Efficiency in Islamic and conventional banks in the GCC

A Financial Ratio and Data Envelopment Analysis approach

Jill Johnes, Marwan Izzeldin and Vasileios Pappas

EM Strasbourg Business School

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Motivation

Why GCC countries

- Economic growth of the region (around 7% real GDP growth)
- The dominant segment of Islamic finance which accounts for 43% of total assets
- Under-researched area
Motivation (cont’d)

Why Islamic banking

- Huge growth of the industry ($822bn in 2009, projected 1$ trillion for 2010)
- Largely immune from the financial crisis (i.e. less risky assets, link between financial sector and real economy)
- Islamic banking adheres to Shariah with practises closely linked to economic growth
- Islamic banking mimics conventional. Especially "new players" (US, UK banks with Islamic windows) come "armed" with the ability to generate unusual and risky derivative assets (IFIS)
Introduction

- Islamic Banking re-emerged in the 1950’s
- In the 80’s Islamic banking was introduced alongside the conventional banking system in the MENA region
- Pakistan, Iran and Sudan opted for Islamic banking system only.
- Expansion to the west (in the 90’s) and the creation fo Islamic windows (e.g. HSBC Amanah)
- In the 21\textsuperscript{st} century Islamic bond industry (sukuk) develops fast (45% growth rates, Islamic Finance News)
### Introduction (cont’d)

<table>
<thead>
<tr>
<th>Guarantee on investment deposits</th>
<th>Conventional: Allowed</th>
<th>Islamic: Not allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of return</td>
<td>Certain and known</td>
<td>Uncertain and unknown</td>
</tr>
<tr>
<td>Investment universe</td>
<td>Every investable asset</td>
<td>Except forbidden commodities and companies</td>
</tr>
<tr>
<td>Short sales</td>
<td>Allowed</td>
<td>Not allowed</td>
</tr>
<tr>
<td>Debt Trading</td>
<td>Allowed</td>
<td>Not allowed (except for Malaysia)</td>
</tr>
<tr>
<td>Operating level</td>
<td>Micro and Macro</td>
<td>Macro basically</td>
</tr>
<tr>
<td>Standardisation and Regulation</td>
<td>In place. IFRS</td>
<td>Standardisation of techniques and practises still at premature stage. Some banks follow the basic guidelines of Basel</td>
</tr>
</tbody>
</table>
Examination of the relative efficiency of Islamic and conventional banks in the GCC region

- Use of financial ratios and equality of means testing
- Data Envelopment Analysis (DEA)
- Malmquist productivity index
- Sample 50 conventional and 19 Islamic banks.
- Range 2004-2007
- Correlation analysis
Important Papers

- **Bader et al (2007)**
  - 21 MENA region countries. Range 1990-2005
  - Financial ratios to test cost, profit and revenue efficiency
  - Similar performance of conventional and Islamic banks

- **Charnes, Cooper and Rhodes (1978)**
  - Introduction of the DEA Methodology

- **Berger et al (1993)**
  - Parametric approach (DFA) to measure efficiency of US banks
  - Range 1984-1989. Loans (output) and number of employees (input)
  - 60% ~ 70% efficiency depending on size
Important Papers (Cont’d)

- **DeYoung and Nolle (1996)**
  - Profit efficiency of foreign-owned US banks relative to US banks.
  - It is argued that foreign banks "bought" their share rather than gaining it.
  - Foreign-owned banks are 4% less profit-efficient.

- **El-Gamal and Inanoglu (2005); Abdul-Majid et al (2005)**
  - No significant difference between Islamic and conventional banks.
Important Papers
(Cont’d)

- **Al-Jarrah and Molyneux (2005)**
  - Islamic banks use more input than the conventional ones
  - Productivity increase in the Malaysian banking sector over 1996-2002 is due to the technological innovations

- **Mokhtar et al (2008)**
  - Islamic banks have lower cost and technical efficiencies than conventional banks
Definition of Financial Ratios
(according to Bankscope)

- **Cost Efficiency Ratios**

  Cost to Income = \frac{Overheads}{Net \ interest \ revenue + Other \ income + Other \ income + Loan \ Loss \ provisions}

  Non Interest Expenses = \frac{Overheads}{Total \ Assets}

- **Profit Efficiency Ratios**

  RoA = \frac{Net \ Income}{Total \ Assets}

  RoE = \frac{Net \ Income}{Equity}

- **Revenue Efficiency Ratios**

  Net Interest Margin = \frac{Net \ Interest \ revenue}{Earning \ Assets}

  Other Operating Income = \frac{Other \ Operating \ Income}{Total \ Assets}
DEA Methodology

Let \( P(x) \) be the production technology of the firm

- \( y \in R_s^+ \) is the set of output vectors
- \( y \in R_m^+ \) is the set of input vectors
- \( P(x) = \{y \in R_s^+ : x \text{ can produce } y\} \)
- And the output distance function is
  \[ D_0(x, y) = \min_\theta \{(\theta(y/\theta) \in P(x)\} \]
- It is directly related to the technical efficiency measure of Farrell (1957)

- If \( y \) is on the boundary then \( D_0(x, y) = 1 \)
- If \( y \) lies inside the frontier then \( D_0(x, y) < 1 \) and technical inefficiency exists
DEA Methodology (cont’d)

- DEA estimates the output distance function using Linear Programming techniques

- Minimise \( \theta_k - \varepsilon \sum_{r=1}^{s} s_r - \sum_{i=1}^{m} s_i \)

- Subject to

- \( y_{rk} - \sum_{j=1}^{n} \lambda_j y_{rj} + s_r = 0 \quad r = 1, \ldots, s \)

- \( \theta_k x_{ik} - \sum_{j=1}^{n} \lambda_j x_{ij} - s_i = 0 \quad i = 1, \ldots, m \)

- \( \lambda_j, s_j, s_i \geq 0 \quad \forall j = 1, \ldots, n \quad r = 1, \ldots, s \quad i = 1, \ldots, m \)

- Where \( y_{rk} \) is the amount of output \( r \) produced by DMU \( k \); \( x_{ik} \) is the amount of input \( i \) used by DMU \( k \); \( s_i, s_r \) are input and output slacks

- DMU \( k \) is efficient if \( TE_k = \theta_k = 1 \)
DEA Methodology (cont’d)

- **Gross technical efficiency**
  \[
  \frac{0y}{0y''}
  \]
  
  All banks together. Frontier FGCDE

- **Net technical efficiency**
  \[
  \frac{0y}{0y''}
  \]
  
  Banks of the same type. Frontier ABCDE (conventional).
  Frontier FGHIIJ (Islamic)

- **Type Efficiency**
  \[
  \frac{0y'}{0y''}
  \]
  
  The impact of the different bank type on efficiency

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Johnes, Izzeldin and Pappas

Workshop on Islamic Finance in Strasbourg
DEA Methodology (cont’d)

- Gross, Net and Type efficiencies graph

\[ y' \]

\[ y' \]

\[ y \]

\[ y \]

\[ \text{Output} \]

\[ \text{Input} \]

\[ X = \text{Conventional Bank} \]

\[ - \text{Islamic Bank} \]
Malmquist Methodology

- When data are available over time, the Malmquist productivity index can be calculated

\[ M_0(x^{t+1}, y^{t+1}, x^t, y^t) = E.T = \left( \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \right) \times \left[ \left( \frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right) \times \left( \frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right) \right]^{1/2} \]

- First term shows the change in technical efficiency (catching-up effect)
- Second term measures the change in technology (shifting of the frontier)
DEA Model

- Intermediation approach
- Outputs
  - Total Loans
  - Other Earning Assets
- Inputs
  - Deposit and short-term funding
  - Fixed assets
  - General and administrative expenses
  - Equity (used as a proxy for risk)
Sample includes 90% of conventional and 50% of Islamic banks (as at 2007)

<table>
<thead>
<tr>
<th>Country</th>
<th>Islamic</th>
<th>Conventional</th>
<th>Sum</th>
<th>Islamic</th>
<th>Conventional</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>6</td>
<td>8</td>
<td>14</td>
<td>17</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Kuwait</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Oman</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Qatar</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>S. Arabia</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>3</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>UAE</td>
<td>6</td>
<td>16</td>
<td>22</td>
<td>7</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>SUM</td>
<td>19</td>
<td>50</td>
<td>69</td>
<td>38</td>
<td>56</td>
<td>94</td>
</tr>
</tbody>
</table>
### Financial Ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>CTI</th>
<th>NIE</th>
<th>ROA</th>
<th>ROE</th>
<th>NIM</th>
<th>OOI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pooled</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>40.38</td>
<td>46.45</td>
<td>2.28</td>
<td>3.28</td>
<td>22.36</td>
<td>24.52</td>
</tr>
<tr>
<td>T-test</td>
<td>(0.048)**</td>
<td>(0.001)***</td>
<td>(0.018)**</td>
<td>(0.557)</td>
<td>(0.115)</td>
<td>(0.001)***</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>36.40</td>
<td>47.70</td>
<td>2.16</td>
<td>3.90</td>
<td>18.04</td>
<td>15.48</td>
</tr>
<tr>
<td>T-test</td>
<td>(0.024)**</td>
<td>(0.040)**</td>
<td>(0.716)</td>
<td>(0.379)</td>
<td>(0.169)</td>
<td>(0.191)</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>31.66</td>
<td>37.94</td>
<td>2.11</td>
<td>3.21</td>
<td>23.02</td>
<td>26.74</td>
</tr>
<tr>
<td>T-test</td>
<td>(0.165)</td>
<td>(0.003)***</td>
<td>(0.185)</td>
<td>(0.433)</td>
<td>(0.247)</td>
<td>(0.259)</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>36.16</td>
<td>43.02</td>
<td>1.96</td>
<td>2.84</td>
<td>20.89</td>
<td>23.33</td>
</tr>
<tr>
<td>T-test</td>
<td>(0.145)</td>
<td>(0.006)**</td>
<td>(0.099)*</td>
<td>(0.535)</td>
<td>(0.571)</td>
<td>(0.021)**</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>42.47</td>
<td>39.76</td>
<td>1.97</td>
<td>2.69</td>
<td>18.93</td>
<td>20.14</td>
</tr>
<tr>
<td>T-test</td>
<td>(0.449)</td>
<td>(0.028)**</td>
<td>(0.102)</td>
<td>(0.607)</td>
<td>(0.312)</td>
<td>(0.027)**</td>
</tr>
</tbody>
</table>

* = significant at 10% significance level; ** = significant at 5% significance level; *** = significant at 1% significance level

T-test tests the null hypothesis that the means of the two samples are equal (equal variances are not assumed)
Financial Ratios (cont’d)

- Islamic banks are profit and revenue efficient
  - Cost efficiency is lower for Islamic banks but the gap is closing in the latter years
Financial Ratios (cont’d)

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  - Cost efficiency is lower for Islamic banks but the gap is closing in the latter years
  - Studies in favour of these results (Iqbal, 2001)
Islamic banks are profit and revenue efficient

- Cost efficiency is lower for Islamic banks but the gap is closing in the latter years
- Studies in favour of these results (Iqbal, 2001)
- Our study is not supportive of Bader et al (2007) who finds Islamic and conventional banks equally efficient
## Bootstrap results

<table>
<thead>
<tr>
<th>Year</th>
<th>CTI</th>
<th>NIE</th>
<th>ROA</th>
<th>ROE</th>
<th>NIM</th>
<th>OOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>(0.048)**</td>
<td>(0.000)***</td>
<td>(0.018)**</td>
<td>(0.557)</td>
<td>(0.115)</td>
<td>(0.001)***</td>
</tr>
<tr>
<td>2005</td>
<td>(0.024)**</td>
<td>(0.040)**</td>
<td>(0.716)</td>
<td>(0.379)</td>
<td>(0.169)</td>
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</tr>
<tr>
<td>2006</td>
<td>(0.165)</td>
<td>(0.003)***</td>
<td>(0.185)</td>
<td>(0.433)</td>
<td>(0.247)</td>
<td>(0.259)</td>
</tr>
<tr>
<td>2007</td>
<td>(0.145)</td>
<td>(0.006)***</td>
<td>(0.099)**</td>
<td>(0.535)</td>
<td>(0.571)</td>
<td>(0.021)**</td>
</tr>
</tbody>
</table>

Bootstrap p-values correct for the small sample bias

- Trend are easier to identify (e.g. Islamic banks turn more cost efficient)
### DEA Results

<table>
<thead>
<tr>
<th></th>
<th>Model with equity</th>
<th>Model without equity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CRS</td>
<td>VRS</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>Best</td>
</tr>
<tr>
<td>Gross efficiency</td>
<td>4.9%</td>
<td>conv 5%</td>
</tr>
<tr>
<td>Net efficiency</td>
<td>2.1%</td>
<td>conv -</td>
</tr>
<tr>
<td>Type efficiency</td>
<td>3.3%</td>
<td>conv 1%</td>
</tr>
<tr>
<td>Gross efficiency</td>
<td>6.1%</td>
<td>conv 10%</td>
</tr>
<tr>
<td>Net efficiency</td>
<td>6.7%</td>
<td>conv 5%</td>
</tr>
<tr>
<td>Type efficiency</td>
<td>0.2%</td>
<td>Isl -</td>
</tr>
</tbody>
</table>

- Conventional banks utilise their resources more efficiently.
- Some studies in support (Majid et al, 2008; Hassan, 2006).
- However, we find Islamic banks to be 4-5% less efficient rather than 14% (Majid et al, 2008) and 16% (Hassan, 2006).
DEA Results (cont’d)

- Net efficiency: reflects managerial inadequacies
- Type efficiency: reflects the inefficiency caused by the Islamic modus operandi
- The different Islamic rules is the major cause of inefficiency
- Personnel of Islamic banks is not inferior to conventional banks (as argued in Hassan and Bashir, 2005)
- Equity is used as a proxy for risk (Majid et al, 2008)
- Equity plays an important role in Islamic banking as mingling of investors’ and shareholders’ funds is allowed
- If equity is removed, then the difference of Islamic banking is lost and is reflected as managerial inadequacies
## Malmquist Productivity Index

<table>
<thead>
<tr>
<th></th>
<th>Malmquist Index</th>
<th>Efficiency Change</th>
<th>Technology Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>0.989</td>
<td>0.939</td>
<td>1.061</td>
</tr>
<tr>
<td>Islamic</td>
<td>1.077</td>
<td>0.901</td>
<td>1.179</td>
</tr>
<tr>
<td><strong>VRS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>0.990</td>
<td>0.958</td>
<td>1.040</td>
</tr>
<tr>
<td>Islamic</td>
<td>1.108</td>
<td>0.915</td>
<td>1.204</td>
</tr>
</tbody>
</table>

Numbers reflect the change from the beginning of the period.

- Malmquist measures the change in Efficiency (catching up effect) and Technology (shift of the production function).
- Islamic banks increased (8.8%) productivity relative to conventional banks.
- Main cause for this rise is the 18% rise in technology that Islamic banks experienced (software improvements etc).
## Efficiencies by Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Bahrain</th>
<th>Kuwait</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRS</td>
<td>0.855</td>
<td>0.779</td>
<td>0.826</td>
<td>0.866</td>
<td>0.799</td>
<td>0.875</td>
</tr>
<tr>
<td>VRS</td>
<td>0.910</td>
<td>0.858</td>
<td>0.870</td>
<td>0.917</td>
<td>0.913</td>
<td>0.908</td>
</tr>
<tr>
<td>SE</td>
<td>0.940</td>
<td>0.906</td>
<td>0.948</td>
<td>0.945</td>
<td>0.875</td>
<td>0.963</td>
</tr>
<tr>
<td><strong>Net Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRS</td>
<td>0.928</td>
<td>0.837</td>
<td>0.897</td>
<td>0.926</td>
<td>0.874</td>
<td>0.934</td>
</tr>
<tr>
<td>VRS</td>
<td>0.958</td>
<td>0.900</td>
<td>0.922</td>
<td>0.961</td>
<td>0.927</td>
<td>0.957</td>
</tr>
<tr>
<td>SE</td>
<td>0.966</td>
<td>0.931</td>
<td>0.974</td>
<td>0.964</td>
<td>0.945</td>
<td>0.976</td>
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<tr>
<td><strong>Type Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRS</td>
<td>0.922</td>
<td>0.925</td>
<td>0.917</td>
<td>0.934</td>
<td>0.912</td>
<td>0.935</td>
</tr>
<tr>
<td>VRS</td>
<td>0.949</td>
<td>0.950</td>
<td>0.942</td>
<td>0.954</td>
<td>0.984</td>
<td>0.947</td>
</tr>
<tr>
<td><strong>Financial Ratios</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTI</td>
<td>54.05</td>
<td>39.16</td>
<td>48.88</td>
<td>36.56</td>
<td>29.29</td>
<td>42.65</td>
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<tr>
<td>NIE</td>
<td>3.28</td>
<td>2.63</td>
<td>3.35</td>
<td>2.17</td>
<td>2.48</td>
<td>2.68</td>
</tr>
<tr>
<td>ROA</td>
<td>3.83</td>
<td>4.50</td>
<td>2.86</td>
<td>5.33</td>
<td>4.94</td>
<td>4.45</td>
</tr>
<tr>
<td>ROE</td>
<td>13.72</td>
<td>25.36</td>
<td>20.84</td>
<td>32.12</td>
<td>34.95</td>
<td>22.43</td>
</tr>
<tr>
<td>NIM</td>
<td>4.30</td>
<td>3.47</td>
<td>4.73</td>
<td>5.35</td>
<td>5.49</td>
<td>3.77</td>
</tr>
<tr>
<td>OOI</td>
<td>3.07</td>
<td>3.14</td>
<td>1.54</td>
<td>2.30</td>
<td>2.38</td>
<td>2.90</td>
</tr>
</tbody>
</table>
UAE, Bahrain and Qatar have the highest gross efficiencies

The low average efficiency of Saudi Arabia is somewhat surprising given the much larger population and GDP

No pattern was found when we checked for different market structures (using the Herfindahl index)
Spearman’s rank correlation between DEA efficiency scores and Financial Ratios for all years

DEA efficiency is significantly positively correlated to the cost ratios (after inverting their signs)

Results agree with Taylor et al (1997). Banks that are inefficient under DEA could be more profitable than DEA efficient ones.

Financial Ratios and DEA should be considered as complementary rather than competing techniques
We provided an in-depth analysis using FRA and DEA for the Islamic and conventional banks in the GCC over the period 2004-2007. We find IBs to be more revenue efficient, at least as profit efficient as CBs.
Conclusions

- We provided an in-depth analysis using FRA and DEA for the Islamic and conventional banks in the GCC over the period 2004-2007
  - We find IBs to be more revenue efficient, at least as profit efficient as CBs
  - IBs are developing their mechanisms fast as evidenced by the falling cost ratios
Conclusions

- We provided an in-depth analysis using FRA and DEA for the Islamic and conventional banks in the GCC over the period 2004-2007
  - We find IBs to be more revenue efficient, at least as profit efficient as CBs
  - IBs are developing their mechanisms fast as evidenced by the falling cost ratios
  - DEA shows that IBs are much less inefficient than other studies find them to be
We provided an in-depth analysis using FRA and DEA for the Islamic and conventional banks in the GCC over the period 2004-2007.

- We find IBs to be more revenue efficient, at least as profit efficient as CBs.
- IBs are developing their mechanisms fast as evidenced by the falling cost ratios.
- DEA shows that IBs are much less inefficient than other studies find them to be.
- Moreover the source of this inefficiency is found in the different practises of IB and not to managerial inadequacies.
Conclusions (cont’d)

- IBs experienced much higher growth in technology than CBs in the examined period
  - This is attributed to the high revenues from oil in association with increased economic and political stability.
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- IBs experienced much higher growth in technology than CBs in the examined period
  - This is attributed to the high revenues from oil in association with increased economic and political stability.
  - The stimulus for innovation in the IB sector is likely to lead to product and practise standardisation and other operational improvements (IFIS-World bank to help IB standardise)
Efficiency in Islamic and conventional banks in the GCC

Thank You!