



Evaluating the Efficiency of the Banking Sector in Kuwait

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Abstract:

Finance and insurance is a leading economic sector in the State of Kuwait. In 2009 it represented 18.7% of total GDP and 51.1% of private sector GDP. This paper focuses on issues related to the efficiency of this sector. Recently IMF published macroeconomic assessment of Kuwaiti financial sector, the stability and stress tests indicate that the overall figure is positive and the financial system is resilient. This paper derived the relative technical and cost efficiency scores by implementing DEA on a panel of 15 banks over the period 2006 - 2009. Total efficiency score of banking sector in State of Kuwait increased steadily from 57% in 1996 to 77% in 2009. The scores are close to world means (86%), and very high if compared to many other countries. However, there's a need for the banking sector to further improve efficiency in order to achieve world best practices. The government also needs to assist banks by creating appropriate policy environment that promotes efficiency.

Introduction

This paper seeks to produce new assessment of the banking sector in the State of Kuwait based on efficiency scores. Non parametric distribution free panel data approach (DEA) is used in order to determine how efficiency in bank sector evolves over time. Efficiency scores are derived by measuring how banks lie far from optimal best practice frontier. Quantifying bank efficiency may help resolve number of managerial issues from a profitability point of view at the bank level and other policy questions in relation with financial system stability

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and supervision. Conducted at the microstructure level, the empirical part of the paper constitutes an alternative to macroeconomic approach to assess bank sector (IMF, 2010) and day-to-day financial statements and ratios compilation performed by bank staffs.

METHODOLOGY

Data Envelopment Analysis (DEA) was first introduced by (Charnes et al. 1978)⁽¹⁾. He developed non parametric approach to production function analysis fairly suitable for implementation to economic activities sharing similar technological features (similar range of products using similar array of inputs) in order to address efficiency issues. It's worth noting that DEA doesn't require explicit specification of production possibility and has the advantage to handle multiple inputs and outputs and focuses on best practice frontier rather than sample central tendencies underlined by parametric econometric based approach.

Consider an industry consisting of N firms indexed by $s = 1 \dots N$, each firm produces n outputs using m inputs. Let y_{is} and x_{js} be the amount of output $i = 1 \dots n$ and input $j = 1 \dots m$ respectively. DEA

approach is based on the efficiency score $e_s = \frac{\sum_{i=1}^n u_i y_{is}}{\sum_{j=1}^m v_j x_{js}}$ where u_i and v_j

are outputs and inputs weights. Optimal weights are selected to maximize this efficiency score subject to two types of constraints.

- The first states that efficiency score should be at least 1, and rules out solutions with u_i and v_j negative that is: $\sum_{i=1}^n u_i y_{is} \leq \sum_{j=1}^m v_j x_{js}$ for all s and $u_i, v_j \geq 0$.

(1) For more developments and applications to financial sector in various countries and regions Cf. Chen and al.(2005), Eisenbeis and al.(1999), Fadzalan(2010), Frodelisi and al(2010), Fioritino and al.(2006), Jackson and al.(2000), Kablan(2008), Pastorand al.(1997), Sathye (2003), Soteriou and al.(1997), Staub and al.(2009), Yang (2009) and Ydistira(2004)

- Since $e_s(u_i, v_j)$ is homogenous of degree zero, the maximizing program could have infinit solutions. To remove this irrelevancy we add the following constraint: $\sum_{j=1}^m v_j x_{js} = 1$ for all s and $u_i, v_j \geq 0$

Efficiency score definition and the two sets of constraints can be combined to yield the following standard primal linear program:

$$\begin{aligned}
 & \text{Max.} \quad \sum_{i=1}^n u_i y_{is} \\
 & \text{subject to} \quad \sum_{i=1}^n u_i y_{ik} - \sum_{j=1}^m v_j x_{jk} \leq 0 \quad \dots\dots\dots \lambda_K \\
 & \quad \quad \quad \sum_{j=1}^m v_j x_{js} = 1 \quad \dots\dots\dots \theta_s \\
 & \quad \quad \quad u_i, v_j \geq 0
 \end{aligned}$$

It's easy to specify the related Dual program.

$$\begin{aligned}
 & \text{Min.} \quad \theta_s \\
 & \text{subject to :} \quad \sum_{k=1}^N \lambda_k y_{ik} \geq y_{is} \quad \dots\dots\dots u_i \quad (D1i) \\
 & \quad \quad \quad \theta_s x_{js} - \sum_{k=1}^N \lambda_k x_{jk} \geq 0 \quad \dots\dots\dots v_j \quad (D2j) \\
 & \quad \quad \quad 0 \leq \theta_s \leq 1
 \end{aligned}$$

The dual program provides intuitive economic interpretation of inefficiency measurement issues. Let s^* be any fictive firm producing $\sum_{k=1}^N \lambda_k y_{ik}$ of outputs $i = 1 \dots n$ using $\sum_{k=1}^N \lambda_k x_{jk}$ of inputs $j = 1 \dots m$. Accordingly, constraints (D1i) state that output produced by firm s is at least equal to s^* output while constraints (D2j) indicate that inputs used by firm s may be reduced in proportion θ_s without being less than inputs used by firm s^* . The optimization program aims to find components of linear combination λ_K in order to achieve maximum

input proportional reduction. Effective firm performances are given by (y_{is}, x_{js}) while benchmark firm performances are given by $\left(\sum_{k=1}^n \lambda_k^* y_{ik}, \sum_{k=1}^n \lambda_k^* x_{jk} \right)$ and $(1 - \theta_s^*)$ is the DEA inefficiency score. It should be noted that efficient firm presents identical input - output features to its benchmark in such a way that: $\lambda_k^* = 1$ for $k = s$ and 0 elsewhere and $\theta_s^* = 1$.

The above dual program deals with efficiency measurement according to proportional reduction of inputs to move firm toward best practice frontier. The problem can be specified in terms of proportional increase of outputs, that is to what extent activity level could be increased using the amount of inputs if selected firm operates efficiently. This output oriented efficiency measurement corresponds to the following linear program:

$$\begin{aligned}
 & \text{Max. } \delta_s \\
 & \text{Subject to : } \delta_s y_{is} \leq \sum_{k=1}^N \lambda_k y_{ik} \\
 & \quad \sum_{k=1}^N \lambda_k x_{jk} \leq x_{js} \\
 & \quad 1 \leq \delta_s
 \end{aligned}$$

The objective function indicates efficiency score which measures the level of success a firm could reach by producing maximum output from a given set of inputs. The first constraint states that increase output is at most equal to benchmark firm output, and the second constraint states that benchmark firm input disposal is at most equal to selected firm input. The last constraint indicates that efficiency score is specified in terms of proportional output increase.

Figure 1 provides elementary illustration of DEA approach. For

practical convenience, we consider the case of firms producing one output using one input. The plot shows four firms (A to D) and production frontier in the case of constant and variable return to scale (CRS) and (VRS), respectively.

According to CRS hypothesis, all firms but A are interior to the frontier and feature inefficiency measured horizontally (vertically) by the distance separating actual position and the frontier indicating to what extent input could be reduced (output may be increased) if inefficient firms operate optimally. VRS hypothesis (decreasing return to scale in the present case), presents different production pattern. All firms but D are on the frontier. The linear piecewise curve (OC) acts as empirical envelopment of existing data. Firm D inefficiency score is equal to the ratio $\frac{D'D}{OX_D}$ and the optimal value $\theta_D^* = \frac{OX_D}{OX_D}$. Firm A and B are peer firms to D and optimal value for firm D benchmark are $\lambda_A^* = \frac{D'B}{AB}$ and $\lambda_B^* = \frac{AD'}{AB}$. Note that $\lambda_A^* + \lambda_B^* = 1$, VRS hypothesis ensures that each firm is compared only to firms with similar size in order to assess its inefficiency. This implies adding the constraint $\sum_{k=1}^N \lambda_k = 1$ to the initial linear program (input or output orientation version).

Firm D total inefficiency (Optimal input reduction) under CRS hypothesis is equal to $D''D$. It can be split into technical inefficiency $D''D'$ and cost inefficiency $D'D$. We note that firms B and C suffer from technical inefficiency only. In presence of decreasing returns to scale, the higher the inefficiency score the bigger the firm size and technical inefficiency and cost inefficiency act in the direction.

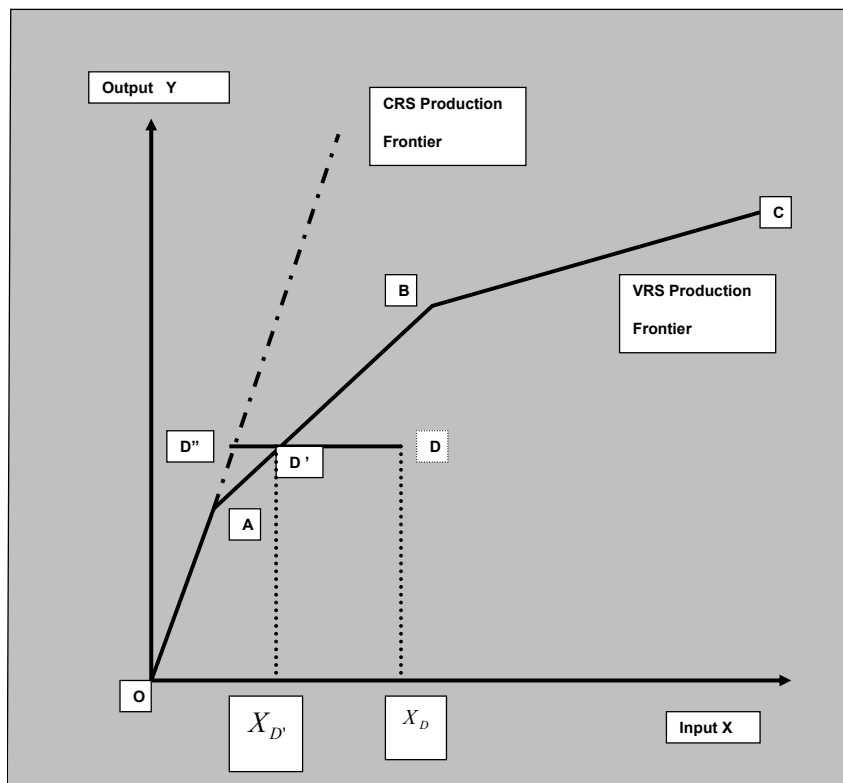


Figure 1 - DEA Efficiency Measurement: One Input-One Output

KUWAIT FINANCIAL SECTOR ASSESSMENT

Finance and insurance is a leading economic sector in the State of Kuwait. In 2009 it represented 18.7% of total GDP and 51.1% of private sector GDP. Assessment of financial sector conditions may be performed through compilation of various financial data made available by financial institutions⁽²⁾. Recently IMF published macroeconomic assessment of Kuwait financial sector stability. The

(2) For more details on banking sector assessment and audit cf. Bashir(1999,2003), Bauer and al. (1998), Berger(1997) Demircuc-Kunt and al. (1997,1998) and IMF(2010).

adopted methodology focused on risks, vulnerabilities and how to ensure financial sector stability and the design of policy mix in order to sustain growth. Main findings of the IMF assessment can be summerized in the following:

- Investment companies constitute the weak link and have experienced funding pressures and asset quality deterioration. Therefore must be restructured.
- Sound and forceful early response by authorities contributed to sector stability, Due to such response only one bank needed public funds for recapitalization.
- The outlook is subject to domestic downside risks and relations between Government and National Assembly.
- Stress tests (form of testing used to determine the stability of a given system or entity, e.g.: what happens if equity markets crash by more than x% this year...) indicate that the overall figure is positive and the financial system is resilient. Specific stress tests to investment companies point to their limited capacity to withstand adverse shocks.
- Spillovers from Dubai debt have been limited and the banking sector has minimal exposure to Dubai real estate.
- Substantial progress is achieved in structural reforms but significant challenges still exist and further progress is well needed.

RELATED LITERATURE.

There's a vast literature discussing different aspects of banking efficiency, mainly:

- Specificity of banking activity and related issues to inputs and outputs definition and measurement. The literature distinguishes two main approaches: production and intermediation. According to production approach, labor, capital and other operating costs are deemed as inputs and products and services such as loans, deposits are considered as outputs. Within this setting DEA method measures cost efficiency of banks. According to intermediation approach, banks collect deposits and other funds from depositors and lend them as loans and other assets. Different forms of collected funds plus cost of collect are deemed as inputs and forms in which

collected funds can be lent are considered as outputs. DEA method measures economic viability of banks.

- Ownership and banking efficiency. Different studies focused on efficiency cross differences between domestic and foreign owned banks operating in the same domestic financial market and regulatory framework. Evidence indicates that countries with high share of banking sector asset held by foreign banks experienced more stable financial market than countries with low share of banking assets held by foreign banks.
- Cost structure and bank size. Interaction between cost structure and bank size has policy implications regarding the optimal structure of banking activity. Empirical results reported both positive and negative relationship between cost level and bank size or little cost savings from bank size expansion. Efficiency studies failed to explain why banks operating at similar scale and product mix could differ dramatically in their average cost and efficiency score.
- Islamic banking versus conventional (interest based) banking. Overall efficiency results suggest that Islamic banks inefficiency is significantly low compared to conventional banks⁽³⁾. This finding is not directly explained by Islamic versus conventional banking technique but by the fact that Islamic banks are small to medium size which induces decreasing returns to scale and Islamic banks are more efficient at controlling costs than at generating profits.
- Regulatory framework and institutional environment. Fueled by frequent financial crisis, international and national financial systems are still evolving. Many studies focused on interactions between regulatory framework and banks efficiency. Two case studies may be cited: creation of European Monetary Union and its impact on European banks efficiency and interdependence of Islamic banks to other financial system. Regarding EMU, the process of integration and the accompanying deregulation embodied an incentive to focus on improving efficiency and empirical main findings recorded small

(3) Cf. (Bashir,1997,2003), (Kamaruddin, 2008), (Saker, 1999) and (Yudistira,2004).

improvement in bank efficiency levels. Islamic banking is developed in the Middle East countries and other areas where institutional and regulatory framework are rather conventional banking oriented and has not yet come out of its infancy. Some practices and financial instruments used by Islamic banks do not seem to conform to Islamic principles. Malaysia is a pioneering country because Banks are regulated and supervised under an Islamic banking act.

- International cross country comparison in order to know how different or similar banking performances are. Empirical studies show that country specific environmental conditions (macroeconomic variables, economic and regulatory conditions, accessibility of banking services,...) exercise strong influence over efficiency score of each county.

DATA AND OVERVIEW OF BANKING SECTOR.

Central Bank of Kuwait (CBK) is the regulatory authority supervising the financial markets and records 21 bank companies operating in Kuwait: 10 domestic banks, one joint venture and 10 foreign banks with local branch. Out of the total 6 banks conduct their business in accordance with Islamic Share'a. We obtained Data from banks annual reports on audited financial statements, operating income and expenses, risk management, and notes on financial statements over the period 1996 - 2009. Data required on four banks are not available and for two banks available only in 2008 and 2009. Data shortcomings reduced the sample to 15 banks over the period 1996 - 2009. Amounts in foreign currency are converted to KWD. Table 1 provides summary statistics.

- **Operating income:** Interest net corresponds to interest income less interest expenses and include conventional interest and murabaha and other Islamic financing income less distribution to depositors for Islamic banks. Investment income records net income from various financial investments. Other income includes net gain on dealing with foreign currencies. According to table 1, banks income components grew at positive rates more frequently. For the same bank growth rates are never simultaneously negative. Bank2 and bank 13 show different pattern with dramatic fall in investment income. Differences across banks are very important and show high volatility in investment and other income.

- **Operating expenses** record non financial operating costs. Employee compensation corresponds to staff costs and general and administration include IT expenses. Amortization corresponds to depreciation of premises and equipments. These components are labor, intermediate consumption and fixed capital costs, all had grew dramatically during the period 2006 - 2009.
- **Assets:** three components of bank assets were considered: Loans include conventional customer loans and Islamic financing to customer investment in securities is net of impairment of financial investment, Deposits correspond to dues from other banks.

Table (1)
The Summary Statistics for Banking Sector in Kuwait (1996-2009)
(Average annual growth rates (%))

Operating income				
Bank	Interest net	Fees & commissions net	Investment income	Other income
1	-11.0	11.8	1.4	20.8
2	-6.5	3.0	-182.7	-115.8
3	11.9	-2.7	11.1	13.7
4	176.2	-4.9	75.2	-36.0
5	17.9	18.7	2.0	36.4
6	23.1	69.8	1.7	228.1
7	6.0	6.5	7.1	18.4
8	31.9	-2.2	-12.8	56.6
9	31.1	27.2	15.9	47.4
10	4.8	26.2	-52.0	38.4
11	8.1	2.1	-60.1	-1.8
12	31.6	153.3	-3.4	69.6
13	10.6	1.9	-1342.5	867.3
14	20.8	34.6	n.a	141.4
15	n.a	n.a	n.a	n.a

Table 1 (Continued)

Bank	Operating expenses				Assets	
	Employee compensation	General & administration	Amortization	Loans	Financial investment net of impairment	Deposits
1	22.9	25.4	51.3	22.4	135.6	68.9
2	15.9	26.5	22.4	254.3	56.5	27.5
3	8.5	4.2	11.2	21.8	62.7	-21.8
4	6.8	-1.7	21.9	16.8	47.0	-273.1
5	28.9	28.9	35.6	19.0	42.0	20.2
6	47.0	56.7	n.a	28.9	78.6	-761.1
7	4.0	11.7	3.8	1.4	3.3	22.3
8	36.8	29.8	18.1	32.4	35.8	36.5
9	12.2	12.0	22.2	34.4	35.1	-527.6
10	19.5	23.8	27.0	14.2	-0.6	169.5
11	0.2	6.1	-4.2	17.0	81.7	7.7
12	41.6	457.9	n.a	34.5	8.2	9.0
13	22.4	11.1	23.0	17.2	31.1	128.7
14	23.9	19.8	15.4	30.5	38.8	21.7
15	12.4	10.7	n.a	20.5	82.3	10.1

Source: Multiple issues of banks' annual reports since 1996-2009. All Banks annual reports include financial statements, operating income and expenses, risk management, and notes on financial statements.

DEA IMPLEMENTATION AND MAIN FINDINGS.

The definition of bank's outputs and inputs is an issue related directly to its described function variables. There's no consensus on the definition of DEA's variables and a variety of definitions exist in the related literature. In particular, many studies define customer deposits as inputs and other studies define it as output. Availability of pertinent information is another factor to definitions diversity.

The standard applied DEA implementation includes five measures of bank output and four inputs according to the following:

Outputs.

- 1 - Value of real estate loans.
- 2 - Value of investment securities.
- 3 - Value of commercial and industrial loans.
- 4 - Value of consumer loans.
- 5 - Other commitments and contingencies (loan commitments, standby letters,...).

Inputs.

- 1 - Labor (full time equivalent employees).
- 2 - Physical capital (fixed plant and equipments).
- 3 - Purchased funds.
- 4 - Time deposits.

Pertinent information obtained from banks on variables presented in the previous section enable us to define outputs as: 1) value of loans, 2) fair value (determined by reference to quoted market prices) of investment securities net of impairment, and 3) value of dues from other banks. On the other hand, input variables are characterized as follows: 1) staff costs, 2) general and administration expenses: 3) amortization. We exclude customer deposits for the ambiguousness of its interpretation as input or output due to its high collinearity with loans.

GAMS - based program was designed order to solve dual linear program and to determine DEA whole components. This routine may be used for any implementation of DEA approach with minor modification-adaptation. Output of GAMS routine include determination of efficiency scores under constant or variable returns to scale and input or output orientation.

Table 2 and 3 provide efficiency scores in case of input orientation and under constant or variable returns to scale respectively. The main findings of Table 2:

- 1 - In 2009, cross bank average efficiency score is 0.77

indicating that, on average, banks could produce outputs with approximately 23% fewer inputs.

- 2 - Overall, based on nominal values of selected banks inputs and outputs, total efficiency score of banking sector in State of Kuwait increased steadily from 1996 (57%) to 2009 (77%). (Berger and Humphrey, 1997) evaluated the world mean Score of efficiency score at 86%, with a range of 55% to 95%. Kuwaiti banking sector with 77% is closer to top ranked countries. However, this score is lower than the world mean and it implies that there's a need for the banking sector to further improve efficiency so as to achieve world best practices. The ongoing crescendo trend signifies that the banking is on the right path to catch up world mean.
- 3 - The ongoing crescendo trend is valid to each bank of our sample because (2006 - 2009) efficiency score average is everywhere higher than its 2006 value.
- 4 - Time series bank efficiency scores range form 20% to 100%. Kuwait banking sector lower bound is higher by 17% mor than the lower bound estimated for Turkey (Jackson et al. 2000) and 5% estimated for India (Sathye, 2002).
- 5 - Banks can be categorized into three groups according to their efficiency score: 4 banks constitute the first group with scores greater than 90%, 6 banks belong to the middle class with a range of 65% to 90% and 5 banks with efficiency score less than 65%.
- 6 - Cross bank 2008 average score is slightly higher than 2007 average, however same banks witnessed efficiency worsen- ing in 2008 as a result of the financial crisis spillover.

Table (2)
CRS Cost Efficiency Scores

	2006	2007	2008	2009	Average
1	0.52	0.75	0.60	0.72	0.65
2	0.19	1.00	1.00	1.00	0.80
3	0.46	0.51	0.60	0.88	0.61
4	0.51	0.56	0.89	1.00	0.74
5	0.41	0.55	0.48	0.49	0.48
6	0.38	0.27	0.36	0.64	0.41
7	0.37	0.41	0.36	0.50	0.41
8	1.00	0.90	1.00	1.00	0.98
9	0.77	1.00	1.00	1.00	0.94
10	0.34	0.29	0.29	0.42	0.34
11	0.22	0.14	0.18	0.26	0.20
12	1.00	1.00	0.62	1.00	0.91
13	0.65	1.00	1.00	0.76	0.85
14	0.78	0.72	0.83	0.95	0.82
15	1.00	1.00	1.00	1.00	1.00
Average	0.57	0.67	0.68	0.77	

Table 3 provides efficiency scores when VRS are assumed. Many reasons can be advocated in order to justify VRS hypothesis such as: small to medium bank size, regulatory framework, agency theory (issue of incentives to motivate banks to take risks), and financial intermediation function (in a market where participants are asymmetrically informed, the presence of asymmetric information increases transaction costs and requires the existence of supervision institution).

- 1 - Efficiency scores under VRS are higher than under CRS assumption. This implies that banking sector features decreasing returns to scale.

- 2 - The difference between VRS score and CRS score measures technical inefficiency and ranges from 0% to 59% and less than 20% for eleven banks.
- 3 - 2008 international crisis and its 2009 spreading effect reduces overall growing trend from 2006 to 2009, in particular, 2009's average score is close to its 2006 value.
- 4 - In 2007, 10 banks were on efficiency frontier, 9 at 2008, and 8 at 2009. Only one firm was on efficiency frontier each year from 2006 to 2009.
- 5 - Time series average efficiency scores range from 37% to 100%.

Table (3)
VRS Cost Efficiency Scores

	2006	2007	2008	2009	Average
1	0.53	0.86	0.62	0.73	0.69
2	0.43	1.00	1.00	1.00	0.86
3	0.69	0.79	0.60	1.00	0.77
4	0.96	1.00	0.90	1.00	0.97
5	0.87	0.58	0.50	0.50	0.61
6	1.00	1.00	1.00	1.00	1.00
7	1.00	1.00	1.00	1.00	1.00
8	1.00	1.00	1.00	1.00	1.00
9	0.80	1.00	1.00	1.00	0.95
10	0.42	0.31	0.30	0.44	0.37
11	0.46	1.00	1.00	0.47	0.73
12	1.00	1.00	1.00	1.00	1.00
13	1.00	1.00	1.00	0.88	0.97
14	1.00	0.88	0.94	0.98	0.77
15	1.00	1.00	1.00	1.00	1.00
Average	0.81	0.89	0.86	0.82	

CONCLUSION AND RECOMMENDATIONS.

The objective of this paper was to apply DEA methodology to investigate recent performance of Kuwait banking sector. The lack of empirical studies dealing with financial sector assessment at the microstructure level motivated this study.

The relative technical and cost efficiency scores were derived by implementing DEA on a panel of 15 banks over the period 2006 - 2009. The main findings were in line with IMF recent macroeconomic diagnosis with more comprehensive tools. Efficiency score levels are close to world means and considered high if compared to many other countries. However, there's a need for banking sector to further improve efficiency so as to achieve world best practice. The government is required to assist banks by creating appropriate policy environment that promotes efficiency. Detailed data at the branch level can enhance estimation of efficiency scores. Accordingly, banking sector in Kuwait may face problems of weak performance and low profitability due to various factors:

- 1 - Low labor productivity.
- 2 - High intermediation cost (high cost deposits).
- 3 - Huge expenditures on establishment.
- 4 - Over staffing.
- 5 - Large number of loss making branches.
- 6 - Mismanagement of funds.

Due to the above, banking sector in Kuwait could be under great deal of pressure to maintain its profitability. Further research could examine more detailed information on financial sector to expand our results regarding Kuwait banks efficiency to investment companies. Also future research may focus on determinants of efficiency using censored regression techniques in order to explore variations in calculated efficiency scores. The study recommends implementation of policy of reducing non-performing assets and rationalization of staff and branches in order to obtain efficiency gains. This will make the Kuwaiti banks internationally competitive which is a declared main goal of medium term plan 2009/2010 - 2013/2014 of the State of Kuwait.

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