), 5–21.
- Nayman Hamamci, H., & Karkacier, A. (2022). Türkiye'de katılım bankalarının finansal etkinliği ve Körfez İşbirliği Konseyi üye ülkelerinde mevcut bankalarla karşılaştırması. *Gazi İktisat ve İşletme Dergisi*, 8(2), 266–280.
<https://doi.org/10.30855/gjeb.2022.8.2.005>

- Octrina, F., & Mariam, A. G. S. (2021). Islamic Bank Efficiency in Indonesia: Stochastic Frontier Analysis. *The Journal of Asian Finance, Economics and Business*, 8(1), 751–758.
<https://doi.org/10.13106/jafeb.2021.vol8.no1.751>
- Özer, K., & Saygin, O. (2022). Katılım Bankacılığının Finansal Performans Analizi: Türkiye Uygulaması. *Ekonomi, Politika & Finans Araştırmaları Dergisi*, 7(1), 257–273. <https://doi.org/10.30784/epfad.1030401>
- Özgür, E. (2008). Katılım Bankalarının Finansal Etkinliği. *Afyon Kocatepe Üniversitesi İİBF Dergisi*, 10(1), 159–175.
- Özkan, T. (2020). Türk Bankacılık Sektöründe Finansal Performans Ölçmede TOPSIS Yönteminin Kullanımı. *Maliye Finans Yazıları*, 113, 47–64. <https://doi.org/10.33203/mfy.566714>
- Pehlivan, P. (2016). Türkiyede Katılım Bankacılığı ve Bankacılık Sektöründeki Önemi. *Sosyal Ekonomik Araştırmalar Dergisi*, 16(31), 296–324. <https://doi.org/10.30976/susead.302169>
- Sardar, A., Azeem, M. M., Ahmed, T., & Zafar, S. (2011). Islamic Banks: Efficiency and its Determinants in Pakistan. *Islamic Studies*, 50(3/4), 423–434. JSTOR.
- Smolo, E. (2013). *Uvod u islamsku ekonomiju i finansije: Teorija i praksa*. Dobra Knjiga.
- Smolo, E. (2020). Islamic Finance and Limited Purpose Banking (LPB): Two Sides of the Same Coin. In A. Rafay (Ed.), *Advances in Finance, Accounting, and Economics* (pp. 100–116). IGI Global.
<https://doi.org/10.4018/978-1-7998-1611-9.ch006>
- Smolo, E., & Mirakhor, A. (2014). Limited Purpose Banking (LPB) and Islamic Finance: Could LPB Model Be Applied to Islamic Finance? *Humanomics*, 30(2), 122–135. <https://doi.org/10.1108/H-08-2013-0053>
- S&P. (2022). *Islamic Finance Outlook: 2022 Edition*. S&P Global Ratings.
<https://www.spglobal.com/ratings/en/research/pdf-articles/islamic-finance-outlook-2022-28102022v1.pdf>
- Yayar, R., & Baykara, H. V. (2012). TOPSIS Yöntemi ile Katılım Bankalarının Etkinliği ve Verimliliği Üzerine Bir Uygulama. *Business and Economics Research Journal*, 3(4), 21–42.
- Yıldırım, O. (2020). Bankacılık Sistemindeki Gelişmeler Ve Türkiye’de Bankacılık Sistemi. *Uluslararası Finansal Ekonomi ve Bankacılık Uygulamaları Dergisi*, 1(2), 63–77.
- Yücel, E., Özdemir, K., & Önal, Y. B. (2015). Türkiye Katılım Bankaları İle Malezya İslami Bankalarında Etkinlik ve Performans İlişkisinin Veri Zarflama Yöntemiyle Analizi. *Bankacılar Dergisi*, 26(94), 95–111.
- Zor, İ., & Çam, E. (2021). Türkiye Katılım Bankalarının Finansal Etkinliklerinin VZA Ve Malmquist TFV Endeksi Metoduyla Analizi. *İnönü Üniversitesi Uluslararası Sosyal Bilimler Dergisi*, 10(2), 241–263.