



Technical efficiency in Saudi banks

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ABSTRACT

This study analyses the technical efficiency of Saudi banks using a two-stage DEA-data envelopment analysis approach. In the first stage, we use a bootstrapped DEA-VRS model to identify the efficiency scores, and in the second stage, we use a bootstrapped truncated regression model to identify the covariates that explain technical efficiency. Policy implications are derived.

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1. Introduction

The Saudi banking sector has undergone substantial changes over the last decade. Banks have expanded their operations and have taken advantage of scale and scope economies as well as product diversification. The driving force behind these changes has been the recent gradual liberalization of financial sector, globalization of financial markets, changes in technology, product innovation and the growth of business activities by Islamic countries in the West (El-Gamal, 2006).

The Saudi banking system is quite unique compared to the traditional banking system. It is under strict regulation imposed by SAMA (Saudi Monetary Agency) and has several distinguished characteristics. Saudi banks, for instance, provide a combination of conventional banking and Islamic banking. They are also funded by low cost demand deposits,¹ and have difficulties to diversify credit risk due the overwhelming dependence on oil. Empirical research on bank efficiency in the Arabic peninsula is still limited as opposed to other regions such Europe and the USA. Some of the few studies include Avkiran (2009), Hisham et al. (2008), and Essayyad and Madani (2003).

The aim of the present research is to analyse the technical efficiency of Saudi banks. The banks are the institutions that channel the oil funds to companies and families and therefore are strong determinants in the allocation of capital, financial stability and the competitiveness and development of manufacturing and services (Beck, Demirgüç-Kunt, & Levine, 2003). We analyse the technical efficiency of Saudi banks with the Simar and Wilson two-stage DEA bootstrap procedure (Simar & Wilson, 2007). In the first stage, we estimate the relative efficiency scores of Saudi

banks. In the second stage, we analyse the relationship between the efficiency scores and some key environmental variables (e.g. foreign vs. domestic ownership) using a truncated regression model.

The remainder of the paper is organised as follows: Section 2 describes the developments in the Saudi banking sector. Section 3 presents the literature survey. Section 4 presents the data. Section 5 discusses the methodology. Section 6 presents the empirical results, and finally, Section 7 concludes.

2. Contextual setting

The Saudi banking system is small in comparison with OECD banking systems. The monetisation of the banking system measured in terms of private credits to GDP was just 37% in 2008. The banking system has displayed a high degree of stability and strong resilience to external shocks till 2007. The stability of the sector has been enhanced by its strict regulatory rules imposed by the Saudi Arabia Monetary Fund.

The main distinguished characteristic of the Saudi banking sector is that it has a blend of Islamic banking and “Islamic Windows” of conventional banking. Islamic banking also known as Islamic Shariah based banking system is different from conventional banking. The concept of Islamic banking is based on its profit-and-loss sharing paradigm (PLS). Islamic banking is underpinned by five codes of belief in Islamic finance, i.e., avoidance of *Riba* (interest), *Gharar* (uncertainty), *Mysur* (gambling), *Haram* (prohibited) and sale of the items not owned or possessed. The main features of Islamic banking have been outlined by Chong and Liu (2009) and Taylor (2004).

Islamic financial products dominate the Saudi market. Islamic banks control some 62% of total assets. It is estimated that about 40% of deposit are non interest bearing because of *Riba*. The gradual deregulation process of financial services allowed foreign financial institutions to provide financial services in Saudi Arabia.

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¹ IMF claims that about 40% of total assets is funded by demand deposits.

Table 1
Sharia-compliant assets of banking sector (percentage of total banking sector assets.)
Source: International Monetary fund.

	1999	2000	2001	2002	2003
On balance sheet	11.2	13.0	15.0	17.0	21.0
Off balance sheet	1.7	2.1	2.3	2.0	2.3

As a reaction to this process, domestic Saudi banks have also introduced a large scale of new products and services. The proportion of Islamic banking has increased significantly. Table 1 shows the share of Sharia-Compliant assets of banking sector.

During the period 1996–2005, Saudi Bank assets grew by 213 %, deposits by 224 % and capital and reserves by 248%. Table 2 indicates the performance of the Saudi Banking sector from 2000 to 2007, measured in terms of ROA and ROE. The profits of the banking system showed strong growth – return on equity averaged well over 20 per cent and return on assets more than 2%.

Saudi banks have a dominant position in retail banking with about 1,300 branches. There are currently thirteen commercial banks in Saudi Arabia. Table 3 lists the largest commercial banks and describes their main activities. Three banks are fully Saudi owned, seven have minority foreign ownership and one foreign bank has a branch presence – Gulf Investment Bank (Bahrain). Five banks have a joint venture agreements with major international banks under which the latter provide management and technical support. Banks operate with the universal banking model and provide a broad range of products and services including retail and corporate banking, investment management and advice, and both domestic and international brokerage services.

The largest bank, National Commercial Bank, is 79% state owned. Most banks have some government participation. In 2005, Saudi Arabia formally joined the World Trade Organization and as a result foreign investors have been allowed to own up to 60% (previously 40%) of any bank. SAMA has granted ten new licenses to foreign banks since 2004, but only five banks so far opened for business. These new foreign banks are restricted to a single branch. The Gulf International Bank (Bahrain) was the first to enter the Saudi market in 2000, followed by the Emirates Bank International (United Arab Emirates), the National Bank of Kuwait, and the National Bank of Bahrain in 2002.²

3. Literature survey

Empirical research analysing bank efficiency has widely used the DEA and stochastic frontier (SF) methods to measure technical efficiency (Alam, 2001; Atallah & Le, 2008; Hahn, 2007; Pasiouras, Liadaki, & Zopounidis, 2008; Williams, Peypoch, & Barros, 2009).

The research on bank efficiency in Islamic countries is still rather limited. Hisham et al. (2008) analysed production efficiency of Islamic Banks and Conventional Bank Islamic Windows in Malaysia by using the variable returns to scale DEA model. The study showed that Islamic banks are more efficient at controlling costs than profits. The driving force of cost efficiency was resource management and economies of scale. Avkiran (2009) applied the network data envelopment analysis (NDEA) on banks operating in the United Arab Emirates. He found that NDEA is superior to the standard DEA technique as it provides adequate detail information for management to identify the specific determinants of inefficiency. The author argues that the method can be used in countries where an industry exhibits high levels of inefficiency and managerial strategies of how to eliminate the remaining inefficiencies have to be implemented.

Other studies on Arabic banks include Turk-Arris (2008), Al-Muharani (2006) and Essayyad and Madani (2003) who investigated the concentration, efficiency, and the profitability of commercial banks operating in Saudi Arabia. They found that the banking system was highly concentrated and lacked sound competitive environment. However their results only covered the period 1989–2001, i.e., before the major structural changes have been adopted as a consequence of the membership of Saudi Arabia in the WTO.

4. Data

Our analysis includes nine banks that currently operate in the Saudi Arabia. Data were collected from annual reports over the period 1999–2007 (81 observations). To model the bank production process, we follow the intermediation approach (see Sealey and Lindley, 1977) and assume that banks purchase liabilities that are transformed into earning assets. Banks are assumed to produce four outputs that cover both on and off-balance sheet activities: (i) total customer loans, (ii) Securities and (iii) interbank loans. Three inputs are used to produce bank outputs: (iv) total employees; (v) fixed assets and (vi) total deposits. The descriptive statistics are shown in Table 4.

5. Methodology

5.1. Efficiency measurement

We use the DEA method to estimate technical efficiency of Saudi banks. The motivation and early versions of the DEA method have appeared in several previous studies in the literature, so they will not be reiterated here. For a detailed review refer to Coelli, Prasada Rao, and Battese (1998). The model used in this study follows an output oriented assumption and can be derived for the i th bank by solving the following linear programming:

$$\hat{\delta}_i = \max_{\delta, \lambda} \{ \delta > 0 \mid \delta_i y_i \leq \sum_{i=1}^n Y \lambda_i; x_i \geq \sum_{i=1}^n X \lambda_i; \sum_{i=1}^n \lambda_i = 1; \lambda_i \geq 0 \},$$

$i = 1 \dots n$ banks, (1)

where Y is vector of bank outputs, X is s vector of bank inputs, λ is a $l \times 1$ vector of constants. The value of $\hat{\delta}_i$ obtained is the technical efficiency score for the i th bank. A measure of $\hat{\delta}_i = 1$ indicates that the bank i is technically efficient, and inefficient if $\hat{\delta}_i > 1$. This linear programming problem must be solved n times, once for each bank in the sample. Note that the DEA model can also be estimated using either the constant returns to scale (CRS)³ or variable returns to scale (VRS) assumptions and the shape of the frontier will differ depending on the scale assumptions that underline the model. In this paper we rely on the VRS assumption, as the CRS is only correct as long as it is appropriate to assume that banks are operating at an optimal level of scale. Technological advances and regulatory changes might vary across banks in various size groups, so allowing for VRS would permit modelling the entire range of technology.

5.2. The bootstrap approach

A new debate has recently been raised in the literature regarding the statistical limitations of DEA scores. Simar and Wilson (1998, 1999, 2007) emphasise that efficiency scores generated by DEA are strongly dependent on each other in the statistical sense,

³ A production function is said to exhibit constant return to scale (CRS) if a proportionate increase in inputs results in the same proportionate increase in outputs. The variable return to scale (VRS), on the other hand, does not assume full proportionality between the inputs and outputs.

² The list includes Deutsche Bank, BNP Paribas, J.P. Morgan, National Bank of Kuwait, Emirates Bank, State Bank of India and National Bank of Pakistan.

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