Journal of Economics, Finance and Accounting – (JEFA), ISSN: 2148-6697

Journal of Economics, Finance and Accounting
Year: 2015 Volume: 2 Issue: 3

FINANCIAL EFFICIENCY ANALYSIS IN ISLAMIC BANKS: TURKEY AND MALAYSIA MODELS

DOI: 10.17261/Pressacademia.2015312956

Ismail Yildirim[1]

[1]Hitit University. ismailyildirim@hitit.edu.tr

Keywords
Islamic Banking, data envelopment analysis, financial efficiency, Turkey, Malaysia.

JEL Classification
G21, G15

ABSTRACT

This study uses Data Envelopment Analysis for the efficiency measurements while using the Malmquist Total Factor Productivity Index in order to measure the total factor productivity change. This study involves 4 Islamic banks operating in Turkey and 13 Islamic banks operating in Malaysia. Half of these Islamic banks operating in Turkey and Malaysia meet the technical productivity (CCR) value. In other words, half of these Islamic banks are able to use their Total Assets and Total Equities efficiently. It was found that the Technical Efficiency Change (EFFCH) value of the Islamic banks was never recorded above 1 for any time period. It was found that the Islamic Banks are unlikely to reach the production limit.

1. INTRODUCTION

The main framework of an Islamic financial system is shaped by rules and laws which are economic, social, political and cultural taboos for Islamic societies (Musa and Obadi, 2009) The Islamic banking industry of the world has been growing consistently since the mid-1970s, when it was first established. It claims to be an important aspect of the global finance market today (Mallin, Faraga and Yonga, 2014). The working principle behind Islamic banks is based on the profit and loss sharing (Bellalah and Ellouz, 2004). According to the Islamic faith, paying or charging interest on any loan is not permitted. Muslims who do not want to enjoy interest yield turn to Islamic banks which operate in accordance with the Islamic principles. Islamic banking naturally has flourished in countries with concentrated Muslim populations. However, countries with no significant Muslim population (i.e. England) have been conducting Islamic banking operations in the Middle-East.

Islamic banks have been making efforts to increase their productivity in order to improve their performance as a result of the globalization and increased competition (Mghaieth and Mehdi, 2014). The recent global mortgage crisis brought Islamic finance forward as an alternative in terms of investment and banking (Smola and Mirakhor, 2010). Islamic banking has become an integral part of the global finance structure particularly with its immunity to the recent banking and financial crises (Aldohni, 2015). Islamic banking has

gained momentum and acknowledgment especially in the Middle-East and Southern Asia when compared to the rest of the world (Ariff, 2014). The most important reason behind this is that these parts of the world are home to countries with a majority of Muslim population.

Overall, Islamic banks operating worldwide can be addressed in two categories. The first one is the countries in which the banking system is based on interest-free principles, while the second involves an interest-free banking system as part of a capitalist system where interest earnings are allowed. Pakistan, Iran and the Sudan fall under the first category. Malaysia, Turkey and all the other Islamic countries fall under the second category.

Efficiency analysis is an important administrative tool for banks which is used to determine the level of input utilization in order to produce output. Data Envelopment Analysis, as a common measurement method used for efficiency analysis, is a linear programming based parameter-free method for measuring the relative efficiency of nonprofit and for-profit organizations and corporations (their decision-making units). This approach considers that different decision-making units may have different production functions. The purpose of this study is to compare the efficiencies of 17 Islamic banks operating in Turkey and Malaysia for a period between 2010 and 2014 with respect to their capital structures and their scale sizes.

2. LITERATURE SURVEY

Malaysia is the most prevalent case for the studies available in the literature which are performed for a single Islamic country. Norbaizura, Rosmanira, Mohd (2014), Ahmad and Abdul-Rahman (2012), Ahmad Mokhtar et al. (2008), Kamaruddin et al. (2008), Sufian (2007), Mokhtar, Abdullah and Al-Habsh (2006), Ahmad Mokhtar et al. (2006) included the Islamic banks operating in Malaysia into their studies.

Norbaizura, Rosmanira, Mohd (2014) measured the efficiencies of 10 Islamic banks operating in Malaysia for 2011 using the DEA method. Ahmad and Abdul-Rahman (2012) analyzed the efficiencies of Islamic and conventional banks operating in Malaysia using the DEA method for a period between 2003 and 2007. It was found that the conventional banks were more efficient than the Islamic banks in terms of managerial efficiency and technologic improvements. Ahmad Mokhtar et al. (2008) analyzed the efficiencies of the Islamic banks operating in Malaysia using the DEA method for a period between 1997 and 2003. It was found that Islamic banks were less efficient than conventional banks. Kamaruddin et al. (2008) analyzed the efficiencies of local and international Islamic banks operating in Malaysia using the DEA method for a period between 1998 and 2004. Sufian (2007) analyzed the efficiencies of Islamic banks operating in Malaysia using the DEA method for a period between 2001 and 2005. It was found that the Islamic banks operating in Malaysia showed insufficient scale efficiency. Mokhtar, Abdullah and Al-Habsh (2006) analyzed the efficiencies of Islamic and conventional banks operating in Malaysia. It was reported that the efficiency level of the Islamic banks were lower than the level of conventional banks. Ahmad Mokhtar et al. (2008) analyzed the efficiencies of Islamic banks operating in Malaysia using the DEA method for a period between 1997 and 2003.

Ada and Dalkılıç (2014), Gishkori and Ullah (2013), Sufian et al. (2013), Said, Rachida and Azza (2011), Al-Maghaireh (2005), Hussein (2003) conducted studies on a single Islamic country.

Ada and Dalkılıç (2014) measured the efficiencies of 4 Islamic banks operating in Turkey and 18 Islamic bank operating in Malaysia using the DEA method for a period between 2009 and 2011.

Gishkori and Ullah (2013) analyzed the efficiencies of conventional banks and Islamic banks operating in Pakistan using the DEA method for a period between 2007 and 2011. It was found that pure technical efficiency was the major reason behind the lower efficiency levels of these banks.

Sufian et al. (2013) analyzed the efficiencies of Islamic and conventional banks operating in Pakistan using the DEA method for a period between 2007 and 2011.This study revealed that conventional banks performed better than the Islamic banks. Said, Rachida and Azza (2011) analyzed the efficiencies of Islamic and conventional banks operating in Indonesia using the DEA method in a study based on the data collected between March, 2010 and July, 2011. Al-Maghaireh (2005) analyzed the efficiencies of 3 Islamic banks and 5 conventional banks operating in the UAE using the DEA method for a period between 2000 and 2004. The results showed that Islamic banks were more efficient than the conventional banks. Hussein (2003) measured the operational efficiencies of 17 Islamic banks operating in Sudan for a period between 1990 and 2000.

The study involves 17 Islamic banks operating in Turkey and Malaysia. Financial efficiency levels of these banks for a period between 2010 and 2014 were identified with respect to variables such as total assets, total equities, and net profit/loss. This study will most likely reinforce the previous studies made in this field and contribute to the literature.

3. DATA AND METHODOLOGY

Techniques used in efficiency measurements are categorized under 3 groups. These are ratio analysis, regression analysis and data envelopment analysis (DEA). Ratio analysis is an analysis method which involves taking ratios of variables and it is one dimensional in terms of scope and purpose. Regression analysis is a parametric method which aims to estimate the future using historical data (Yu and Shi, 2014). DEA, on the other hand, is not a parametric analysis method and it is based on the linear programming approach. DEA, is one of the methods which allow for the use of multiple inputs and outputs, is a method commonly preferred by researchers (Wu et al., 2006). This method is able to deliver efficiency scores which reflect the relationship between input and output variables. The efficiency scores found in this study account for the relative efficiency levels of each sub-field (Wanke and Barros, 2014).

Three basic methods are used in Data Envelopment Analysis. These are,

-CCR (Charnes-Cooper-Rhodes) Method

-BCC (Banker-Chaenes-Cooper) Method

-Full Cumulative Method.

These methods allow for formulation as a fractional or linear program provided that input or output orientation is taken into consideration. The CCR method is further explained as it was used in this study.

Charnes-Cooper-Rhodes (CCR) Model

It is a model which explores the necessary reduction input combination in order to obtain optimum output without changing the output level (Matthews and Mahadzir, 2006). This model is defined as follows (Chan and Agha, 2002):

$$Enbh_j = \frac{\sum_{r=1}^{n} u_r y_r}{\sum_{i=1}^{m} v_i x_i}$$

In Equation (1), DMU must select "k" weights in order to give efficiencies below 1 when the other DMUs use the selected weights. Otherwise, when the DMU reaches the value of 1, some other DMUs might be efficient above 1. Thus, the limit can be represented as follows;

$$\frac{\sum_{r=1}^{n} u_r y_r}{\sum_{i=1}^{m} v_i x_i} \leq 1$$

DMU must select "k" weights in order to give efficiencies below 1.0 when the other DMUs use the selected weights. Otherwise, when the DMU efficiency value reaches 1.0, some other DMUs might be efficient above 1.0. This limit can be represented as follows;

$$u_r \geq 0 \quad ; \quad r = 1..., n$$
$$v_i \geq 0 \quad ; \quad i = 1,..., m$$

Nevertheless, it is obvious that the weights of inputs and outputs used by the DMU, *k*, cannot take a negative value:

The symbols included in the formula refer to the following values:

The parameter of $X_{ij} > 0$ represents the amount of "i" input used by "*j*" decision making unit (DMU).
The parameter of $Y_{ij} > 0$ represents the amount of "r" output produced by "*j*" decision making unit (DMU).

Malmquist Total Factor Productivity Index

Malmquist-TFP index is a DEA-based approach which allows for the measurement of changes in the efficiency of DMUs over the course of time (Liu and Wang, 2008). Having been used in data envelopment analysis by Caves, Christiensen and Diewert (1982), this index (TFP) consists of difference functions which represent technologies with multiple input and output based on input and output amount. The advantage of the Malmquist Index when compared to others is that it does not necessitate prices while eliminating the need for assumptions on the structure of the technology (Estache et al., 2004).

Most commonly used approach of our time in distance function calculations for TFP index, the mathematical programming models developed by Fare et al. (1994) are given below with the matrix notation:

$$\left[d^{t}(y_t, x_t)\right]^{-1} = \max_{\phi,\lambda} \phi \qquad \left[d^{s}(y_s, x_s)\right]^{-1} = \max_{\phi,\lambda} \phi$$

$$st \qquad st$$

$$-\phi y_{it} + Y_t \lambda \geq 0 \qquad -\phi y_{is} + Y_s \lambda \geq 0$$

$$x_{it} - X_t \lambda \geq 0 \qquad x_{is} - X_s \lambda \geq 0$$

$$\lambda \geq 0 \qquad \lambda \geq 0$$

$$\left[d^{t}(y_s, x_s)\right]^{-1} = \max_{\phi,\lambda} \phi \qquad \left[d^{s}(y_t, x_t)\right]^{-1} = \max_{\phi,\lambda} \phi$$

$$st \qquad st$$

$$-\phi y_{is} + Y_t \lambda \geq 0 \qquad -\phi y_{it} + Y_s \lambda \geq 0$$

$$x_{is} - X_t \lambda \geq 0 \qquad x_{it} - X_s \lambda \geq 0$$

$$\lambda \geq 0 \qquad \lambda \geq 0$$

Calculations of any period and observation of the distance values defined above require a solution of *n(3t-2)* linear programming models, *n* being the number of observations and *t* being the number of periods (Fare et al., 1997).

Efficiency analysis of Islamic banks involves two countries. Malaysia is one of the countries which stands out when it comes to Islamic banking. Islamic banking in Malaysia accounts for 20% of the overall banking system. Turkey has seen developments in terms of Islamic banking in the recent years. Table 1 gives and overview of Turkey and Malaysia.

Table 1: Overview of Turkey & Malaysia (2013)

	Population (million)	Islamic finance assets	Islamic Assets Size	Global Distribution of Islamic Banking Assets
Malaysia	29.8million	US$140 billion	$125 billion	8%
Turkey	76.1million	US$50 billion	$39 billion	2%

Source: Ernst and Young; World Islamic Banking Competitiveness Report 2013–14

Turkey and Malaysia are countries with a majority of Muslim population. Turkey's population is 76.1 million while Malaysia has 29.8 million residents. The Muslim population living in these countries constitutes the potential Islamic bank customers. From a global perspective the Islamic banks of Malaysia account for the 8% of the overall Islamic banking while this number is 2% for Turkey. In Malaysia the Islamic assets size adds up to $125 billion while this number adds up to $39 billion in Turkey.

Analysis involves 17 banks in total, 4 Islamic banks operating in Turkey and 13 Islamic banks operating in Malaysia were included in this analysis. A list of the banks included in the analysis is given in Table 2.

Table 2: Banks Included in the Analysis

Country	# of Banks	Banks
Malaysia	13	Al Rajhi Banking & Inv. Corp. (Malaysia), Alliance Islamic Bank Berhad, Asian Finance Bank, Bank Islam Malaysia Berhad, Bank Kerjasama Rakyat Malaysia Berhad, Bank Pembangunan Malaysia Berhad, CIMB Islamic Bank Berhad, Hong Leong Islamic Bank Berhad, Malayan Banking Berhad, Maybank Islamic Berhad, OCBC Al-Amin Bank Berhad, Public Islamic Bank Berhad, RHB Islamic Bank Berhad
Turkey	4	Albaraka Turk Participation Bank, Bank Asya Participation Bank, Turkiye Finance Participation Bank, Kuweit Turk Participation Bank

Inputs and outputs of this study must be selected with the utmost attention as they provide the basis for DMU comparison. Meaningful inputs and outputs must be selected for their causative connection with the production process, as different input and output groups will give different efficiency rates for the same DMUs. Input and output variables used in this study were selected with the consideration of previous research in this field. Table 3 shows the input and output values selected for this study.

Table 3: Input and Output Variables Used in This Study

Period	Input	Output
2010-2014	Total Assets	Total Deposits
	Total Equities	Net Profit/Loss

Total assets and total equities were used as inputs while total deposits and net profit/loss were used as outputs in the efficiency calculations of these banks. All the input and output values are in USD.

4. EMPIRICAL FINDINGS

This research uses the input-oriented approach for technical efficiency measurement. Pure technical efficiency and scale efficiency are among the components of technical efficiency. Pure technical efficiency predicts the technical efficiency value without the need for any assumptions for return to scale. Scale efficiency is the case when a company operates on invariable return to scale (Kim, 2000). Total efficiency measures will be obtained for each decision making point when this model is solved for each decision making point. These measures, when equal to 1, are representative of efficiency while when lower than 1, are representative of inefficiency.

Efficiency Results

Table 4 shows the average technical efficiency values and pure technical and scale efficiencies as components of technical efficiency for 17 Islamic banks operating in Turkey and Malaysia for a period between 2010 and 2014.

Table 4: Efficiency Values of the Islamic Banks

Year	Technical Efficiency (CCR)	Scale Efficiency
2010	0,9211	0,9454
2011	0,9105	0,9309
2012	0,9315	0,9543
2013	0,9409	0,9512
2014	0,9313	0,9632

Technical efficiency (CCR) value of the Islamic Banks of Turkey and Malaysia for 2010 is 92%, i.e. their technical inefficiency value is 8%. This technical inefficiency value reveals that Islamic banks would have been able to obtain the same amount of output (Total Deposits, Net Profit/Loss) using 8% less input. The scale efficiency value for the same year is 94%. The reason behind the technical inefficiency of 2010 is the scale inefficiency. Technical efficiency (CCR) value for 2011 is 91%, i.e. their technical inefficiency value is 9%. Technical efficiency (CCR) value for 2012 is 93%, i.e. their technical inefficiency value is 7%. Technical efficiency (CCR) value for 2013 is 94%, i.e. their technical inefficiency value is 6%. Technical efficiency (CCR) value for 2014 is 93%, i.e. their technical inefficiency value is 7%.

2013 was the year with the highest technical efficiency (CCR) for the Islamic banks operating in Turkey and Malaysia, while, 2011 saw the lowest technical efficiency.

Technical Efficiency (CCR) Results

Table 5 shows technical efficiency (CCR) results from Islamic banks of Turkey and Malaysia included in this research. Banks with efficiency values equal to 1 are referred to as efficient banks and the total and percentage of efficient banks were calculated accordingly.

Table 5: Technical Efficiency (CCR) Values of the Islamic Banks of Turkey and Malaysia

Country		*2010*	*2011*	*2012*	*2013*	*2014*
Malaysia	*Average Efficiency*	0.853	0.848	0.894	0.884	0.902
	Efficiency Percentage	85.3%	84.8%	89.4%	88.4%	90.2%
	# of Efficient Banks	6	5	6	6	7
	% of Efficient Banks	46.2%	38.5%	46.2%	46.2%	53.8%
Turkey	*Average Efficiency*	0.969	0.995	0.936	0.924	0.982
	Efficiency Percentage	96.9%	99.5%	93.6%	92.4%	98.2%
	# of Efficient Banks	2	2	2	1	3
	% of Efficient Banks	66.7%	66.7%	66.7%	33.3%	75%

According to the data obtained from 13 Islamic banks operating in Malaysia, it was found that the average efficiency had increased in the recent years (0.853 in 2010, 0.848 in 2011, 0.894 in 2012, 0.884 in 2013, and 0.902 in 2014). Only 6 out of 13 (46.2%) Islamic banks operating in Malaysia had technical efficiency for 2010. 5 banks in 2010, 6 banks in 2012 and 2013 (46.2%), and 7 banks in 2014 (90.2%) had technical efficiency. According to the analysis it was found that the number of efficient banks among these 13 banks has been recently increasing.

Turkey, on the other hand, has seen a decrease in the average efficiency level of banks. However, the average efficiency level of Islamic banks of Turkey had increased in 2014 (0.969 in 2010, 0.995 in 2011, 0.936 in 2012, 0.924 in 2013, and 0.982 in 2014). 2 out of 3 (66.7%) Islamic banks included in the analysis from Turkey had technical efficiency for 2010, 2011, and 2012. Only 1 out of these 3 banks had technical efficiency for 2013. This number is 3 Islamic banks for 2014 (75%).

Malmquist Total Factor Productivity (TFP) Index Results

Malmquist Total Factor Productivity (TFP) Index is measured with multiplication of the change in technical efficiency and technological change (Angelidis and Lyroudi 2005).

Malmquist TFP Index involves the variables of Change in Technical Efficiency (EFFCH), Technologic Change (TECHCH), and Change in Pure Technical Efficiency (PECH). Change in Scale Efficiency (SECH) and Change in Total Factor Productivity (TFPCH) (Raphael, 2013). The change in total factor productivity (TFPCH) is calculated as follows;

Change in Technical Efficiency (EFFCH) = (PECH) X (SECH)

Change in Total Factor Productivity (TFPCH) = (EFFCH) X (TECHCH)

Change in Technical Efficiency (EFFCH), Technologic Change (TECHCH), Change in Pure Technical Efficiency (PECH), Change in Scale Efficiency (SECH) and Change in Total Factor Productivity (TFPCH) values were calculated separately for Turkey and Malaysia for a period between 2010 and 2014. Accordingly, Change in Total Factor Productivity (TFPCH), when greater than 1, represents an increase in total factor productivity; when less than 1, represents a decrease in total factor productivity; and when equal to 1, represents "no change" in total factor productivity. Table 6 shows the Malmquist TFP Index results.

Table 6: Malmquist Total Factor Productivity (TFP) Index Results

Country	*Period*	*EFFCH*	*TECHCH*	*PECH*	*SECH*	*TFPCH*
Malaysia	*2010-2011*	0.8879	0.932	0.923	0.962	0.8275
	2011-2012	0.9269	1.004	0.941	0.985	0.9306
	2012-2013	0.8975	1.002	0.932	0.963	0.8993
	2013-2014	0.9034	1.087	0.948	0.975	0.9086
Turkey	*2010-2011*	0.8807	1.006	0.907	0.971	0.8860
	2011-2012	0.9800	1.045	0.982	0.998	0.9241
	2012-2013	0.8795	0.998	0.902	0.975	0.8777
	2013-2014	0.9076	0.982	0.912	0.987	0.9874

Change in Total Factor Productivity (TFPCH) was calculated for Turkey and Malaysia separately. Technical and technologic advancements will be represented by Change in Technical Efficiency (EFFCH) and Technologic Change (TECHCH) indexes as components of Change in Total Factor Productivity (TFPCH) assume values greater than 1.

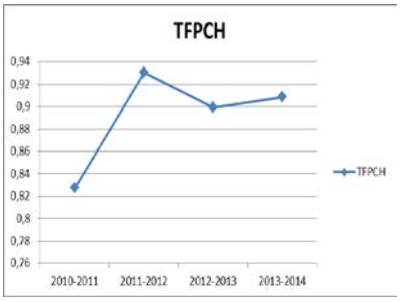
It was found that the Technical Efficiency Change (EFFCH) value of Islamic banks operating in Malaysia was never recorded above 1 for any time period. It was found that the Islamic Banks in Malaysia are unlikely to reach the production limit. It was found that Technologic Change (TECHCH) value of Islamic banks operating in Malaysia has been recorded above 1 in the recent years. Technologic Change (TECHCH) index, when greater than 1, is indicative of an upward shift in production frontier. These values show that technical and technologic development of Islamic banks is at a high level.

It was found that Technical Efficiency Change (EFFCH) value of 4 Islamic banks operating in Turkey was never recorded above 1 for any time period. When Technologic Change Index (TECHCH) is evaluated it was found that this value was recorded above 1 for the first years yet it was recorded below 1 for the following years. It was found that the production limit of Islamic Banks in Turkey decreased in the recent years.

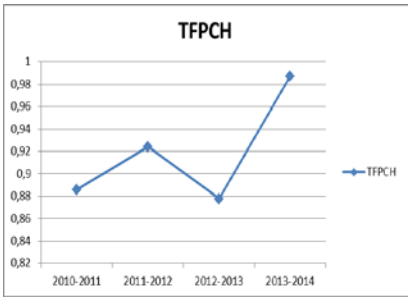
Pure Technical Efficiency (PECH) and Change in Scale Efficiency (SECH) as components of Change in Technical Efficiency (EFFCH), when greater than 1, are representatives of the banks' managerial efficiency and ability to produce on a sufficient scale. Turkey and Malaysia do not give results greater than 1 for Change in Scale Efficiency (SECH) and Pure Technical Efficiency Change (PECH). It is clear that the Islamic banks operating in Turkey and Malaysia fail to provide administrative efficiency and are not able to produce on a sufficient scale.

When Change in Total Factor Productivity (TFPCH) was evaluated for Turkey and Malaysia, it was found that it has never been recorded above 1 for these years in question. Change in Total Factor Productivity (TFPCH) of Islamic banks of Turkey marks a great increase for the period between 2013 and 2014. This period was governed by the improvement of the Change in Technical Efficiency (EFFCH), in other words, a favorable trajectory of the input-output values. The Change in Total Factor Productivity (TFPCH) for Turkey and Malaysia is shown in Graph 1.

Graph 1: Graphic Representation of Malmquist Total Factor Productivity (TFP) Index Results



Malaysia



Turkey

Change in Total Factor Productivity (TFPCH) of Islamic banks of Malaysia has seen a decrease after a brief increase between 2010 and 2011. The recent decline in Change in Total Factor Productivity of Islamic Banks operating in Malaysia is a result of Change in Technical Efficiency (EFFCH) and Technologic Change (TECHCH). Change in Total Factor Productivity (TFPCH) of Islamic banks of Turkey marks an increase after the period between 2012 and 2013.

5. CONCLUSION

Islamic banking has been developing to a great extent in the recent years. The share of Islamic banks in the global economy has been increasing. Efficient operability of the ever-developing Islamic banks is important for healthy development of the economy of a country.

This study compares the efficiency of Islamic banks operating in Turkey and Malaysia. Nearly half of the Islamic banks operating in Malaysia have the technical efficiency. The most efficient year for the Islamic banks of Turkey was 2014. The year 2013 was the highest technical efficiency (CCR) for the Islamic banks operating in Turkey and Malaysia, while, 2011 saw the lowest technical efficiency.

It was found that the Technical Efficiency Change (EFFCH) value of Islamic banks operating in Turkey and Malaysia was never recorded above 1 for any time period. It was found that the Islamic banks in Turkey and Malaysia are unlikely to reach the production limit. This

period was governed by the decline in the Change in Technical Efficiency (EFFCH), in other words, unfavorable trajectory of the input-output values.

Efficiency levels of Islamic banks operating in Turkey and Malaysia are not always increasing. Scale inefficiency is the major reason behind the technical inefficiency of Islamic banks. Islamic banks are not operating on an optimal scale.

The study measures the efficiency of Islamic banks operating in Turkey and Malaysia. In this respect, this study will make a significant contribution to the literature. Future research may focus on extended numbers of Islamic banks operating in Turkey and Malaysia and may diversify the research periods and input and output variables.

REFERENCES

Ada, A. A., Dalkılıç, N. (2014). Efficiency Analysis in Islamic Banks: A Study for Malaysia and Turkey, BDDK Bankacılık ve Finansal Piyasalar, Cilt: 8, Sayı: 1.

Ahmad Mokhtar, H. S., Abdullah, N. & Alhabshi, S.M. (2006). Efficiency of Islamic Banking in Malaysia: A Stochastic Frontier Approach, Journal of Economic Corporation, 22 (2), 37-30.

Ahmad Mokhtar, H. S., Abdullah, N. & Alhabshi, S.M. (2008). Efficiency and Competition of Islamic Banking in Malaysia, Humanomics, 24(1), 28-48.

Ahmad, S., Abdul-Rahman, A.R., (2012). The efficiency of Islamic and conventional commercial banks in Malaysia. Int. J. Islam. Middle East. Finance Manage. 5 (3), 241–263.

Aldohni, A. K. (2015). The Quest for a Better Legal and Regulatory Framework for Islamic Banking, Ecclesiastical Law Journal / Volume 17 / Issue 01 / pp 15 – 35.

Al-Maghaireh, (2005). A. Comparative Financial Performance of Islamic Banks vis-à-vis Conventional Banks in the UAE. Working Paper. Dept. of Economics and Finance, UAE University. Al-Ain. 2005.

Ariff, M. (2014). Whither Islamic Banking? The World Economy, Volume 37, Issue 6, pages 733–746.

Bellalah, M., Ellouz S. (2004). Islamic finance, interest rates and Islamic banking: A Survey of the literature. Finance India: special issue, 18, 533-546.

Caves, D., Christiensen, L.R. and Diewert, W.E., (1982). The economic theory of ındeks numbers and the measurement of ınput, output and productivity, Econometrica, Vol. 50, 1393-1414.

Chen, Y., Agha, I.A. (2002). Continuous Optimization Output–Input Ratio Analysis and DEA Frontier, European Journal of Operational Research, Volume: 142.

Ernst and Young; World Islamic Banking Competitiveness Report 2013–14.

Estache A., Be, B. T., and Trujillo, L. (2004). Sources of efficiency gains in port reform: A DEA decomposition of a Malmquist TFP indeks for Mexico, Utulities Policy, Vol. 12, 221-230.

Fare, R., S. Grosskopf ve P. Roos (1997). Malmquist productivity indexes: A survey of theory and practice, Index Numbers: Essays in Honour of Sten Malmquist, Ed.:R. Fare, S. Grosskopf, R.R. Russell, Kluwer Academic Publishers: Boston, 1997.

Fare, R., S. Grosskopf, M. Norris, Z. Zhang (1994). Productivity growth, technical progress, and efficiency changes in industrialised countries, American Economic Review, Vol.84, 1994, pp.66-83.

Gishkoru, M.A., Ullah, N. (2013). Technical Efficiency of Islamic and Commercial Banks: Evidence from Pakistan Using DEA Model (2007-2011), Journal of Business and Management, Volume 7, Issue 4, PP 68-76.

Hussein, K.A. (2003). Operational Efficiency in Islamic Banking: The Sudanese Experience. Islamic Research and Training Institute (IRTI) Working Paper, No. 1, Islamic Development Bank, Saudi Arabia.

Kamaruddin, B.H., Safa, M.S., and Mohd, R. (2008). Assessing production efficiency of Islamic banks and conventional bank Islamic windows in Malaysia, International Journal of Business and Management Research, 1 (1) pp. 31-48.

Kim J.,(2000). A Comparative Study on Productive Efficiency: Japan and United States Non-Life Insurance Industries, Doctorial Thesis of Philosophy, Temple University.

Liu, F.F. ve Wang, P.H. (2008). DEA Malmquist Productivity Measure: Taiwanese Semiconductor Companies, International Journal of Production Economics, 112: 367-379.

Mallin, C., Faraga, H., Yonga, K. (2014). Corporate social responsibility and financial performance in Islamic banks, Journal of Economic Behavior & Organization 103, S21–S38.

Matthews, K., Mahadzir, İ. (2006). Efficiency and Productivity Growth of Domestic and Foreign Commercial Banks in Malaysia, Cardiff Economics Working Papers, Cardiff, U.K., 2006.

Mghaieth, A., Mehdi, I.K.E. (2014). The determinants of cost/profit efficiency of Islamic banks before, during and after the crisis of 2007-2008 using SFA approach, IPAG working papers, http://www.ipag.fr/fr/accueil/la-recherche/publications-WP.html

Moktar, H.S., N. Abdullah and S.M. Al-Habshi (2006). Efficiency of Islamic Banks in Malaysia: A Stochastic Frontier Approach, Journal of Economic Cooperation among Islamic Countries 27 (2), 37–70.

Musa, H and Obadi S.M. (2009). Islamıc Fınancıal Systems, Studia Universitatis, Vasile Goldiş, Arad Economic Sciences, Issue: 11 / 2009.

Norbaizura, K., Rosmanira, I. W., Mohd, M.A. (2014). Assessing Efficiency and Effectiveness of Malaysian Islamic Banks: A Two Stage DEA Analysis, Proceedings Of The 3rd International Conference On Mathematical Sciences Book Series: Aip Conference Proceedings Volume: 1602 Pages: 934-938.

Said, J., Rachida, B.J., Azza, Z. (2011). Efficiency and effectiveness comparison of Islamic and conventional banking: case of Indonesia, Online at http://mpra.ub.uni-muenchen.de/57551/ MPRA Paper No. 57551 posted 24.

Smola, E. and Mirakhor, A. (2010). The Global Financial Crisis and Its Implications for the Islamic Financial Industry", International Journal of Islamic and Middle Eastern Finance and Management, 3, (4), 372-385.

Sufian, F. (2007). The Efficiency of Islamıc Banking Industry: A Non-Parametric Analysis with Non-Discretionary Input Variable. Islamic Economic Studies, 14(1& 2), 53-87.

Sufian, S., Farman, A., Baber, A., Muhammad, H. (2013). Examining Efficiency of Islamic and Conventional Banks in Pakistan: Using Data Envelopment Analysis, Global Journal of Management and Business Research Volume 13 Issue 10.

Y. Yu, Q. Shi (2014).Two-stage DEA model with additional input in the second stage and part of intermediate products as final outputs, Expert Systems with Applications, 41 (15), pp. 6570–6574.

Wanke, C. Barros (20149. Two-stage DEA: An application to major Brazilian banks, Expert Systems with Applications, 41 (5) (2014), pp. 2337–2344.

Wu, Z. Yang, L. Liang (2006).Using DEA-neural network approach to evaluate branch efficiency of a large Canadian bank, Expert Systems with Applications, 31 (1), pp. 108–115.