PERFORMANCE EFFICIENCY OF THE JORDANIAN ISLAMIC BANKS USING DATA ENVELOPMENT ANALYSIS AND FINANCIAL RATIOS ANALYSIS

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Abstract:

The purpose of this study is to investigate and compare the development of the relative efficiency of Jordanian Islamic banks performance over time (2005-2009), using two different approaches: Malmquist Data Envelopment Analysis and Financial Ratio Analysis. There are 3 Islamic banks in Jordan, one of which has been established recently, 2010. The results reveal that Jordanian Islamic banks are constantly efficient in term of their inputs producing actual outputs, using both approaches, during the study period. However, the variation between the sample banks is not significant. In addition, there is no significant evidence on the association between DEA and FRA bank rankings It is recommended that Jordanian Islamic banks managers should increase their banks efficiency by improving recourse utilization to produce optimal outputs.

Key Words: Efficiency, Data Envelopment Analysis (DEA), Financial Ratio Analysis (FRA), Islamic Banks, Jordan

Introduction

Measuring the relative efficiency of financial institutions has gained academic attentions over the years. Various approaches have been used to determine the efficiency. These approaches broadly fall under two types: nonparametric approaches, such as Data Envelopment Analysis (DEA), and parametric approaches, such as Financial Ratios Analysis (FRA).

Islamic banks have started operating in Jordan three decades ago. However, the Jordanian banking system is a non-Islamic one. Currently, there are three Islamic banks. These are Jordan Islamic Bank for Finance and Investment (JIBFI, established in 1978), Islamic international Arab Bank (IIAB, established in 1997) and Jordan Dubai Islamic Bank (JDIB, established in 2010).

Since there have been limited studies investigating Jordanian Islamic banks' efficiency, the objective of this study is to measure and analyze their performance efficiency during the period (2005-2009). As well as to compare between the efficiency level measured by DEA and that calculated by FRA. In other words, this study tries to show how efficient are the Jordanian Islamic banks measured by both DEA and FRA; and to see whether the Islamic banks efficiency level varies by methodology used (DEA and FRA). While most of previous studies adopted conventional tools (FRA) to evaluate the efficiency, this study employs two technical tools (DEA and FRA) to do so. The importance of such analysis is not just to fill the literature gap, but also to help Islamic banks managers find how efficient is their bank performance and how to improve it, and by utilizing which resources. In addition, this study helps investors make an informed decision, as the stock exchange does value and appreciate performance efficiency.

The remainder of this study is organized as follows: Section II reviews the related literature, while section III introduces the subject concepts, including fund resources and uses, financial services, the relationship with the Central bank and the relationship among Islamic banks. Section IV presents the data and the methodology used in the study, and section V reveals the empirical results and the analysis. The last section VI summarizes and concludes the study.

Literature Review

Over the past decade, there has been a considerable growth in studies addressing performance efficiency in the Islamic banking sector, all over the world. Some of the literature used DEA methodology. For example, Viverita et al. (2007) examine the efficiency change of Islamic banks in Africa, Asia and the Middle East during the period of (1998-2002) on country and regional basis, using DEA. The results show that Indonesia and Yemen proved the most improved countries over the period, and Asia was the best region. In contrast, the United Arab Emirates, as a country, and the Middle East, as a region, had the best use of inputs and outputs for efficiency change. For technical change efficiency, Indonesia and Yemen were the most improved countries and Asia is the best performing region. Finally, efficiency and change are negatively related to the banks' age. Similar results founded by Kazaj and Sadeqi (2003), who examine the ability of Islamic banks in financing monetary throughout the world during the period (2000-2001), using DEA. They identified 41 to 46 efficient Islamic banks around the world.

Some literature, however, argues that the country per which the Islamic banks operate is a leading factor of efficiency. Yudistira (2003), for example, provides new evidence on the performance of 18 Islamic banks during the period 1997-2000, and finds that efficiency differences across the sample appear to be mainly determined by country specific factors.

Other literature tries to compare between controlling costs and generating profits efficiencies. Kamaruddin et al. (2008), for instance, investigate this matter in full-fledged Islamic banks and Islamic window operations of domestic and foreign banks in Malaysia during the period (1998-2004), using DEA. They find that Islamic banks are relatively more efficient at controlling costs than at generating profits. The main contributor for cost efficiency of domestic and foreign banks comes from resource management and economies of scale, respectively.

Other literature used FRA. For instance, Bashir (2001) examine the determinants of 14 Islamic banks' performance across eight Middle Eastern countries during the period (1993-1998). The model introduces a set of variables that are expected to affect the performance of Islamic banks. Capital ratios, leverage, overhead, loan and liquidity ratios, and foreign ownership are used as proxies for internal performance, while controlling for macroeconomic environment, financial market structure, and taxation. The results indicate that high leverage and large loans to asset ratios lead to higher profitability. Foreign-owned banks are more profitable than their domestic counterparts. As for the relationship between bank characteristics and performance measures, the results indicate that Islamic banks' profitability measures respond positively to the increases in capital and loan ratios. In addition, customer and short-term funding, non-interest earning assets, and overhead promote bank profits. The results suggest that the tax factors are much more important in the determination of bank performance. The negative effect of the reserve tax indicates the opportunity cost of holding reserves. However, the results should be interpreted cautiously. The scope of the study is limited as several Islamic banks are not included, and the size of the sample is small with many missing observations.

Al-Maghaireh (2005) examines the performance of 3 Islamic banks and 5 non-Islamic banks, in the United Arab Emirates (UAE), in terms of profitability, liquidity, risk and solvency and efficiency in during the period (2000-2004), using FRA. The study shows that the sample Islamic banks are relatively more profitability, less liquid, less risky, and more efficient compared to the UAE commercial banks. Similarly, Samad and Hassan (2000) evaluate the inter-temporal and inter-bank performance of the Bank Islam Malaysia Berhad (BIMB) compared with 8 commercial banks in terms of profitability, liquidity, risk and solvency and community involvement during the period (1984-1997). They apply the financial ratio analysis in measuring the performance, and ANOVA T-test and F-test to determine the significance of the results. The study finds that BIMB is relatively more liquid and less risky. Also, the examination of various performance measures and the inter-temporal comparison of BIMB's performance reveal that Islamic bank made statistically significant progress on returns on assets and returns on equity during the period of the study. Also, BIMB risk increased significantly as measured by debt-equity and equity multiplier. However, the comparison indicates that Islamic bank is still less risky and more solvent.

It can be seen from the above review that, most previous studies investigated the performance of Islamic banks in comparison with the commercial banks, using either DEA or FRA. None of the literature has compared the results of both approaches. This study tries to fill the gap and employs both methodologies, by investigating the performance efficiency of Jordanian Islamic banks, using

DEA and FRA. Also, this study is among the few to investigate the performance efficiency of Islamic banks in Jordan.

Theoretical Framework

Banks have become a necessity for social and economical development. However, bank interest-based activities are prohibited (Haram) in Islam. This led to the establishment of Islamic banks to operate according to Islamic laws and regulations (Sharia). This section introduces the concepts of Islamic banking as well as outlining its main sources and uses of funds.

1) The Concept of Islamic Bank:

An Islamic bank is a financial and monetary institution that provides financial and banking services through its financial intermediary role, i.e. attracts financial resources and employs funds, according Sharia (Ajlouni, 2012, p.110). Sharia prohibits the payment of interests for the renting of money (Riba), as well as investing in businesses that produce prohibited goods or services, such as Alcoholic drinks or gambling services.

The definition of Islamic bank includes many elements, the most prominent are:

1. Islamic bank is a financial intermediary, like traditional banks.
2. Islamic bank provides financial services, current accounts and investment deposits in accordance with Islamic Sharia.
3. What distinguishes Islamic bank from traditional ones is the Islamic dimension in collecting and using the resources.
4. The Islamic bank aims at developing economic, justice and social solidarity (Obada, 2008, p.27).

Although these principles were used as the basis for carrying out economic activities during the golden middle ages, when Arabic Islamic civilization was bright and prosperous, Islamic banks were formed in the second half of the 20th century. The first Islamic bank in Jordan, Jordanian Islamic Bank for Finance and Investment was established in 1978. Currently there are more than 300 Islamic banks all over the world (Ajlouni, 2012, p.79).

2) Sources of Funds in the Islamic Bank:

As a financial intermediary, an Islamic bank collects deposits and attracts savings as the main resource of fund, in addition to its equity capital. Thus, the sources of funds can be divided in two main parts: the first is self-resources (internal): including the paid in capital of bank, reserves, and retained earnings. The second is external resources, which represent the largest part of the bank resources, i.e. deposits (current, savings and time deposits). Some external funds of Islamic banks include Islamic investment bonds, accounts covering fund, financial guarantees, credit cards, insurance letters, charities, services and grants (Ajlouni, 2012, p.173).

3) Uses of Funds in the Islamic Bank:

Islamic financing is based upon the Islamic Sharia rule that no returns without taking the associated risk (AlGunum BelGurum). Islamic banks use their funds in accordance with this basic rule. This is completely different from traditional banking in that Islamic bank could not lend money for a specific term and gets the reward for that, i.e. interest income. Instead, it provides project funding and shares the returns as well as the project risk. Thus, all Islamic financing types can be seen as different kinds of partnership contracts, as follows (Ajlouni, 2012, p. 205-285):

1- Mosharakah (Joint Venture): It is a contract between the Islamic bank and two or more parties investing in a transaction, for predetermined period of time or assignment. Those parties might be individuals, groups and/or institutions. The distribution of returns, if any, between them is predetermined on an agreed percentage of the returns, regardless of the capital share invested. However, the loss is directly related to the percentage of capital shares.

2- Modarabah (Venture Capital): It is a contract between the Islamic bank (Rabb ElMal), who provides the capital, and an entrepreneur (Rabb ElAmal), who carry-out the work, for predetermined period of time or transaction. The distribution of returns is similar to that of Mosharakah. However, the financial loss will only be burden by Rabbu ElMal, while Rabbu ElAmal looses his efforts, time and reputation.

3- Morabaha (Cost-Plus): It is a contract, used for commodity and trade financing, between a client (business or individual), and the Islamic bank to purchase a certain product, such as a car, a house, or a cargo of sugar. Upon the order of the client, the bank buys the product in a known price and re-sells it to the client with a known cost-plus sale price agreed upon as well as the terms of

payment, i.e. the period of time to pay-back the credit. This sort of Islamic financing has some conditions and terms, such as identifying the product's characteristics, declaring its disadvantages, and knowing the cost of the product and the profit to the bank (Al-Khaqani, 2011, p.237).

4- Sales on Credit & Financing Future Production (Ba'iul Salam): Buying and selling on credit is accepted and apparently widespread in trade transitions. Fiqh books have various details on various aspects of trade transactions on credit. The commodity sold and its price should be known to the seller and buyer, it should have value in law and must be in existence and/or it must be susceptible to delivery of possession, either immediately or at some future time (Ayub, 2007, p.135 and p.139)

Ba'iul Salam is a tool for financing the cost of future production of a manufactured product, an agricultural produce or an imported goods. The manufacturer forwards the cost of future production. The Islamic bank agrees to buy, at an agreed-upon price, the production of the manufactured product (such as machine, equipment, furniture, car or wood) before it is produced. The money is paid in advance to the manufacturer, to use it for financing its working capital (to buy raw materials, pay wages, etc.). This tool helps in providing the liquidity needed by the manufacturers (Ajlouni, 2012, p.257-260).

5- Lease (Ejarah): Ejara is defined by Sharia as a contract to take advantage of renting the right to use an item. The item to be leased must be a non-fungible asset, such as a car or a house; or a work or productive services of an individual, such as an engineer and a builder; or a worker, or any person who can offer defined valuable work. However, gold or silver and food cannot be leased or rented because they cannot be used without being consumed. There are two types of leasing contract in Islamic banks: (1) Lease contract, per which the asset is leased for a specific period of time and then returned to the title holder. (2) Lease-To-Own contract, whereby the user and title owner agree to a monthly payment that consists of two parts. One part has to do with the gradual purchase of the property by the lessee (client), and the other part has to do with the rental of the actual asset at the current market rate. At the end of the period, the asset ownership transferred to the lessee (Abdul-Rahman, 2010, p.56-58).

6- Farming (Mozara'h) and Implanting (Mogharasah): Mozara'h and Mogharasah are methods for financing agriculture. They can be represented by a partnership contract between two or many parties. In the farming partnership, one party presents a farm to another party for cultivation and maintenance in exchange for an agreed share in the crop (Ali, 2010, p.111). In a three party contract, one party will provide the land, second party, the Islamic bank, will provide funds to purchase the inputs (seeds, chemicals, fuel, etc) and the third party will provide the labor, for an agreed share in the crop. Farming contract is a short-term one, a year or less, depending on the term of the crop's season.

The implanting partnership provides financing of tree cultivation. Whereby one party presents a land to another party to plant trees on it. The Islamic bank provides the funds needed for cost of cultivation, wages, and maintenance. These parties share the trees and fruits in accordance to a defined percentage. Implanting contract is a long-term one, more than one year, depending on the durability of the trees.

7- Irrigation (Mosaqah): Mosaqah is a partnership contract on irrigating and gathering fruits of tree. It depends on one party presenting designated plants/trees that produce usable goods to another in order to work on their irrigation in exchange for an agreed share in fruits. This form of financing is very effective for the agriculture sector where a specified share of output will go to the labor and the other portion will go to the owner.

8- Manufacturing (Istisna): Istisna is a contract of manufacturing and is best suited for infrastructure projects in the public sector. It is a special type of sale contract. It is a contract to purchase now, for a predetermined price, something that will be manufactured in the near future according to agreed specifications (Zarqa, 1997). It is a contract in which one party demands the production of a commodity according to certain specifications and then the delivery of it from another party, with payment dates and price specified in the contract. Islamic banks frequently use Istisna to finance construction and manufacturing projects (Hassan and Lewis, 2007, p.53 and p.150). The bank may undertake the construction of a facility for a deferred price, and subcontract the actual construction to a specialized firm. The manufacturer manufactures the asset and delivers it to the bank along with all related assets and market risks (Ayub, 2007, p.77). The mustasne (the Developer) will ask the Banks, as the original sane (Manufacturer), to finance the construction of the Project pursuant

to an istisna agreement. The Banks will act as sane in a parallel istisna agreement with a construction contractor (Hassan and Lewis, 2007, p.220-221).

4) Financial Services in the Islamic Bank:

As long as the service does not imply an interest expense or revenue (Riba), Islamic banks can provide all the sort of banking and financial services provided by any commercial bank. These include, but not limited to, money transfers, collecting commercial documents, selling and buying foreign currencies and renting safe boxes.

5) The Relationship with the Central Bank:

When an Islamic bank operates in a traditional financial and banking system, it has to adhere to the Central Bank regulations. The relationship between the Islamic banks and Central Bank can be summarized as follows (Ajlouni, 2012, p.145):

1. An Islamic bank has to deposit a predetermined percentage of its deposits in the Central Bank (compulsory cash reserve), but has to forgo interest paid by the central bank.
2. Islamic banks cannot deal with the Central Bank as a last resort for lending. Jordanian Islamic banks deposit a stable amount of money in the Central Bank without interest, so that the Central Bank can lend them, when necessary, without interest.
3. Islamic banks cannot buy treasury bills or government bonds, risk-free assets.
4. Islamic banks cannot benefit from the Central Bank offers of interest discount on financing export-oriented projects.

Data and Methodology

The main objective of the study is to examine the efficiency of Islamic banks in Jordan, and the relative efficiency of each bank. The population of the study consists of all Jordanian Islamic banks. According to Central Bank of Jordan website (http://www.cbj.gov.jo), there are three Islamic banks operating in Jordan. These are Jordanian Islamic Bank for Finance and Investment (JIBFI) (www.jordanislamicbank.com), Islamic International Arab Bank (IIAB) (www.iiabank.com.jo) and Jordan Dubai Islamic Bank (JDIB). However, (JDIB) is excluded from the study because it has been established recently (2010), while the study sample covers the period (2005-2009), whereby two Islamic banks and twenty one commercial banks operating in Jordan. The data used in this study are financial information, extracted and analyzed from the balance sheets and income statements which are available in the annual reports of the banks.

The study uses eleven financial ratios for bank's performance. These ratios are grouped under three broad categories: Profitability; liquidity and risk and solvency (Samad and Hassan, 2000).

A. Profitability ratios:

(1) Return on Asset (ROA) = Profit after tax/ total asset
(2) Return on Equity (ROE) = Profit after tax/ equity capital
(3) Profit Expense Ratio (PER) = profit/total expense

B. Liquidity measures:

(4) Cash Deposit Ratio (CDR) = cash/deposit.
(5) Loan Deposit Ratio (LDR) = Loan/deposit
(6) Current Ratio (CR) = Current asset (CA) / current liability (CL)
(7) Current Asset Ratio (CAR) = current asset/total asset

C. Risk and insolvency indicators:

(8) Debt Equity Ratio (DER) = Debt/equity capital
(9) Debt to Total Asset Ratio (DTAR) = Debt/total asset
(10) Equity Multiplier (EM) = total assets/share capital
(11) Loan to Deposit Ratio (LDR) = loans/deposit

The wide acceptance of Charnes et al. (1978) DEA as a measurement tool for measuring efficiency of the financial institutions (Charnes et al., 1990) can be attributed to certain strengths of this approach. The main advantages of using DEA are due to the fact that the data may not necessarily assume any functional form. DEA leads to a comparison of one decision making unit (DMU) against peer or a combination of peers. The units of the inputs and outputs may vary as they do not affect the calculation of efficiency measure. This implies that changing the units of measurement (e.g., measuring quantity labor in person hours instead of person days) does not change the value of the efficiency measures. It can handle multiple inputs and outputs (Cao et al., 2007). The application of

(DEA) technique has provided several efficiency measures such as allocative, pure technical and scale efficiency that explain cost and profit efficiency differentials among banks (Kamaruddin et al., 2008).

DEA measures the technical efficiency of a given bank by calculating an efficiency ratio equal to a weighted sum of outputs over a weighted sum of inputs (Charnes et al., 1985a). For each DMU, these weights are derived by solving an optimization problem which involves the maximization of the efficiency ratio for that DMU subject to the constraint that the equivalent ratios for every DMU in the set is less than or equal to 1. Therefore, according to DEA, technical efficiency is defined as the ratio of the weighted sum of the m outputs to the weighted sum of the n inputs (Braglia et al., 2003, p. 543).

Efficiency of DMU j = $$E_j = \frac{\text{weighted sum of outputs}}{\text{weighted sum of inputs}} = \frac{\alpha_1 y_{1j} + ... + \alpha_m y_{mj}}{\beta_1 x_{1j} + ... + \beta_n x_{nj}}$$

$$= \frac{\sum_{i=1}^{m} \alpha_i y_{ij}}{\sum_{i=1}^{n} \beta_i x_{ij}}$$

Where:

α_k : is the weight of output k

β_k : is the weight of input k

y_{kj} : is the amount of output k from DMU j

x_{kj} : is the amount of input k from DMU j

The efficiency score is usually expressed as a number between 0% and 100% (or constrained to the interval [0, 1]). A DMU with a score of 100% is deemed efficient relative to others. A score of less than 100% indicates inefficiency unit. 100% efficiency is attained by any DMU if and only if none of its inputs or outputs can be improved without worsening some of its other inputs or outputs (Charnes et al., 1985b).

Despic et al. (2007) propose a new mathematical model for efficiency analysis, which combines DEA methodology with an old idea—Ratio Analysis. Their model, called DEA-R, treats all possible ratios ‘‘output/input’’ as outputs within the standard DEA model. Although DEA and DEA-R generate different summary measures for efficiency, the two measures are comparable. The mathematical and empirical comparisons establish the validity of DEA-R model in its own right. The key advantage of DEA-R over DEA is that it allows effective integration of the model with experts’ opinions via flexible restrictive conditions on individual ‘‘output/input’’ pairs.

This study follows Johnes et al. (2009) in using the inputs and outputs. The inputs are:
(1) Deposits and short term funding,
(2) Fixed assets,
(3) General and administration expenses,
(4) Equity.
While, the outputs are:
(1) Total credit facilities,
(2) Other earning assets.

The Results and the Analysis:

This section examines Jordanian Islamic banks efficiency in terms of their ability to provide outputs with minimum inputs consumption. The analysis consists of two sections: conventional financial ratio analysis and non-parametric input-output DEA model.

Financial Ratio Analysis:

Liquidity, profitability, and risk and solvency ratios were calculated for the sample banks during the study period (2005-2009). The results are exhibited in table (1).

Table (1) Financial Ratios for Jordanian Islamic Banks
During the Period 2005-2009

Year	Profitability Ratios			Liquidity Ratios				Risk & Solvency Ratios			
	ROA	**ROE**	**PER**	**CDR**	**LDR**	**CR**	**CAR**	**DER**	**DTAR**	**EM**	**LDR**
Jordanian Islamic Bank for Finance and Investment (JIBFI)											
2005	0.97 %	18.86 %	52.44%	41.75 %	39.63%	0.55	49.72 %	1834.21 %	94.83 %	19.34	39.63%
2006	1.06 %	13.42 %	60.79%	42.58 %	45.46%	1.20	45.54 %	1168.45 %	92.12 %	12.68	45.46%
2007	1.44 %	17.22 %	79.04%	39.63 %	50.77%	1.26	40.28 %	1096.99 %	91.62 %	11.97	50.77%
2008	1.90 %	21.83 %	83.34%	37.01 %	52.63%	0.43	37.30 %	1047.78 %	91.26 %	11.48	52.63%
2009	1.28 %	15.77 %	69.84%	40.60 %	48.85%	0.13	40.19 %	1134.21 %	91.87 %	12.35	48.85%
Mean	1.33 %	17.42 %	69.09%	40.31 %	47.47%	0.71	42.61 %	1256.33 %	92.34 %	13.57	47.47%
Islamic International Arab Bank (IIAB)											
2005	0.97%	6.93%	60.95%	9.28%	54.46%	0.55	43.36 %	613.33%	85.98 %	7.13	54.46%
2006	1.39%	12.71 %	124.51 %	17.54 %	4.51%	1.20	42.65 %	814.86%	89.07 %	9.15	4.51%
2007	1.83%	14.67 %	103.19 %	17.46 %	5.96%	1.26	42.30 %	701.79%	87.53 %	8.02	5.96%
2008	0.86%	8.37%	99.73%	5.55%	68.59%	0.43	36.60 %	870.47%	89.70 %	9.70	68.59%
2009	0.25%	2.21%	23.45%	5.23%	100.13 %	0.13	10.90 %	785.01%	88.70 %	8.85	100.13 %
Mean	1.06%	8.98%	82.37%	11.01 %	46.73%	0.71	35.16 %	757.09%	88.19 %	8.57	46.73%

Table (1) reveals that JIBFI has higher profitability ratios, higher liquidity and higher risk and solvency ratios. In fact, this conclusion is consistent with the finance theory that more risk more return. It seems that the ratio outcomes are influenced by bank size and age. JIBFI is bigger and older than IIAB.

Data Envelopment Analysis:

The Efficiency Measurement System (EMS) software is used to measure the efficiency of the banks included in the sample of the study. In practical terms, the DEA is performed for each year separately. Table (2) displays the DEA results based on the model with two outputs and four inputs.

Table (2) Jordanian Islamic Banks Efficiency Scores
During the Period 2005-2009

Year	JIBFI	IIAB	Mean
2005	53.8%	77.2%	**65.5%**
2006	57.2%	7.4%	**32.3%**
2007	92.6%	100.0%	**96.3%**
2008	100.0%	96.9%	**98.5%**
2009	100.0%	100.0%	**100.0%**
Mean	**80.7%**	**76.3%**	**78.5%**

It can be seen that JIBFI improved its efficiency score from being inefficient (53.79%, 57.2% and 92.6%) in 2005, 2006 and 2007, respectively to fully efficient (100%) in 2008 and 2009. JIBFI lowest efficiency score was in 2006, resulted from lower bank outputs (total credit facilities). However, IIAB efficiency scores were scattered. It was 77.2% in 2005, higher than that of JIBFI. Then, it decreased significantly in 2006 to a mere 7.4%. Later, it increased sharply to full efficiency in 2007 and 2009. IIAB efficiency scores fluctuation was due to early period of expansion in the bank's number of branches. The efficiency score of JIBFI is significantly higher than IIAB by around 5 percentage points. Overall, efficiency improvement is evident in the Islamic banking industry in Jordan from 65.5% in 2005 to 100% in 2009.

Slack Analysis and Improvement

One of the objectives of this study is to provide suggestions to increase the technical efficiency of Jordanian Islamic banks. This section explains how IIAB and JIBFI can improve their efficiency scores, by employing slacks analysis of inputs and outputs variables of inefficient banks. Slacks are the adjustments of inputs and/or outputs that should be eliminated by the DMU under evaluation to be considered as efficient. Slacks usually refer to inputs and it's the difference between the actual and target inputs and outputs values. Table (3) reports the results of the slack analysis for JIBFI and IIA.

Table (3) Slacks Analysis for Improving the Efficiency of JIBFI and IIAB
During the Period (2005-2009)

Year	Inputs				Outputs	
	Deposits & Short Term Funding	Fixed Assets	General and Administration Expenses	Equity	Total Facilities	Other Earning Assets
Slacks JIBFI						
2005	155,646,063	5,638,310	300,457	0	0	944,565
2006	126,289,979	26,628,621	194,374	0	195,661,477	0
2007	119,299,363	30,834,880	415,394	0	375,800,974	0
2008	0	0	0	0	0	0
2009	0	0	0	0	0	0
Slacks IIAB						

2005	66,615,292	0	667,194	18,384,217	0	0
2006	0	4,646,919	51,459	1,328,704	0	0
2007	0	0	0	0	0	0
2008	217,307,189	0	992,776	19,478,687	0	0
2009	0	0	0	0	0	0

Table (3) shows the amount that must be increased in the inputs of IIAB and JIBFI to improve their efficiency scores to produce the actual outputs. As well as the amount of increasing the outputs of IIAB and JIBFI to improve their efficiency scores by utilizing the actual inputs.

Comparison between FRA and DEA:

This section illustrates the result of comparing between the FRA and the DEA. A Spearman's rank correlation analysis of DEA efficiency scores and eleven financial ratios are calculated. Table (4) displays the results.

Table (4) Spearman's Correlations between DEA Rankings and Financial Ratios

Spearman's rho		**ROA**	**ROE**	**PER**	**CDR**	**LDR**	**CR**
Efficiency Rankings	**Correlation Coefficient**	- 0.200	- 0.200	- 0.600	***- 0.800* ****	**0.900 ***	-0.700
	Sig. (2-tailed)	0.747	0.747	0.285	***0.104***	**0.037**	0.188
Spearman's rho		**CAR**	**DER**	**DTAR**	**EM**	**LDR**	
Efficiency Rankings	**Correlation Coefficient**	**- 0.900 ***	-0.500	-0.500	-0.500	**- 0.900 ***	
	Sig. (2-tailed)	**0.037**	0.391	0.391	0.391	**0.037**	

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.10 level (2-tailed).

Table (4) shows that bank rankings calculated from DEA efficiency are not significantly related to bank rankings derived only from the ROA, ROE, PER, CR, DER, DTAR and EM ratios. However, significant correlations found in the table above were negative, indicating that there is no evidence of any significant relationship in the rankings derived from any other pairs of DEA efficiencies and financial ratios. The correlation evidence, therefore, suggests that FRA and DEA should generally be viewed as complementary rather than competing, and should be used together when evaluating efficiency of organizations since they answer different questions.

Summary

Growth has been particularly strong in the Jordanian Islamic banking industry, and this led to an increase in product innovation efficiency to deal with higher customer numbers. This study aimed at measuring the technical efficiency of Islamic banks in Jordan. It used the financial information published in the annual reports to measure the efficiency of Jordanian Islamic banks using Data Envelopment Analysis (DEA) and Financial Ratio Analysis (FRA) methodologies, during the period 2005-2009. At the time of the analysis, there were only two Islamic banks listed in Amman Stock Exchange: JIBFI and IIAB.

The FRA results indicate that JIBFI has higher profitability ratios than IIAB, but is more risky than the IIAB. This is consistent with the high risk high returns principle of finance. However, there is no significant difference in the efficiency levels of Jordanian Islamic banks using FRA. Such conclusion is persistent over time. That is, there is no difference in the level of efficiency measured by FRA of JIBFI or IIAB over time.

Technical efficiency of Jordanian Islamic banks was calculated by DEA methodology with Constant Return to Scale model. Statistical tests support similar efficiency hypothesis of FRA that

there is no significant difference in the efficiency levels of Jordanian Islamic banks using DEA. Once again, this result is constant over time. That is there is no difference in the level of efficiency measured by DEA of JIBFI or IIAB over time.

The correlation between efficiency levels measured by DEA and FRA is not statistically significant. Thus, the efficiency of Jordanian Islamic banks must be evaluated by using both DEA and FRA.

Jordanian Islamic banks can improve their efficiency by making some adjustments to its inputs as indicated in this study. Managers of Jordanian Islamic banks should make decisions about reallocating the resources within their banks to increase the efficiency in order to sustain long term growth and profitability. Finally, it would be interesting to assess the efficiency of Jordanian Islamic banks by taking into account other efficiency factors (variables) other than the ones used in this study.

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