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ENTROPY-BASED WASPAS APPROACH FOR FINANCIAL PERFORMANCE IN THE COVID-19 ERA: EVIDENCE FROM ISLAMIC COUNTRIES

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Abstract

The purpose of this study is to compare financial performance of the Islamic banks in the COVID-19 Era. The performance evaluation was conducted on seven Islamic countries between 2017 and 2021. Entropy Method was utilized to choose the best performance evaluation criteria affecting the Islamic banks' performance and Waspas Method was used to determine the best performing Islamic country. The results indicate that 'liquid assets to short-term liabilities' is the best performance criteria for Islamic banks during the 'whole period', 'no pandemic period' and 'pandemic period'. Additionally, while the Islamic country with the best performance was Bangladesh during 'no pandemic period', Turkey was the leading Islamic country for both 'whole period' and 'pandemic period'.

JEL classification: G28, M41 , M48, Z32

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Introduction

The pandemic of Coronavirus (COVID-19) not only has posed a serious health threat but also has greatly affected economies and financial markets all over the world. In order to cope with the effects of the pandemic, countries have made great efforts to save their economies, policy makers have implemented various practices, central banks have tried to provide liquidity, and measures have been taken to support households and companies through fiscal policies. However, the effects of COVID-19 spread rapidly in a very short time.

On the other hand, Islamic banking and finance has developed remarkably over the last two decades all over the globe. Starting from the late 1960s, the profit-sharing system continues to grow rapidly. Islamic banks were previously operating mostly in Islamic countries. The practices of Islamic finance have increased considerably all over the globe and Islamic banks have now spread to more than sixty countries. Islamic banking is growing not only in the number of countries in which it operates, but also in terms of financial transactions. Thus, Islamic banking is being practiced on an even more intensive scale and it has the power to influence the global economy (Moin 2008; Khan & Bhatti, 2018; Haseeb 2018). Under these circumstances, it is important to evaluate financial performance of the Islamic banks, in particular, during the pandemic period, in a highly competitive financial environment.

Several multi-criteria decision-making (MCDM) techniques are used to evaluate financial performance. The TOPSIS Method is one of the most preferred methods to compare financial performance of Islamic countries. The method was initially suggested by Hwang and Yoon (1981), Lai et al. (1994), Yoon and Hwang (1995). Gümrah (2016), Alsu et al. (2018), Elmas and Yetim (2021) evaluated financial performance of Islamic countries based on international comparison. Gümrah (2016) also applied TOPSIS Method to investigate Islamic banking performance in Turkey and Malaysia. Based on the results, participation banks located in Turkey were ranked as the first three within the period of 2010-2013. Alsu et al. (2018) examined the financial performance by utilizing TOPSIS Method covering the period of 2009-2015. Eighteen participation banks located in six Islamic countries were included in the analysis. Participation banks in Saudi Arabia and Qatar performed better in the performance ranking. Turkey's participation banks were in the middle. Moreover, Albaraka Turk exhibited a better performance in comparison with the others. Elmas and Yetim (2021) conducted an analysis on participation banks between the years 2012-2019. Saudi Arabia, Malaysia, United Arab Emirates, Kuwait, Turkey and Bahrain were included and TOPSIS Method was used. The results indicate that Turkey took the fifth place in the performance ranking.

Yayar and Baykara (2012) conducted an analysis utilizing TOPSIS Method in Turkey. They evaluated the performance of the participation banks in Turkey. Albaraka Turk exhibited the most efficiency in the 2005-2011 period. Another study using TOPSIS Method was conducted by Elsayed et al. (2017). The best performing banks were ranked as Bank Al-Bilad, Al-Inmaa Bank, Al-Rajhi Bank, and Riyad Bank, in the Kingdom of Saudi Arabia.

CAMELS Rating System is a widely utilized method in financial performance evaluation, as well. Benli et al. (2018) conducted an analysis utilizing CAMELS approach in the period 2010-2017. Only Albaraka Turk had good performance in 2014, Kuwait Turk weakly performed in 2015. CAMELS Rating System was also used by Özkan (2019). She compared the financial performance of the participation banks in Turkey between the years 2016-2018. The Vakıf, Kuveyt Turk and Ziraat participation banks are the best performing banks, respectively. On the other hand, Turkey Finance and Albaraka exhibited the poorest performance. Another study using CAMELS Rating System was conducted by Akyüz et al. (2020). They compared the financial performance of Islamic banks in Turkey within the period of 2013-2017. Based on the CAMELS approach results, the performance of Islamic banks tended to decrease since 2015.

It is also seen in the literature that the performance of the different types of banks are compared. For instance, Çetin and Bıtırak (2010) used Analytic Hierarchy Process (AHP) to test the performance of commercial and participation banks between the years 2005-2007. As a result, Akbank as a commercial bank and Bank Asya as a participation bank were found to be the best performing banks in the analysis period. Batir et al. (2017) measured and compared efficiency of the participation and conventional banks in Turkey. Based on Data Envelopment Analysis (DEA) results, participation banks were found more efficient than the conventional banks between 2005-2013.

Yıldız (2020), Yağlı (2020), Hamamcı and Karkacıer (2022) preferred an integrated approach in the evaluation process. Yıldız (2020) used Entropy-based TOPSIS Method and conducted a comparative analysis between the Participation 30 and Participation 50 indices in Turkey covering the 2015-2017 period. While there was no statistically significant difference between the indices, they had good scores in financial performance in comparison with the BIST 100 Index. Yağlı (2020) compared the state and private participation banks performance in Turkey. While the performance evaluation criteria were determined by utilizing CAMELS Rating System, the performance ranking was done by the TOPSIS method. The results indicated that state participation banks had better financial performance

than private participation banks in Turkey. Hamamcı and Karkacıer (2022) utilized TOPSIS and Entropy methods to evaluate performance of participation banks in Turkey and Gulf Cooperation Council between 2016-2019. Accordingly, UAE ranked first for all the years except 2018. Oman exhibited the best performance in 2018.

To sum up, the existing literature mostly concentrates on the comparison of the different types of banks such as participation, commercial and conventional banks. The financial performance of different Islamic banks are analyzed, as well. As mentioned earlier, an international comparison is quite limited on the evaluation of the performance. Conducting the analysis on the COVID-19 pandemic period is also a first of its kind to the best of the author's knowledge.

This analysis compares financial performance of the Islamic banks operating in seven Islamic countries (Saudi Arabia, Malaysia, UAE, Kuwait, Indonesia, Turkey, Bangladesh) in the COVID-19 era. This study covers the period between the years 2017-2021 and provides evidence in terms of earnings, asset quality, leverage, liquidity and capital adequacy for the analysis period. Within this context, the purpose of this study is threefold:

A) to determine the best performance criteria affecting Islamic bank financial performance,
B) to rank Islamic countries based on their financial performance,
C) to analyze the COVID-19 effect on Islamic bank financial performance among different countries.

In this study, the most important performance criteria affecting Islamic bank financial performance is determined by using Entropy weights. Waspas Method is utilized for the performance ranking, as suggested by Shannon (1948) and Zvadskas et al. (2012).

The findings of this study are expected to be useful for regulators of financial institutions, government policymakers, and bank management, in particular. This study helps them to enhance Islamic bank financial performance by taking into consideration financial performance indicators. It also provides a tool for managers to manage Islamic banks with more accurate strategies and offers a perspective for analysts to evaluate financial performance more effectively during crisis periods such as COVID-19. Comparing and analyzing the financial performance of Islamic banks in different countries will enable managers to make the right decisions and gain a competitive advantage in Islamic finance markets.

The remainder of this study includes the following parts: the data is explained, and the methods utilized in this study are stated. The conclusion follows the findings.

Material and methods

The financial performance of Islamic banks is evaluated based on an international comparison between 2017-2021, in this study. This study also aims to determine the financial performance of Islamic banks under the global pandemic of COVID-19. Due to the uncertainty of the economic impact of this disease, there would be a significant effect in the performance evaluation. Therefore, after comparing the financial performances of the banks for the "whole period", "no pandemic period" and "pandemic period" were also analyzed, separately. While "no pandemic period" covers the period from 2017 to 2019, "pandemic period" includes the data starting with the year 2020 because the effects of the pandemic started to be reflected on financial statements for the first quarter of 2020.

IFDI Report 2022 includes 136 countries that have dependencies with a presence in Islamic finance. The top ten countries by Islamic Finance Assets were selected based on IFDI Report 2022, in this study. However, the Islamic countries of Saudi Arabia, Malaysia, United Arab Emirates, Kuwait, Indonesia, Turkey and Bangladesh were included in the analysis. Iran, Qatar and Bahrain were excluded because of the unavailability of the data series for the given period. The data used in the study were obtained from the official website of the Islamic Financial Services Board (IFSB). IFSB provides data at the country level. The number of Islamic banks and branches are presented in Table 1.

Table 1: Number of Islamic Banks and Number of Branches

Countries	Number of Islamic Banks		Number of Branches	
	2017	2021	2017	2021
Saudi Arabia	4	4	830	808
Malaysia	6	6	2,246	2,246
UAE	8	10	304	212
Kuwait	6	6	176	182
Indonesia	13	12	462	500
Turkey	5	6	970	1,307
Bangladesh	8	10	1,124	1,590

Source: Author's own work.

As seen from Table 1, the number of Islamic banks has increased in UAE, Turkey and Bangladesh over the period 2017-2021. While no changes have been observed in Saudi Arabia, Malaysia and Kuwait, the number of Islamic banks has decreased only in Indonesia. It is also reported that there has been a significant increase in the number of branches in Turkey and Bangladesh for the study period.

The classification of financial performance measurements is made based on earnings, asset quality, financial leverage, liquidity and capital adequacy in the banking industry. Within this context, while return on assets, return on equity, net profit margin are used to measure earnings, gross nonperforming financing ratio and net nonperforming financing ratio are evaluated for the asset quality of the banks. As a measure of financial leverage, capital to assets ratio is utilized and liquid assets ratio and liquid assets to short-term liabilities are taken into account to assess liquidity as the performance evaluation criteria. Capital adequacy ratio is also preferred while evaluating financial performance of banks. The data was collected from the official website of the Islamic Financial Services Board. Average values of the years are used in the analysis to measure long-term performance, as in Erdoğan (2022). Financial performance measurement criteria under these certain classifications in the banking industry are presented in Table 2.

Table 2: Financial Performance Measurement Criteria

Financial Performance	Measurments
Earnings	Return on Assets (ROA) Return on Equity (ROE) Net Profit Margin (NPM)
Asset Quality	Gross Nonperforming Financing Ratio (Gross NPF) Net Nonperforming Financing to Capital (Net NPF)
Leverage	Capital to Assets
Liquidity	Liquid Assets Ratio Liquid Assets to Short-Term Liabilities
Capital Adequacy	Capital Adequacy Ratio (CAR)

Source: Author's own work.

While ROA reflects the earning performance based on the total assets (Spathis et al. 2002), ROE indicates the earning performance based on the shareholders' stake (Hassan & Bashir, 2006). The third ratio of earnings NPM also represents earnings and is expected to be high while trying to make right decisions (Husna & Desiyanti, 2016; Mahdi & Khaddafi, 2020). Gross NPF and Net NPF that measure asset quality represent the financing risk and have ability to affect bank profitability, directly (Effendi et al., 2017). Capital to assets ratio measures leverage of the institution and represents the extent to which assets are funded by external sources. One of the most used liquidity ratios is liquid asset ratio. This ratio gives information about the liquidity shock absorption capacity of a bank. On the other hand, liquid assets to short-term liabilities is more focused on the bank's sensitivity to selected types of funding. If the liquidity ratios are higher, the bank has the capacity to absorb liquidity shock (Vodova, 2013). Capital adequacy ratio is an indicator of how well a bank can meet its obligations. It is crucial during crisis periods to provide adequate funding, in particular. Considering all these determinants, these criteria should be taken into consideration to evaluate the financial performance of the banking sector in the financial world.

MCDM methods are one of the most used methods to determine the best alternative between multiple alternatives by conducting mathematical analysis in the evaluation process (Elsayed et al., 2017; Yılmaz et al., 2020). Entropy is used to determine the best performance criteria affecting the Islamic banks' financial performance, Waspas Method is utilized for the performance ranking, in this study.

Entropy method

This method is suggested by Shannon (1948) to provide an evaluation during the decision-making process. The criteria weights are calculated through this method.

The steps of the Entropy Method can be expressed, as follows (Wu et al., 2011):

The decision matrix is constructed, as in the following matrix:

$$\begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{pmatrix}$$

The decision matrix is normalized for each criterion, as follows:

$$P_{ij} = \frac{x_{ij}}{\sum_{j=1}^{m} x_{ij}} \quad i = 1,2,...,m \quad j = 1,2,...,n \qquad (2)$$

The entropy value (e_j) is computed for all criteria, as follows:

$$d_j = 1 - e_j \quad j = 1,2,...,n \tag{3}$$

The objective weight (W_j) for each criterion is calculated, as follows:

$$W_j = \frac{d_j}{\sum_{S=1}^{n} d_s} \quad j = 1,2,...,n \tag{4}$$

The objective weight is expected to be higher for the decision-making process (Wang & Lee, 2009).

Waspas method

The Waspas Method integrates the weighted sum model (WSM) and weighted product model (WPM) to achieve a more effective result during the decision-making process. The optimal alternative is determined through this method (Zvadskas et al., 2012; Chakraborty et al., 2014).

The steps of the Waspas Method can be expressed as follows (Zvadskas et al., 2012; Chakraborty et al., 2014):

The decision matrix is defined, as in the Entropy Method, at first. The following matrix represents the decision matrix:

$$\begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{pmatrix}$$

The decision matrix is normalized for each criterion. The beneficial criteria is computed as in equation 5 and the non-beneficial criteria is computed as in equation 6:

$$\overline{X_{ij}} = \frac{x_{ij}}{max_i x_{ij}} \quad i = 1,2,...,m \quad j = 1,2,...,n \tag{5}$$

$$\overline{X_{ij}} = \frac{min_i x_{ij}}{x_{ij}} \quad i = 1,2,...,m \quad j = 1,2,...,n \tag{6}$$

The total relative importance of i^{th} alternative is expressed based on the Weighted Sum Model (WSM), as follows:

$$Q_i^{(2)} = \prod_{j=1}^{n} (\overline{X_{ij}})^{w_j} \tag{7}$$

The total relative importance of i^{th} alternative is developed based on the Weighted Product Model (WPM), as follows:

$$Q_i^{(2)} = \prod_{j=1}^{n} (\overline{x_{ij}})^{w_j} \tag{8}$$

The total importance of i^{th} alternative is determined to calculate a joint generalized criterion, as follows:

$$Q_i = 0.5Q_i^{(1)} + 0.5Q_i^{(2)} \tag{9}$$

The total relative importance of i^{th} alternative is defined to express a more generalized equation as follows:

$$Q_1 = lQ_i^{(1)} + (1-l)Q_i^{(2)} \quad l = 1,0.1,...,1 \tag{10}$$

Q_i value is expected to be highest for the best alternative between multiple alternatives.

Results

Table 3 exhibits the constructed decision matrix of seven Islamic countries and nine evaluation criteria for 'whole period', 'no pandemic period' and 'pandemic period', separately.

Table 3: Constructed Decision Matrix

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Whole Period									
Saudi Arabia	0.0238	0.1857	0.5140	0.1995	0.0116	0.0741	0.1361	0.2924	0.2701
Malaysia	0.0104	0.1494	0.3853	0.1766	0.0147	0.0947	0.0663	0.1925	1.3369
UAE	0.0139	0.1047	0.3180	0.1797	0.0607	0.1196	0.1283	0.1532	0.1915
Kuwait	0.0106	0.1026	0.2870	0.1764	0.0183	0.0776	0.1072	0.2634	0.3531
Indonesia	0.0179	0.1517	0.1978	0.2168	0.0330	0.0920	0.1087	0.1114	0.1633
Turkey	0.0163	0.2130	0.2517	0.1784	0.0353	0.0559	0.0769	0.5851	0.7193
Bangladesh	0.0098	0.2064	0.3466	0.1415	0.0385	0.2144	0.0473	0.1683	0.6816
No Pandemic Period									
Saudi Arabia	0.0251	0.1736	0.4900	0.2094	0.0114	0.0793	0.1453	0.2946	0.2800
Malaysia	0.0110	0.1596	0.4105	0.1721	0.0149	0.0813	0.0650	0.1896	1.3728
UAE	0.0151	0.1168	0.3152	0.1722	0.0534	0.0833	0.1243	0.1507	0.1865
Kuwait	0.0143	0.1282	0.2496	0.1795	0.0203	0.0793	0.1111	0.3044	0.4180

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
No Pandemic Period									
Indonesia	0.0146	0.1291	0.1571	0.1902	0.0392	0.1355	0.1005	0.1096	0.1463
Turkey	0.0141	0.1712	0.2310	0.1710	0.0385	0.0766	0.0827	0.5265	0.6751
Bangladesh	0.0134	0.2582	0.3594	0.1168	0.0475	0.2222	0.0471	0.2370	0.9608
Pandemic Period									
Saudi Arabia	0.0228	0.1944	0.5300	0.1924	0.0118	0.0703	0.1294	0.2909	0.2665
Malaysia	0.0099	0.1420	0.3669	0.1799	0.0146	0.1045	0.0672	0.1946	1.3108
UAE	0.0132	0.0986	0.3305	0.1832	0.0682	0.1467	0.1306	0.1494	0.1872
Kuwait	0.0075	0.0792	0.3117	0.1758	0.0181	0.0804	0.1048	0.2336	0.3090
Indonesia	0.0190	0.1607	0.2145	0.2294	0.0307	0.0720	0.1106	0.1180	0.1822
Turkey	0.0177	0.2420	0.2730	0.1842	0.0317	0.0380	0.0728	0.6122	0.7444
Bangladesh	0.0080	0.1811	0.3406	0.1558	0.0304	0.1996	0.0478	0.1438	0.5222

Source: Author's own work.

Entropy results

Table 4 reports the normalized decision matrix by dividing into three periods: 'whole period', 'no pandemic period' and 'pandemic period'.

Table 4: Normalized Decision Matrix

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Whole Period									
Saudi Arabia	0.2316	0.1667	0.2234	0.1573	0.0547	0.1017	0.2029	0.1656	0.0727
Malaysia	0.1013	0.1342	0.1675	0.1392	0.0693	0.1301	0.0988	0.1090	0.3598
UAE	0.1353	0.0940	0.1382	0.1416	0.2861	0.1642	0.1913	0.0867	0.0515
Kuwait	0.1036	0.0922	0.1248	0.1390	0.0862	0.1065	0.1599	0.1491	0.0950
Indonesia	0.1746	0.1362	0.0860	0.1708	0.1559	0.1263	0.1621	0.0631	0.0440
Turkey	0.1585	0.1913	0.1094	0.1406	0.1663	0.0767	0.1146	0.3313	0.1936
Bangladesh	0.0951	0.1854	0.1507	0.1115	0.1815	0.2944	0.0705	0.0953	0.1834
No Pandemic Period									
Saudi Arabia	0.2334	0.1527	0.2222	0.1729	0.0506	0.1046	0.2149	0.1625	0.0693
Malaysia	0.1024	0.1404	0.1853	0.1421	0.0660	0.1074	0.0961	0.1046	0.3398
UAE	0.1405	0.1028	0.1423	0.1422	0.2373	0.1099	0.1839	0.0832	0.0462
Kuwait	0.1332	0.1128	0.1127	0.1482	0.0901	0.1047	0.1644	0.1679	0.1035
Indonesia	0.1353	0.1136	0.0709	0.1570	0.1742	0.1788	0.1487	0.0605	0.0362
Turkey	0.1312	0.1506	0.1043	0.1412	0.1709	0.1012	0.1224	0.2905	0.1671
Bangladesh	0.1242	0.2271	0.1622	0.0964	0.2109	0.2933	0.0697	0.1308	0.2379
Pandemic Period									
Saudi Arabia	0.2320	0.1771	0.2239	0.1479	0.0572	0.0988	0.1951	0.1669	0.0757
Malaysia	0.1012	0.1293	0.1550	0.1383	0.0709	0.1469	0.1013	0.1117	0.3721
UAE	0.1347	0.0898	0.1396	0.1409	0.3322	0.2062	0.1969	0.0858	0.0532
Kuwait	0.0768	0.0721	0.1317	0.1351	0.0882	0.1130	0.1581	0.1341	0.0877
Indonesia	0.1938	0.1463	0.0906	0.1764	0.1492	0.1011	0.1667	0.0677	0.0517
Turkey	0.1803	0.2204	0.1153	0.1416	0.1541	0.0535	0.1097	0.3513	0.2113
Bangladesh	0.0811	0.1649	0.1439	0.1198	0.1482	0.2806	0.0721	0.0825	0.1482

Source: Author's own work.

As stated earlier, the decision matrix is normalized, at first. The values of e_j, d_j and w_j are determined by equation 2, equation 3 and equation 4, respectively. The values of e_j, d_j and w_j are exhibited for 'whole period', 'no pandemic period' and 'pandemic period' on Table 5.

Table 5: Entropy Values and Objective Weights

	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Whole Period									
e_j	0.8237	0.8298	0.8276	0.8420	0.7865	0.8040	0.8217	0.7815	0.7388
d_j	0.1763	0.1702	0.1724	0.1580	0.2135	0.1960	0.1783	0.2185	0.2612
w_j	0.1011	0.0976	0.0988	0.0906	0.1224	0.1123	0.1022	0.1253	0.1497
No Pandemic Period									
e_j	0.8309	0.8301	0.8202	0.8398	0.7918	0.8053	0.8207	0.7959	0.7336
d_j	0.1691	0.1699	0.1798	0.1602	0.2082	0.1947	0.1793	0.2041	0.2664
w_j	0.0977	0.0981	0.1038	0.0925	0.1202	0.1125	0.1035	0.1178	0.1538
Pandemic Period									
e_j	0.8115	0.8204	0.8302	0.8425	0.7759	0.7936	0.8222	0.7728	0.7371
d_j	0.1885	0.1796	0.1698	0.1575	0.2241	0.2064	0.1778	0.2272	0.2629
w_j	0.1051	0.1001	0.0947	0.0878	0.1249	0.1151	0.0991	0.1267	0.1465

Source: Author's own work.

The evaluation criteria of Liquid assets to short-term liabilities was found to be the best performance criteria for all the periods. Furthermore, Liquid assets ratio was the second most affecting criteria of the Islamic banks for 'whole period' (0.1253) and 'pandemic period' (0.1267), while Gross NPF (0.1202) follows the amount of Liquid assets to short-term liabilities for 'no pandemic period'. Additionally, the criterion of CAR is the least affecting performance criteria of the Islamic banks for all the periods based on the results reported on Table 5. Thus, the results of the study provide evidence that liquidity and asset quality have more effects than profitability for the performance evaluation in Islamic countries.

Waspas results

Islamic countries are ranked based on the financial performance through Waspas Method. The normalized decision matrix of seven Islamic countries and nine evaluation criteria is presented in Table 6.

Table 6: Normalized Decision Matrix

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Whole Period									
Saudi Arabia	1.0000	0.8716	1.0000	0.9205	0.1913	0.3455	1.0000	0.4998	0.2020
Malaysia	0.4372	0.7015	0.7495	0.8148	0.2422	0.4419	0.4869	0.3289	1.0000
UAE	0.5842	0.4915	0.6186	0.8289	1.0000	0.5579	0.9428	0.2618	0.1433
Kuwait	0.4472	0.4819	0.5584	0.8136	0.3013	0.3618	0.7880	0.4501	0.2641
Indonesia	0.7538	0.7121	0.3849	1.0000	0.5448	0.4292	0.7989	0.1904	0.1222
Turkey	0.6842	1.0000	0.4897	0.8229	0.5813	0.2607	0.5648	1.0000	0.5381
Bangladesh	0.4103	0.9692	0.6743	0.6526	0.6344	1.0000	0.3474	0.2876	0.5099
No Pandemic Period									
Saudi Arabia	1.0000	0.6722	1.0000	1.0000	0.2133	0.3567	1.0000	0.5595	0.2040
Malaysia	0.4387	0.6181	0.8342	0.8222	0.2781	0.3661	0.4472	0.3602	1.0000
UAE	0.6020	0.4525	0.6405	0.8223	1.0000	0.3748	0.8555	0.2863	0.1358
Kuwait	0.5707	0.4967	0.5071	0.8574	0.3797	0.3570	0.7648	0.5781	0.3045
Indonesia	0.5797	0.5000	0.3193	0.9082	0.7341	0.6097	0.6918	0.2081	0.1066
Turkey	0.5622	0.6630	0.4694	0.8168	0.7201	0.3449	0.5693	1.0000	0.4917
Bangladesh	0.5320	1.0000	0.7302	0.5577	0.8885	1.0000	0.3242	0.4502	0.6999

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Pandemic Period									
Saudi Arabia	1.0000	0.8036	1.0000	0.8388	0.1723	0.3522	0.9909	0.4751	0.2033
Malaysia	0.4360	0.5869	0.6923	0.7842	0.2135	0.5235	0.5145	0.3178	1.0000
UAE	0.5806	0.4075	0.6237	0.7989	1.0000	0.7349	1.0000	0.2441	0.1428
Kuwait	0.3311	0.3273	0.5880	0.7662	0.2654	0.4027	0.8028	0.3816	0.2357
Indonesia	0.8354	0.6640	0.4048	1.0000	0.4492	0.3605	0.8467	0.1928	0.1390
Turkey	0.7772	1.0000	0.5152	0.8029	0.4640	0.1906	0.5573	1.0000	0.5679
Bangladesh	0.3496	0.7485	0.6427	0.6791	0.4461	1.0000	0.3663	0.2349	0.3984

Source: Author's own work.

The total relative importance of the alternatives based on the WSM for 'whole period', 'no pandemic period' and 'pandemic period' is computed separately and presented in Table 7.

Table 7: Normalized Weighted Matrix (WSM)

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Whole Period									
Saudi Arabia	0.1429	0.1245	0.1429	0.1315	0.0273	0.0494	0.1429	0.0714	0.0289
Malaysia	0.0625	0.1002	0.1071	0.1164	0.0346	0.0631	0.0696	0.0470	0.1429
UAE	0.0835	0.0702	0.0884	0.1184	0.1429	0.0797	0.1347	0.0374	0.0205
Kuwait	0.0639	0.0688	0.0798	0.1162	0.0430	0.0517	0.1126	0.0643	0.0377
Indonesia	0.1077	0.1017	0.0550	0.1429	0.0778	0.0613	0.1141	0.0272	0.0175
Turkey	0.0977	0.1429	0.0700	0.1176	0.0830	0.0372	0.0807	0.1429	0.0769
Bangladesh	0.0586	0.1385	0.0963	0.0932	0.0906	0.1429	0.0496	0.0411	0.0728
No Pandemic Period									
Saudi Arabia	0.1429	0.0960	0.1429	0.1429	0.0305	0.0510	0.1429	0.0799	0.0291
Malaysia	0.0627	0.0883	0.1192	0.1175	0.0397	0.0523	0.0639	0.0515	0.1429
UAE	0.0860	0.0646	0.0915	0.1175	0.1429	0.0535	0.1222	0.0409	0.0194
Kuwait	0.0815	0.0710	0.0724	0.1225	0.0542	0.0510	0.1093	0.0826	0.0435
Indonesia	0.0828	0.0714	0.0456	0.1297	0.1049	0.0871	0.0988	0.0297	0.0152
Turkey	0.0803	0.0947	0.0671	0.1167	0.1029	0.0493	0.0813	0.1429	0.0702
Bangladesh	0.0760	0.1429	0.1043	0.0797	0.1269	0.1429	0.0463	0.0643	0.1000
Pandemic Period									
Saudi Arabia	0.1429	0.1148	0.1429	0.1198	0.0246	0.0503	0.1416	0.0679	0.0290
Malaysia	0.0623	0.0838	0.0989	0.1120	0.0305	0.0748	0.0735	0.0454	0.1429
UAE	0.0829	0.0582	0.0891	0.1141	0.1429	0.1050	0.1429	0.0349	0.0204
Kuwait	0.0473	0.0468	0.0840	0.1095	0.0379	0.0575	0.1147	0.0545	0.0337
Indonesia	0.1193	0.0949	0.0578	0.1429	0.0642	0.0515	0.1210	0.0275	0.0199
Turkey	0.1110	0.1429	0.0736	0.1147	0.0663	0.0272	0.0796	0.1429	0.0811
Bangladesh	0.0499	0.1069	0.0918	0.0970	0.0637	0.1429	0.0523	0.0336	0.0569

Source: Author's own work.

The total relative importance of the alternatives based on the WPM for 'whole period', 'no pandemic period' and 'pandemic period' is computed separately and exhibited in Table 8.

Table 8: Normalized Weighted Matrix (WPM)

Countries	ROA	ROE	NPM	CAR	Gross NPF	Net NPF	Capital to Assets	Liquid assets ratio	Liquid assets to short-term liabilities
Whole Period									
Saudi Arabia	1.0000	0.9806	1.0000	0.9882	0.7896	0.8591	1.0000	0.9057	0.7957
Malaysia	0.8885	0.9506	0.9596	0.9712	0.8166	0.8899	0.9023	0.8531	1.0000
UAE	0.9261	0.9035	0.9337	0.9736	1.0000	0.9200	0.9916	0.8258	0.7576
Kuwait	0.8914	0.9010	0.9201	0.9710	0.8425	0.8648	0.9665	0.8922	0.8268
Indonesia	0.9604	0.9527	0.8725	1.0000	0.9169	0.8862	0.9684	0.7890	0.7406
Turkey	0.9472	1.0000	0.9030	0.9725	0.9254	0.8252	0.9216	1.0000	0.9153
Bangladesh	0.8805	0.9955	0.9453	0.9409	0.9371	1.0000	0.8598	0.8369	0.9083
No Pandemic Period									
Saudi Arabia	1.0000	0.9448	1.0000	1.0000	0.8019	0.8631	1.0000	0.9204	0.7968
Malaysia	0.8889	0.9336	0.9744	0.9724	0.8329	0.8663	0.8914	0.8643	1.0000
UAE	0.9301	0.8929	0.9383	0.9724	1.0000	0.8692	0.9780	0.8364	0.7519
Kuwait	0.9230	0.9049	0.9076	0.9783	0.8708	0.8632	0.9624	0.9247	0.8438
Indonesia	0.9251	0.9057	0.8495	0.9863	0.9568	0.9318	0.9487	0.7991	0.7263
Turkey	0.9210	0.9430	0.8976	0.9715	0.9542	0.8589	0.9227	1.0000	0.9036
Bangladesh	0.9138	1.0000	0.9561	0.9200	0.9832	1.0000	0.8514	0.8923	0.9503
Pandemic Period									
Saudi Arabia	1.0000	0.9693	1.0000	0.9752	0.7778	0.8615	0.9987	0.8991	0.7964
Malaysia	0.8882	0.9267	0.9488	0.9659	0.8020	0.9117	0.9094	0.8489	1.0000
UAE	0.9253	0.8796	0.9348	0.9684	1.0000	0.9570	1.0000	0.8175	0.7573
Kuwait	0.8539	0.8525	0.9270	0.9627	0.8274	0.8781	0.9691	0.8714	0.8135
Indonesia	0.9746	0.9432	0.8788	1.0000	0.8920	0.8644	0.9765	0.7904	0.7544
Turkey	0.9646	1.0000	0.9096	0.9691	0.8961	0.7892	0.9199	1.0000	0.9223
Bangladesh	0.8606	0.9595	0.9388	0.9462	0.8911	1.0000	0.8663	0.8131	0.8768

Source: Author's own work.

Table 9 provides a joint generalized criterion for a λ value of 0.5. Accordingly, it is observed that Turkey is the best performing Islamic country for 'whole period' and 'pandemic period'. It is followed by the Islamic banks traded in Saudi Arabia. The banks exhibit the worst performance with the lowest value in Kuwait, and Indonesia follows it during 'whole period' and 'pandemic period'. Waspas rankings of the Islamic banks' 'whole period' performance virtually match the Islamic banks' 'pandemic period' performance.

However, the results differ during 'no pandemic period'. Accordingly, while Bangladesh is the leading country in terms of financial performance, Indonesia exhibits the worst performance among Islamic countries. Bangladesh's performance ranking is remarkable during the 'pandemic period'. While it appears as the first during 'no pandemic period', it drops to the fifth place during 'pandemic period' based on the performance evaluation criteria.

Table 9: Total Importance of the Alternative

Countries	$Q_i^{(1)}$	$Q_i^{(2)}$	Q_i	R
Whole Period				
Saudi Arabia	0.8615	0.4737	0.6676	2
Malaysia	0.7433	0.4403	0.5918	5
UAE	0.7756	0.4341	0.6048	4
Kuwait	0.6380	0.3727	0.5054	7
Indonesia	0.7052	0.3671	0.5361	6
Turkey	0.8488	0.5359	0.6924	1
Bangladesh	0.7837	0.4775	0.6306	3

Countries	$Q_i^{(1)}$	$Q_i^{(2)}$	Q_i	R
No Pandemic Period				
Saudi Arabia	0.8580	0.4796	0.6688	2
Malaysia	0.7378	0.4371	0.5875	4
UAE	0.7385	0.4051	0.5718	5
Kuwait	0.6880	0.4185	0.5533	6
Indonesia	0.6654	0.3446	0.5050	7
Turkey	0.8054	0.5175	0.6614	3
Bangladesh	0.8833	0.5705	0.7269	1
Pandemic Period				
Saudi Arabia	0.8337	0.4530	0.6434	2
Malaysia	0.7241	0.4258	0.5750	4
UAE	0.7904	0.4365	0.6134	3
Kuwait	0.5859	0.3243	0.4551	7
Indonesia	0.6989	0.3627	0.5308	6
Turkey	0.8393	0.5102	0.6747	1
Bangladesh	0.6951	0.4037	0.5494	5

Source: Author's own work.

Table 10 reports a more generalized analysis with the varying values of λ. Accordingly, almost no difference on the ranking was observed based on different λ values. Table 10 also shows that the Islamic country of Turkey was the best alternative for 'whole period' and 'pandemic period'. The country with the best performance was Bangladesh for 'no pandemic period'. Therefore, it can be concluded that the Waspas rankings of the Islamic countries almost exactly match the WSM rankings, supporting the study of Chakraborty and Zavadskas (2014).

To sum up, these results indicate that the government managed the economy in the COVID-19 era successfully by utilizing economic stimuli in Turkey, Saudi Arabia and UAE. The policies and measures taken by bank management were also effective in these countries. However, Bangladesh exhibited the worst performance among Islamic countries during the pandemic. Thus, it can be said that banking operations in Bangladesh were the most affected by the COVID-19 pandemic.

Table 10: Effect of λ on Performance Ranking

Countries	λ=0	λ=0.1	λ=0.2	λ=0.3	λ=0.4	λ=0.5	λ=0.6	λ=0.7	λ=0.8	λ=0.9	λ=1	R
Whole Period												
Saudi Arabia	0.4737	0.5125	0.5513	0.5901	0.6289	0.6676	0.7064	0.7452	0.7840	0.8228	0.8615	3
Malaysia	0.4403	0.4706	0.5009	0.5312	0.5615	0.5918	0.6221	0.6524	0.6827	0.7130	0.7433	4
UAE	0.4341	0.4683	0.5024	0.5366	0.5707	0.6048	0.6390	0.6731	0.7073	0.7414	0.7756	5
Kuwait	0.3727	0.3993	0.4258	0.4523	0.4789	0.5054	0.5319	0.5585	0.5850	0.6115	0.6380	6
Indonesia	0.3671	0.4009	0.4347	0.4685	0.5023	0.5361	0.5699	0.6037	0.6376	0.6714	0.7052	7
Turkey	0.5359	0.5672	0.5985	0.6298	0.6611	0.6924	0.7237	0.7549	0.7862	0.8175	0.8488	1
Bangladesh	0.4775	0.5081	0.5387	0.5693	0.6000	0.6306	0.6612	0.6918	0.7225	0.7531	0.7837	2
No Pandemic Period												
Saudi Arabia	0.4796	0.5174	0.5553	0.5931	0.6309	0.6688	0.7066	0.7445	0.7823	0.8201	0.8580	3
Malaysia	0.4371	0.4672	0.4973	0.5273	0.5574	0.5875	0.6175	0.6476	0.6777	0.7077	0.7378	4
UAE	0.4051	0.4384	0.4718	0.5051	0.5385	0.5718	0.6051	0.6385	0.6718	0.7052	0.7385	6
Kuwait	0.4185	0.4455	0.4724	0.4994	0.5263	0.5533	0.5802	0.6072	0.6341	0.6611	0.6880	5
Indonesia	0.3446	0.3767	0.4088	0.4408	0.4729	0.5050	0.5371	0.5691	0.6012	0.6333	0.6654	7
Turkey	0.5175	0.5463	0.5751	0.6038	0.6326	0.6614	0.6902	0.7190	0.7478	0.7766	0.8054	2
Bangladesh	0.5705	0.6018	0.6330	0.6643	0.6956	0.7269	0.7581	0.7894	0.8207	0.8520	0.8833	1

Countries	λ=0	λ=0.1	λ=0.2	λ=0.3	λ=0.4	λ=0.5	λ=0.6	λ=0.7	λ=0.8	λ=0.9	λ=1	R
Pandemic Period												
Saudi Arabia	0.4530	0.4911	0.5291	0.5672	0.6053	0.6434	0.6814	0.7195	0.7576	0.7957	0.8337	2
Malaysia	0.4258	0.4557	0.4855	0.5153	0.5451	0.5750	0.6048	0.6346	0.6645	0.6943	0.7241	4
UAE	0.4365	0.4719	0.5073	0.5427	0.5781	0.6134	0.6488	0.6842	0.7196	0.7550	0.7904	3
Kuwait	0.3243	0.3504	0.3766	0.4027	0.4289	0.4551	0.4812	0.5074	0.5335	0.5597	0.5859	7
Indonesia	0.3627	0.3963	0.4299	0.4635	0.4972	0.5308	0.5644	0.5980	0.6317	0.6653	0.6989	6
Turkey	0.5102	0.5431	0.5760	0.6089	0.6418	0.6747	0.7077	0.7406	0.7735	0.8064	0.8393	1
Bangladesh	0.4037	0.4328	0.4619	0.4911	0.5202	0.5494	0.5785	0.6077	0.6368	0.6659	0.6951	5

Source: Author's own work.

Discussion

Islamic banking and finance have been growing over the last two decades all over the world. Thus, the developments and risks in this sector should be followed and the possible effects should be considered carefully. In particular, the decision-making process has become more complex under uncertain and risky market conditions. Therefore, it is important to evaluate the performance of the Islamic banks during the global pandemic of COVID-19.

In this study, the financial performance of the Islamic banks in seven Islamic countries (Saudi Arabia, Malaysia, the United Arab Emirates, Kuwait, Indonesia, Turkey, Bangladesh) was evaluated between the years of 2017-2021. Entropy-based Waspas Method was utilized and the study was divided into three sub-periods: 'whole period', 'no pandemic period' and 'pandemic period'. Islamic bank financials were used to evaluate the financial performance. The study provides evidence in terms of earnings, asset quality, leverage, liquidity and capital adequacy for the analysis period. Thus, as financial performance measurement indicators, ROA, ROE, NPM, Gross NPF, net NPF, capital to assets, liquid assets ratio, liquid assets to short-term liabilities and capital adequacy ratio were taken into consideration.

To determine the best performance criteria affecting the banks' performance, Entropy Method was used. Accordingly, Islamic bank performance is mostly affected by Liquid assets to short-term liabilities for all the periods. Furthermore, Liquid assets ratio was the second most affecting criteria for the Islamic banks for 'whole period' and 'pandemic period', while Gross NPF follows the amount of Liquid assets to short-term liabilities for 'no pandemic period'. Additionally, the criterion of CAR was found to be the least affecting criteria of Islamic bank performance for all the periods based on the Entropy results. Thus, the results of the study provide evidence that liquidity and asset quality have more effects than profitability for performance evaluation in Islamic countries.

Waspas Method which is a combination of WSM and WPM methods was then used to rank the Islamic countries based on their financial performances. It can be said that Turkey was the leading country based on the financials for 'whole period' and 'pandemic period'. It was followed by the Islamic banks in Saudi Arabia. The banks exhibited the worst performance with the lowest value in Kuwait, and Indonesia follows it during 'whole period' and 'pandemic period'. Thus, it is observed that the Waspas rankings of the Islamic banks' 'whole period' performance virtually match the Islamic banks' 'pandemic period' performance. However, the results differ during 'no pandemic period'. Accordingly, while Bangladesh was the leading country in terms of financial performance, Indonesia exhibited the worst performance among Islamic countries. Bangladesh's performance ranking is remarkable during the 'pandemic period'. While it appears as the first during 'no pandemic period', it drops to the fifth place during 'pandemic period' based on the performance evaluation criteria. While this is the case for Bangladesh, the Islamic banking sector can be said to have been managed effectively, the right policies were followed and the right precautions taken during crisis periods in Turkey, Saudi Arabia and UAE. It is also reached that the Waspas rankings of the Islamic banks traded in Islamic countries almost exactly match the WSM rankings. This indicates consistency with Chakraborty and Zavadskas (2014) study.

These results indicate that the government effectively managed the economy in the COVID-19 era by using economic stimuli in Turkey, Saudi Arabia and UAE. The policies and measures taken by bank management were also effective in these countries. However, Bangladesh exhibited the worst performance among Islamic countries during the pandemic. Thus, it can be said that banking operations in Bangladesh were the most affected by the COVID-19 pandemic.

Although Islamic banks in Bangladesh have followed several credit and refinance policies through stimulus packages of the government, they may undertake more effective measures by ensuring adequate liquidity and loanable funds during the crisis. It is also thought that Islamic banks in Bangladesh may use proactive initiatives more effectively. The pandemic of COVID-19 has also adversely affected the repayment capacity of borrowers in Bangladesh. Thus, the banks may increase credit and interest rate measures. Man-

agement of Islamic banks in Bangladesh may also place the focus on liquidity, in particular because the negative impact of COVID-19 pandemic on bank performance reduces its ability to create liquidity.

Liquidity risk is one of the key indicators affecting operations of the banking institutions (Cecchetti et al., 2006; Saleh et al., 2020). A crisis may cause liquidity disruptions because of the lower inflow of deposits and difficulty in distributing credit to borrowers (Obeidat et al., 2021). Thus, the financial position, reputation, customer confidence, profitability and viability of the banks may suffer. It can also be said that because banks transferred assets into safer investments during the pandemic, adding assets is not evaluated as an effective strategy to create liquidity (Viverita et al., 2023). On the other hand, Altan (2004), Viverita et al. (2023) have emphasized that there is a significant relationship between off-balance sheet activities and liquidity. To create more liquidity, especially in pandemic period, off -balance sheet activities may not be included in the liquidity measurement. Sukuk, as a financial market product, may also be used to manage liquidity for Islamic banking. It helps to manage budget deficit and promote Islamic capital market in the long run. Furthermore, to deal with the liquidity risk, the central banks may facilitate the business of banks through policies to create more liquidity and to support the flow of credit (Demirgüç-Kunt et al., 2021).

Conclusion

This study provides new evidence integrating Entropy and Waspas methods in the performance measurement of Islamic banks. Liquidity and asset quality are found to be more effective than profitability for performance evaluation in Islamic countries. Turkey, Saudi Arabia and UAE can be said to be managed with more accurate policies in the COVID-19 era.

This study highlights important policy and managerial implications to enhance the performance of the Islamic banks. An implication for Islamic bank managers is to manage liquidity and risks effectively, in particular, during crisis periods. Enforcement of regulations may also be revised to facilitate payments under uncertainty conditions such as the COVID-19 pandemic and measures may be taken to support Islamic banks through fiscal policies.

There is a growing literature that focuses on the Islamic banking sector. This study is one of the first comprehensive attempts to evaluate the financial performances of seven Islamic countries. Conducting the analysis on the COVID-19 pandemic period is also a first of its kind to the best of the author's knowledge. It can also be said that while most researchers focus on the impact on bank performance measured by profitability ratios, liquidity and asset quality ratios are included in this study. Therefore, this study fills the gap and contributes to the international literature in the field of Islamic banking and finance by looking from a different perspective and being a reference for further studies.

There are two limitations of the study. The first one is its scope. The study covers seven countries for the 2017-2021 period. Iran, which is the leading countries based on IFDI Report 2022 could not be included because of the unavailability of the data series for the given period. The other limitation of the study is that sensitivity of risks ratios could not be included due to data unavailability, for the given period.

For further studies, it would be suggested to include banks from more countries. The study could also be conducted on a regional basis such as South Asia, Gulf Cooperation Council (GCC), etc. This would provide a way to examine the importance of the countries for the regional ranking. Researchers can also conduct future studies on the comparison of financial performance with conventional banking. To take into consideration other large market events, such as the global financial crisis, might be profitable in terms of comparison of the results.

References

Akyüz, F., Soba, A. Ş. & Yeşil, T. (2020). Evaluation of Financial Performance of Participation Banks with Camels Analysis Method. The Journal of Accounting and Finance, 87, 145-166.

Alsu, E., Taşdemir, A., & Kallo, Z. (2018). Evaluation of Performances of Participation Banks: International Comparison with TOPSIS Method. Gaziantep University Journal of Social Sciences, 17(1), 303-316.

Altan, M. (2004). Türkiye'de Banka Gruplarının Bilanço Dışı İşlemleri ve Bu İşlemlerin Bankaların Karlılık, Sermaye Yeterliliği, Aktif Kalitesi ve Likiditesi Üzerinde Yarattığı Etki. SÜ İİBF Sosyal ve Ekonomik Araştırmalar Dergisi, 4(7), 19-37.

Batir, T. E., Volkman, D. A. & Gungor, B. (2017). Determinants of Bank Efficiency in Turkey: Participation Banks versus Conventional Banks. Borsa Istanbul Review, 17(2), 86-96.

Benli, Y. K., Karaca, S. S. & Bozdan, N. (2018). Measuring of Performance of Participation Banks with Camels Analysis in Turkey. Journal of Current Researches on Business and Economics, 8(2), 197-210.

Cecchetti, S. G., Flores-Lagunes, A. & Krause, S. (2006). Has Monetary Policy Become More Efficient? A Cross-Country Analysis. The Economic Journal, 116(511), 408-433.

Chakraborty, S. & Zavadskas, E. K. (2014). Applicatons of Waspas Method in Manufacturing Decision Making. Informatica, 25(1), 1-20.

Chakraborty, S., Zavadskas, E. K. & Antucheviciene, J. (2014). Applications of Waspas Method as a Multi-Criteria Decision-Making Tool. Economic Computation and Economic Cybernetics Studies and Research. Academy of Economic Studies, 49(1), 5-22.

Çetin, A. C. & Bıtırak, İ. A. (2010). Analytic Hierarchy Process Approach in Bank Performance Evaluation: An Application in the Commercial Banks and Participation Banks. Alanya İşletme Fakültesi Dergisi, 2(2), 75-92.

Demirgüç-Kunt, A., Pedraza, A. & Ruiz-Ortega, C. (2021). Banking sector performance during the COVID-19 crisis. Journal of Banking & Finance, 133(2021), 1-22.

Elmas, B. & Yetim, A. (2021). Katilim Bankalarinin Finansal Performanslarinin TOPSİS Yöntemi ile Uluslararasi Boyutta Değerlendirilmesi. International Journal of Islamic Economics and Finance Studies, 7(3), 230-263.

Elsayed, E. A., Dawood, A. K. S. & Karthikeyan, R. (2017). Evaluating Alternatives through the Application of TOPSIS Method with Entropy Weight. International Journal of Engineering Trends and Technology, 46(2), 60-66.

Erdoğan, H. H. (2022). A Multicriteria Decision Framework for Bank Performance Evaluation in Turkey. Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 27(1), 98-109.

Gümrah, A. (2016). Measuring the Performance of Participation Banks by TOPSIS Method: Turkey and Malaysia cases. International Journal of Business and Management Studies, 5(1), 211–218.

Hassan, M. K. & Bashir, A. H. M. (2006). Determinants of Islamic Banking Profitability. Book Chapter in Islamic Perspectives on Wealth Creation, Edinburgh University Press New York: Columbia University Press.

Haseeb, M. (2018). Emerging Issues in Islamic Banking & Finance: Challenges and Solutions. Academy of Accounting and Financial Studies Journal, 22(Special Issue), 1-5.

Husna, N. & Desiyanti, R. (2016). The Analysis of Financial Performance on Net Profit Margin at the Coal Company. International Journal of Management and Applied Science, 2(4), 105-108.

Hwang, C. L. & Yoon, K. (1981). Multiple Attributes Decision Making: Methods and Applications. New York: Springer-Verlag.

Khan, A. Q. & Bhatti, A. A. (2018). Islamic Banking and Finance: A New Paradigm in International Relations. Journal of Islamic Business and Management, 8(1), 85-101.

Lai, Y. L., Liu, T. Y. & Hwang, C. L. (1994). TOPSIS for MODM. European Journal of Operational Research, 76(3), 486-500.

Mahdi, M. & Khaddafi, M. (2020). The Influence of Gross Profit Margin, Operating Profit Margin and Net Profit Margin on the Stock Price of Consumer Good Industry in the Indonesia Stock Exchange on 2012-2014. International Journal of Business Economics and Social Development, 1(3), 34-55.

Moin, M. S. (2018). Performance of Islamic Banking and Conventional Banking in Pakistan: A comparative study. School of Technology and Society, University of Skövde.

Nayman Hamamcı, H. & Karkacıer, A. (2022). Evaluation of Financial Performance of Participation Banks in Turkey and GCC with TOPSIS Method. Uluslararası Ekonomi ve Yenilik Dergisi, 8(1), 55-78.

Obeidat, M., Tarawneh, A., Khataibeh, M. & Ghassan, O. (2021). The Performance of Banks in a Developing Country: Has COVID-19 Made Any Difference? Journal of Economics Finance and Accounting, 8(2), 102–108.

Özkan, T. (2019). Performance Measurement of Participation Banks in Turkey: An Application based on Analysis of Camels. Turkish Studies Economics, Finance, Politics, 14(3), 903-920.

Saleh, I., Afifa, M. A. & Murray, L. (2020). The Effect of Credit Risk, Liquidity Risk and Bank Capital on Bank Profitability: Evidence from an Emerging Market. Cogent Economics & Finance, 8(1), 1-13.

Shannon, C. E. (1948). A Mathematical Theory of Communication. Bell System Technical Journal, 27(3), 379-423.

Spathis, Ch., Kosmidou, K. & Doumpos, M. (2002). Assessing Profitability Factors in the Greek Banking System: A Multicriteria Methodology. International Transactions in Operational Research, 9(5), 517-530.

Viverita, V., Bustaman, Y. & Danarsari, D. N. (2023). Liquidity Creation by Islamic and Conventional Banks during the COVID-19 Pandemic. Heliyon, 9(4), 1-14.

Vodova, P. (2013). Determinants of Commercial Bank Liquidity in Hungary. e-Finanse, 9(3), 64-71.

Wang, T. C. & Lee, H. D. (2009). Developing a Fuzzy TOPSIS Approach based on Subjective Weights and Objective Weights. Expert Systems with Applications, 36(5), 8980-8985.

Wu, J., Sun, J., Liang, L. & Zha, Y. (2011). Determination of Weights for Ultimate Cross Efficiency using Shannon Entropy. Expert Systems with Applications, 38(5), 5162-5165.

Yağlı, İ. (2020). Multi-Criteria Financial Performance Analysis of Turkish Participation Banks. Alanya Academic Review Journal, 4(3), 861-873.

Yayar, R. & Baykara, H. V. (2012). An Implementation upon Efficiency and Productivity of Participation Banks with TOPSIS Method. Business and Economics Research Journal, 3(4), 21-42.

Yıldız, S. B. (2020). Performance Analysis of Turkey's Participation and Conventional Indices using TOPSIS Method. Journal of Islamic Accounting and Business Research, 11(7), 1403-1416.

Yılmaz, B. Ö., Tozan, H. & Karadayi, M. A. (2020). Multi-Criteria Decision Making (MCDM) Applications in Military Healthcare Field. Journal of Health Systems and Policies, 2(2), 149-181.

Yoon, K. & Hwang, C. L. (1995). Multiple Attribute Decision Making: An Introduction. Thousand Oaks, CA: Sage.

Zavadskas, E. K., Turskis, Z. & Antucheviciene, J. (2012). Optimization of Weighted Aggregated Sum Product Assessment. Electronics and Electrical Enginering, 122(6), 3-6.