Cost Efficiency and Board Composition under Different Takaful Insurance Business Models

1. Introduction

This paper investigates cost efficiency and the extent to which it is affected by corporate governance in the takaful (mutual guarantee) insurance market operating in compliance with Islamic principles and in which risks are shared by the members participating in each takaful risk pool (Khorshid, 2004). Rediker & Seth (1995) report that firm-specific cost efficiencies depend in part on how effective the system of corporate governance is in controlling and resolving incentive conflicts between owners (principals) and managers (agents). A sound system of governance could also help takaful insurers realize operational efficiencies and enhance economic performance by improving systems of resource allocation and product design and strategic innovation, such as business restructuring initiatives (Thompson & Wright, 1995). Wang et al.(2007) and Huang et al. (2011) report that the link between corporate governance and economic efficiency is important for the management of, amongst other things, insurance companies' asset-liability structure, claims handling, and ownership structure. We observe that investigating the corporate governance-cost efficiency relation in the takaful insurance market is particularly important because directors' fiduciary responsibilities in this market not only extend to shareholders and policyholders, but they are also subject to oversight by the Shariah supervisory board of the company and the government agency in charge of industry regulation. This unique structure of the takaful insurance market thus warrants examination.

In this study we investigate the macroeconomic environments surrounding takaful markets and their impact on takaful insurers' cost efficiency using two economic variables (i.e., inflation and rates of interest). We also examine relative efficiency differences between insurers based on the type of takaful business model, namely, the *mudaraba, wakala* and *hybrid* models. In addition, we control for the potential cost efficiency impact of the Shariah supervisory board on decisions taken at the corporate board level. We believe that the findings of this study could offer all stakeholders – policyholders, insurers, Islamic scholars and government officials alike – a better guideline to further develop the takaful insurance industry. These contributions represent potentially important advances on recent exploratory studies of takaful insurance markets such as Marie et al. (2009) and Abdul Kader et al. (2010). For example, in the present study we examine whether the cost efficiency –

corporate governance relation is affected by input-side macroeconomic influences such as inflation and the effects of interest rates. Additionally, the governance effects on cost efficiency arising from the type of takaful model employed and the operation of the Shariah board are also investigated in this study. Incorporating such factors into our analysis contributes new and potentially important insights on the cost efficiency-governance relation in takaful insurers. We believe that this contribution helps improve our understanding not only of the underlying business economics of takaful insurance - an important emergent sector of the international insurance industry, but also the function of Islamic corporate finance more generally.

Takaful insurance is a cooperative type of insurance in which the insurer helps policyholders to provide loss protection services for each other. This arrangement is in some ways similar to the mutual-type insurance business in the conventional market. This structure, on top of the Islamic principle governing the operational scope, limits takaful insurers' ability to generate additional capital and to invest policyholders' and shareholders' funds. Indeed, Abouzaid (2007) and Swiss Re (2008) argue that takaful insurance markets need more liquid and diversified investment choices to attract capital investors. In view of these constraints, optimizing operational cost efficiency is likely to be an important business objective for takaful insurers, particularly given the dampening of consumer demand in the wake of the recent global financial crisis (Ernst & Young, 2009). What is more, the takaful insurance industry is relatively young and not all jurisdictions in which the insurers operate have fully introduced laws and regulations related to takaful insurance operations and corporate governance (Islam, 2003). At the same time, a number of jurisdictions (e.g., Indonesia, Jordan, Malaysia and Saudi Arabia) permit competition between takaful and conventional insurance companies. To stay competitive, takaful insurers need to focus more on operating cost minimization than on profit maximization.

We also focus on economic rather than accounting-based measures of insurers' performance in this study (Marie et al., 2009). Accounting-based performance ratio measures are deficient for this study because they combine both input and output efficiencies, thus likely distorting the measurement and analysis of efficiency performance (Pi & Timme, 1993). Variations in the accounting and actuarial practices used by insurance companies can also complicate comparisons of reported financial performance (Klumpes, 2005). Focusing on economic measures of takaful insurer performance thus helps us avoid potentially confounding effects emanating from differences, say, in companies' treatment of accounting items and their reporting of

annual earnings. Furthermore, a significant number of takaful insurers are not listed thereby precluding the use of share price-based measures as indicators of financial performance (Abdul Kader et al., 2010). Thus, we attempt in this paper to investigate the relation between cost efficiency and corporate governance and other firm-specific factors in takaful insurance markets globally.

The remainder of our paper is structured as follows. Section 2 describes the key features of takaful insurance. Section 3 provides the literature review related to corporate governance and takaful insurance cost efficiency. Section 4 defines cost efficiency and discusses the methodology and data for the first-stage DEA analysis and the second-stage regression analysis. Section 5 analyzes the results and Section 6 concludes the study.

2. Takaful Insurance – Operations

Interest in insurance markets and the products designed in compliance with Islamic law (Shariah) continues to rise around the world. Takaful insurance is growing rapidly in numerous Islamic states and Muslim populous countries in the Middle East and North Africa. Several countries in other regions, notably Malaysia and Indonesia, also promote takaful insurance operations (Kwon, 2007). Swiss Re (2008) reports that in 2007 Muslim countries generated about 11 percent (US$45 billion) of global insurance premiums written. The takaful insurance market share was roughly 4 percent (US$1.7 billion) in those countries. Despite being small in size in global terms, the takaful insurance market continues to grow at a fast annual rate. For example, Swiss Re (2008) note that its growth rate (25 percent, after adjustment for inflation) was much higher than that of the conventional market (10.2 percent) during the four years 2004-2007. Ernst & Young (2009) also reports that global takaful premiums are projected to reach US$8 billion in 2012.[1] It is estimated that there are between 100-150 takaful insurance companies of varying size and complexity operating in nearly 30 countries including a handful of licensed operations in Europe.[2]

---

[1] See also Abouzaid (2007), Bhatty (2007) and Kwon (2007) for a detailed analysis of takaful insurance operations by region and globally.

[2] For example, in 2007 the United Kingdom's (UK) insurance industry regulatory – the Financial Services Authority (FSA) - approved a license for the first takaful insurer - Salaam Insurance - to operate in the country. However, to date business has been slow to develop for this UK-based takaful insurance firm.

As alluded to above, takaful insurers combine elements of the conventional mutual form (e.g., by assigning primacy to the financial claims of policyholders) and the equity-capitalized and profit-orientated stock company structure (Swiss Re, 2008). Takaful insurance operations share several unique characteristics. First, the takaful insurer must separate the policyholders' (*takaful*) fund from the shareholders' fund. This separation permits the insurer to draw money from the former fund to support its insurance operations, while leaving the latter fund intact unless it experiences underwriting losses. When policyholders and shareholders share operating profits after closure of the book, the arrangement is based on the common *mudharabah* model (see Figure 1).

[Insert Figure 1 here]

As Figure 1 makes clear, the *mudharabah* ("profit-sharing") model allows the capital provider (e.g., shareholder) to determine ex-ante the profit-sharing ratio with the capital user (e.g., insurance pool) but bear the full risk of underwriting and investment losses. A key advantage of the *mudharabah* model is that ostensibly the managers of takaful insurance firms have incentives to engage in efficient operational activities in order to maximize returns for capital providers. The *mudharabah* model has traditionally been common in East Asian countries such as Brunei and Malaysia (Swiss Re, 2008).

When a takaful insurer is permitted to deduct a fee upon receipt of the premium, the arrangement is based on the *wakalah* model (see Figure 2). In this case, the shareholders may be entitled to a discretionary return on the annual surplus arising from insurance operations in addition to their *wakalah* ("fee") for contributing capital to support the insurance operations (Kassim, 2007).

[Insert Figure 2 here]

In both types of arrangements, insurance premiums are in essence treated as *tabarru* ("donations") to policyholders' (takaful) funds. Additionally, any surplus – less reserves for future claims and other qualified contingencies -- on the takaful fund must be returned to policyholders as an annual policy refund or paid out as a *zakat* ("charitable contribution"). In both types of arrangements, takaful insurers – that is, the shareholder investors – must be ready to provide a *qard al-hasnah* ("interest-free loan") for the takaful fund when the fund experiences deficit or, where applicable, fail to meet the minimum requirement to maintain solvency margin (Swiss Re, 2008). The loan is repayable from future annual surpluses. Variant funding arrangements

also exist in the financing of takaful insurance operations.[3] Finally, hybrid (i.e., joint *mudharabah* and *wakalah*) models are becoming increasingly common in takaful insurance markets with the principles of the profit-sharing-based *mudharabah* model being applied to investment activities with the *wakalah* model being used for underwriting (Thomson & Flower, 2007).

Regardless the financing arrangement structure, takaful operations must be Shariah compliant. The insurer must avoid having any *haram* ("forbidden") elements in insurance contracts that are incompatible with Islamic principles – for example, *jahalah* ("ambiguity or uncertainty") or *riba* ("charging interest"). As such, fully Islamic finance allows shareholders to participate in the surplus arising from the use of contributed insurance capital on a profit-sharing basis that has been agreed ex-ante with policyholders (Kwon, 2007). The sharing percentages (*S*%) at the bottom of Figure 1 illustrate this principle. Further, the insurer must employ a *halal* ("permitted") investment strategy. Exploitive or risky investments are thus prohibited, as they possess an element of *ghara* ("exploitation"). Investment in *haram* industries – for instance, alcohol manufacturing, pork-related production, and the entertainment business – is thus discouraged (Al-Suwailem, 2002).

Market conduct and corporate governance are probably the most effectively self-regulated areas in takaful insurance since takaful insurers commonly maintain a Shariah supervisory board comprising mainly Islamic scholars (Marie et al., 2009). The supervisory board helps the takaful insurer recognize the property rights of all stakeholders and preserve the significance of contractual obligations – both explicit and implicit (Greuning & Iqbal, 2008). As a governance structure the supervisory board oversees the takaful insurer's compliance with Islamic principles and jurisprudence and monitor the insurer's fiduciary obligations to various stakeholders. However, there are several concerns regarding Shariah governance, including the issue of the board's independence as the board members are appointed and remunerated by the managers of the takaful insurer (Greuning & Iqbal, 2008).

Several other problems exist in takaful insurance markets. In particular, use of the *mudharabah* model may create operational difficulties for takaful insurers. For example, Kwon (2007) notes that under the *mudharabah* model the insurer's share of

[3] For example, the *musharaka* mode of financing allows a capital user (e.g., insurance pool) to enter into agreement with a secondary capital supplier (e.g., reinsurer) but then share profits and losses in proportion to their respective capital contributions. Takaful reinsurance tends to suit this mode of operation (Abouzaid, 2007).

profit is dependent upon selling more policies, raising premium rates, and/or increasing returns on invested assets. However, such goals are not easy to achieve. Aggressive investment activity has a *maisir* ("gambling") element and can inflate the volatility of investment results. The insurer may not be free to raise premium rates, especially in a competitive market (Khorshid, 2004) or when competing with conventional insurers, or need time to attract a sufficiently large number of participants to get the scale economy benefit in its operations (Kwon, 2007). The insurer becomes less attractive to capital investors when it experiences underwriting losses. Maintenance of a reliable number of sales agents whose compensation is adversely affected mainly by the investment performance of the insurer can be a related issue. The relatively non-diverse Islamic investment opportunities and, when compared to conventional financial markets, the relatively low market liquidity for Islamic securities can sometimes put downward pressure on reported annual profits (Abouzaid, 2007). Limited reinsurance capacity in many Islamic insurance markets, particularly for potentially highly volatile and difficult-to-assess non-life insurance lines (e.g., environmental risks) can further hinder takaful insurers from achieving a desired level of efficiency (Abouzaid, 2007). These considerations, together with the fact that financial services regulation and corporate governance in several jurisdictions lags behind those of developed economies (Islam, 2003) underscore the need for takaful insurers to develop cost efficient operations as a prelude to effective long-term strategy.

3. Board Composition and Cost Efficiency

Agency theory holds that corporate governance is concerned with the way that owners monitor and control managerial performance to achieve their wealth maximization objectives (Nelson, 2005). The need for corporate governance thus emerges because of unresolved contracting incentive conflicts, particularly those between owners and managers of firms (Jensen & Meckling, 1976). With a working corporate governance system in place, the owners can be assured that their managers use shareholders' capital efficiently, thus receiving a competitive return on their investment (Zheka, 2005). In the modern corporation, the board of directors is charged with alleviating such conflicts (Hardwick et al., 2011). This principle of corporate governance also applies to takaful insurance firms; this is particularly the case with regard to ensuring that the interests of participants in the takaful pool are protected against the opportunistic and self-interest behavior of shareholders and

their managers. The remainder of this section examines the link between corporate governance and cost efficiency in takaful insurance firms.

3.1. Non-executive Directors

Firms, especially publicly-traded firms and those firms offering public interest-related business services (e.g., financial institutions and utilities companies), appoint voluntarily or by law business experienced non-executive (outside) directors to advise executive (inside) board members on strategic business matters including how to achieve operational cost efficiency (Pi & Timme, 1993).[4] Indeed, Perry & Shivdasani (2005) show that of firms experiencing poor operating performance (e.g., increased costs and decreasing returns on assets), those with a majority non-executive directors on the board are more likely to remedy an adverse financial position. Fama & Jensen (1983) argue that, as compared with internal directors, outside directors are more likely to have stronger economic incentives to develop their reputations as decision control experts and so increase their human capital value in the external job market. This argument is supported by Wang et al. (2007) who find a positive relation between the proportion of non-executive directors on the board and cost efficiency in non-life insurers operating in Taiwan. Accordingly, it can be hypothesized that:

> [H1] O*ther things being equal, the cost efficiency of takaful insurance firms is expected to be positively related to the proportion of non-executive directors on the board*.

Of course, the opposite may be observed when the excessive prudence and risk aversion of outside directors (for example, motivated by concerns about compliance with Shariah principles) could at times negatively affect the cost efficiency of the firm.

3.2. Chief Executive Officer (CEO)/Chairman Positions

Another issue relates to the influence of the CEO, particularly where the person concurrently holds chairpersonship for the sake of consolidation of decision management and control functions of the company. Hermalin & Weisbach (1991) suggest that persons holding both positions tend to appoint non-executive directors who are unlikely to question his or her business decisions, thus reducing their

[4] As in Hossain et al.(2000), we define non-executive directors in this study as board members who are identified from published sources as not active or retired employees of the takaful insurance firm and do not have close business ties (e.g., as consultants) to that firm.

effectiveness as independent monitors of the economic interests of the shareholders. The merging of the CEO/Chairman positions could further restrict the dissemination of information to other board members, thereby increasing the agency costs of managerial decision-making and blunting the effectiveness of the board's decisions (Nelson, 2005; Reheja, 2005). Hermalin & Weisbach (1991, 2003) also consider that close monitoring by the Chairman and other board members could help the firm increase the effort expended by the CEO to maximize shareholders' wealth and avoid dismissal. Rogers (2002) finds that the separation of the CEO/Chairman positions reduces the likelihood of high cash flow volatility arising from excessive risk-taking. This could be particularly important in takaful insurers keen to avoid highly uncertain and risky situations (*ghara*). Based on this reasoning, we hypothesize that:

> [H2] *Other things being equal, the cost efficiency of takaful insurance firms is expected to be higher where there is a separation of the CEO and chairman positions, all other things held constant*.

However, there are counter-arguments on appointing a single individual as CEO and Chairman, such as the benefits of sure-footed decision-making and a centralized system of organizational command and control (e.g., see Brickley et al., 1997). Thus, the actual impact of a single person appointment for both positions warrants examination.

3.3. Board Size

Pearce & Zahra (1992), Yermack (1996) and Raheja (2005), among others, contend that board size is an important factor in determining the effectiveness of corporate governance. In particular, Raheja (2005) suggests that large boards can provide additional expertise, extensive business networks, and increased monitoring capacity. In fact, Pearce & Zahra (1992) find evidence supporting a positive relation between board size and performance in the United States (US) corporate sector. This leads us to hypothesize that:

> [H3] Other things being equal*, the cost efficiency of takaful insurance firms is expected to be higher when there are large boards of directors*.

Yermack (1996) offers a contrasting finding that small boards of directors are more effective than large boards in the US. This is because large boards enhance the risk of conflicting opinions between board members, thereby promoting more

efficient and effective decision-making. Jensen (1993) also observes that large governing boards face more coordination problems and so greater difficulties in making decisions than small boards of directors. Jensen (1993) recommends that corporate boards have a maximum of eight members.

3.4. Other Internal and External Factors

Ownership Structure: Zheka (2005) reports that the ownership structure of a company can significantly affect managerial incentives, systems of monitoring and control, the decision-making process, and ultimately the financial performance of the firm. For example, managers in firms with concentrated shareholdings are likely to be subject to greater monitoring and control by shareholders than their counterparts in firms with more widely-held ownership structures where individual minority owners have incentives to free-ride on the monitoring expenditures of larger investors (Grossman & Hart, 1980). This reasoning suggests that, other things being equal, takaful insurers with more concentrated shareholdings will be relatively more cost efficient than their counterparts with more diffuse ownership structures.

Firm Size: Fama & Jensen (1983) argue that enhanced business complexity could make monitoring managerial behavior more difficult and less effective in large entities than in small companies. Cost efficiency could also be achieved when the firm enjoys such size effects as economies of scale (i.e., increased product-market share) (Cummins, 1999). Indeed, Diacon et al. (2002) find evidence of firm size effects in European life insurance companies. This paper therefore examines the impact of firm size on cost efficiency.

Product-Mix: Khaled et al. (2001) report that product-mix influences the cost efficiency of insurance firms in that insurers with a broad range of products can benefit not only from scale economies arising from increasing production but also from economies of scope in the use of shared inputs (e.g., labor, technology). Accordingly, we predict that multi-product takaful insurers are more cost efficient that their counterparts with narrower lines of insurance business.

Shariah Supervisory Board: In takaful insurance markets the Shariah board plays an important role in ensuring that business and financial matters (e.g., policy contract design, premium rating, and reserving) are in conformance with Islamic law (Greuning & Iqbal, 2008). However, by pursuing legal and religious compliance objectives the Shariah board is likely to stifle operational efficiency. As such, we

expect that other things being equal there will be a negative relation between the influence of the Shariah board and the cost efficiency of takaful insurers.

Macroeconomic Effects: It is widely recognized that the underwriting profitability and operational efficiency of insurance firms is affected by cyclical macroeconomic effects such as inflation and interest rate changes (Haley, 1993). For example, in inflationary periods claims will tend to move upwards in line with the general level of prices, whereas in times of high rates of interest insurers are likely to be better able to sustain underwriting losses because yields on their bond portfolios will be enhanced. Inflation and interest rates are likely to particularly affect the price of inputs (e.g., labor and capital) and so they could be potentially important influences on the cost efficiency-corporate governance relation in takaful insurance firms. All other things held constant, we predict a negative relation between cost efficiency and the annual level of inflation and a positive relation between cost efficiency and interest rates.

Jurisdiction and Takaful Insurance Model: Takaful insurance markets differ in terms of regulation quality, tax policy, and the takaful insurance model employed (Abouzaid, 2007). For example, countries (e.g., Bahrain and Malaysia) with clear and unbiased regulatory guidelines tend to assist regulated insurance firms to use resources more efficiently. Some Islamic countries (e.g., Malaysia) also give takaful insurers tax advantages, thereby potentially helping them become more cost efficient. Furthermore, some Islamic jurisdictions (e.g., UAE and Malaysia) allow managers discretion over the type and mix of takaful business model that can be used while other countries (e.g., Bahrain and Sudan) do not offer such flexible business laws and regulations (Abouzaid, 2007).[5] We thus test in this paper for regulatory effects and flexibility as to the type of takaful model used by insurance firms.

3.5. Interaction Terms

Corporate governance structures are means to monitor managerial behavior and control agency incentive conflicts (Jensen & Meckling, 1976). While supporting this argument, Barnhart & Rosenstein (1998) postulate that corporations may use various governance mechanisms interactively in order to find optimal solutions to agency problems. Conversely, different governance mechanisms may substitute for and/or

[5] For example, Sudan favors the *mudharabah* model. Bahrain favors the *wakalah* model for underwriting activities and the *mudharabah* for investment activities.

complement each other and failure to control for the possible interaction among the mechanisms may result in misleading conclusions. For example, it could be that cost efficiency is affected by the proportion of non-executive directors on the board in conjunction with the board size. In this paper, we employ two multiplicative interactions – one between board size and non-executive directors, and the other between board size and CEO duality – to control for such conjoint effects.

4. Methodology and Data Sources

In this section, we define cost efficiency and related concepts and we explain the methodology used to estimate the efficiency scores.

4.1. Defining Cost Efficiency

For a typical takaful insurer, an overall cost efficiency (*CE*) score reflects both technical and allocative efficiencies. Technical efficiency (*TE*) measures how efficiently technology is employed in the use of inputs to achieve a given level of output. Like insurers in the conventional market, takaful insurers' technology includes expertise not only in underwriting, marketing and claims management but also in actuarial modeling and financial services provision (e.g., profit emergence models and asset-liability management systems). Allocative efficiency (*AE*) refers to how efficiently management chooses the mix of inputs at given input prices. A production frontier shows the minimum quantity of inputs needed to produce any given quantity of output for a perfectly efficient firm, while a cost frontier shows the minimum cost of producing any given quantity of output for a perfectly efficient firm. Not all takaful insurers are likely to operate at the production and cost frontiers because of technical inefficiency, allocative inefficiency or both: that is, they may fail to get the best out of their inputs and/or to employ the cost-minimizing combination of inputs. In the present study we define cost efficiency simply as:

$$CE = TE \times AE \tag{1}$$

Technical efficiency can be further divided into pure technical efficiency (*PTE*) and scale efficiency (*SE*). *PTE* measures how far a takaful insurer is away from the production (or cost) frontier under conditions of variable returns to scale, while *SE* measures the relative production loss (or cost increase) caused by a deviation from constant returns to scale. Thus, scale inefficiency may be associated with either increasing returns to scale (economies of scale) or decreasing returns to scale (diseconomies of scale). We can then describe a takaful insurance firm as being cost

efficient if its costs are equal to the costs of a best practice firm operating under the same conditions (i.e., producing the same output bundle with the same input prices).

4.2. Data Envelopment Analysis

For the measurement of cost efficiency of takaful insurance companies, we employ non-parametric data envelopment analysis (DEA). We select this method in part because of the relatively small sample size for our study and the non-normal distribution of the underlying data. DEA, a linear programming methodology, is less demanding than parametric approaches in terms of the degrees of freedom, the form of the production function, and error term assumptions. Compared with parametric stochastic frontier methods, DEA uses individual observations rather than population averages and focuses on revealed "best practice" firm efficiency frontiers rather than on the central tendency properties of firm efficiency frontiers (Zheka, 2005). These attributes are particularly advantageous in small sample studies (Cummins & Zi, 1998; Cummins & Weiss, 2001; Zheka, 2005). The basic DEA formulation assumes that our sample of takaful insurance firms each consume different amounts of the available inputs to produce different quantities of outputs, under the assumptions of convexity, positive monotonicity and the free disposability of inputs and outputs for all observations.

Cost efficiency can then be evaluated from the following variable returns-to-scale specification, proposed by Banker et al. (1984):

$$
\begin{aligned}
&Min\ \theta \\
&\theta, \lambda \\
&s.t.\ x_0\theta - X\lambda \geq 0, \qquad Y\lambda \geq y_o, \qquad e^T\lambda = 1; \qquad \lambda_i \geq 0; \qquad i = 1, \ldots, n
\end{aligned} \tag{2}
$$

where: X and Y represent primal vectors of inputs and outputs, respectively, with columns x_i and y_i for n observations; e is a vector of ones; $\lambda = (\lambda_1, \lambda_2, \ldots, \lambda_n)^T$ is a vector of constants; and θ is an input radial measure of pure technical efficiency.

When θ_i = 1, takaful insurer i is deemed to be on the boundary of total factor efficiency. However, as Schaffnit et al.(1997) make clear, θ_i = 1 is a necessary but not sufficient condition for a takaful insurer to be technically efficient since (x_0, y_0) may contain slack in its allocation of m-inputs and s-outputs. Thus, takaful insurer i is cost efficient only if θ_i = 1, $X\lambda = x_0$, and $Y\lambda = y_0$; conversely, it is cost inefficient when $\theta_i < 1$. Given input price data and assuming cost minimization, pure technical, scale,

allocative and overall cost efficiencies can be estimated by running the following cost minimizing DEA:

$$
\begin{aligned}
&Min\ w_i' x_i^* \\
&\lambda, x_i^* \\
&s.t.\ Y\lambda - y_i \geq 0, \qquad x_i^* - X\lambda \geq y_o, \qquad e^T\lambda = 1; \qquad \lambda_i \geq 0; \qquad i = 1, \ldots, m
\end{aligned} \tag{3}
$$

where w_i is a vector of input prices and x_i^* is the cost-minimizing vector of input quantities for the *i*th takaful insurer, given input prices and the output levels y_i. In conducting the DEA, we assume that takaful insurers attempt to minimize the cost of employing various inputs to produce outputs.

To conduct our DEA analysis we use an unbalanced panel data set of 180 firm/years for the period 2004-2007. The sample comprises composite and non-life takaful insurance firms of varying size, ownership structure, and product-mix, operating from 17 countries.[6] Financial data for these sample firms are drawn from the World Islamic Insurance Directory (2009). The study period in fact covers all the years during which takaful insurer data are available. The insurers in the sample represent about 33 percent of the total number of takaful insurers currently operating world-wide, and their premiums in the aggregate accounts for approximately one-third of the takaful insurance market premiums written in 2007. We examine direct takaful insurers, thus excluding takaful reinsurers and trust fund management companies. Finally, all the financial data are converted to US dollar – as reported in the World Islamic Insurance Directory (2009) – using the end of year exchange rate.

For the purposes of this study, we define a takaful insurance company's total cost as the annual operating expenses incurred in employing two inputs (labor and physical capital) to produce insurance output. The labor input is measured by the number of employees and the price of labor is proxied by taking the estimated total

[6] The distribution of takaful insurance firms each year is: 2004 – 37 firms; 2005 – 46 firms; 2006 – 47 firms; and 2007 – 50 firms. The 17 countries are: Algeria, Bahrain, Brunei, Egypt, Kuwait, Indonesia, Iran, Jordan, Malaysia, Pakistan, Qatar, Saudi Arabia, Sri Lanka, Sudan, Tunisia, UAE, and the Yemen. Life (family) and health insurance are offered by some composites but constitute less than 10% of total premiums amongst our sample of takaful insurance firms. However, we include such outputs as they will affect to some degree the costs of production of takaful insurers. Additionally, there are no exclusive takaful family (life) insurers in our sample.

wage bill divided by the number of employees.[7] The price of the capital input for each insurer is proxied by dividing total capital expenses (i.e. total operating costs minus labor costs) divided by the insurer's total assets. Since the outputs of takaful insurers are not standardized (i.e., cannot be stated in terms of unit cost), we use output proxies that are closely related to these services. Like conventional insurers, takaful insurers engage in risk-pooling and risk-bearing business and, following Bhatty (2007), we assume that takaful insurers produce four outputs: (a) motor vehicle insurance, (b) property (fire) insurance; (c) marine and aviation insurance; and (d) other insurance.

Given the very limited availability of data on takaful insurers, we use gross premium contributions to proxy these risk-pooling and risk-bearing outputs, recognizing the potential limitation that premium contributions are measures of revenue and so represents 'price $\times$ quantity', rather than just quantity. There has in fact been a great deal of discussion in the literature on the most appropriate proxies to use as measures of the intangible risk-pooling and risk-bearing outputs of insurance firms. Many early studies tended to use premium income as an output indicator, but more recent researchers (see in particular Cummins, 1999, and Cummins & Weiss, 2001) have tended instead to use the value of benefit payments (i.e. claims) as the basis of their output measurements. However, this may be unsatisfactory because, while *expected* claims might be an appropriate proxy for a firm's planned level of insurance output, *actual* claims paid in any given year may differ significantly from expected claims, thereby creating a potentially serious 'errors-in-variables' problem. That is, annual premiums are less likely than annual claims to be susceptible to random fluctuations which can cause 'outlier problems' for DEA. Our use of premium contributions may therefore be justified as they are likely to be highly correlated with expected claims. Another advantage of premium-based measures of insurance output is that they also reflect the other services (e.g., underwriting services) that insurance companies provide.

4.3 Second-Stage Regression Analysis

In the second-stage regression analysis, we estimate the influence of firm-specific factors as well as market and macroeconomic environmental factors on takaful insurer efficiency. The model can be represented as follows:

[7] Prior studies such as Khaled et al. (2001) suggest that labor costs typically constitute about 70 percent of insurers' annual management expenses. We thus compute labor costs for each firm in our sample as: (management expenses x 0.70) ÷ total number of employees.

$$y_{it}^{*} = f(NEXECS_{it}, CEO_{it}, BSIZE_{it}, OWN_{it}, LSIZE_{it}, MIX_{it}, SHARB_{it}, INT_{it}, INF_{it}, LOC_{it}, TAKMOD_{it}, IT_{it}, YEARS) + u_i + v_{it} \quad (4)$$

where y_{it}^{*} is the transformed cost efficiency score of the *i*th takaful insurer in year *t* estimated from the first-stage DEA analysis. The error term, u_i, is a firm-specific error, and we assume that $u_i \sim N(0, \sigma^2_u)$ and $v_{it} \sim N(0, \sigma^2_v)$.

The dependent variable y_{it} ranges from zero to one but there is no guarantee that estimates from a linear model will meet this restriction. Therefore, as in Barnhart & Rosenstein (1998) and Klein (2002), we employ the logit transformation $y_{it}^{*} = ln[y_{it} /(1- y_{it})]$ to convert efficiency scores into unrestricted variables that can take values in the range [-∞, +∞].[8]

Based on the discussion earlier in this paper, we define independent variables as follows. The proportion of non-executive directors on the board (*NEXECS*) is the ratio of the number of non-executive directors to the total number of board directors. The separation of the CEO and Chairman (*CEO*) is represented by a dummy variable where *CEO* = 1 for separate functions and *CEO* = 0 otherwise. Board size (*BSIZE*) is the total number of directors on the board. Ownership structure (*OWN*) is measured as the proportion of the total number of shares held by the top three shareholders. Firm size (*LSIZE*) is measured as the natural log of total assets[9].

Shariah Board (*SHARB*) is the number of people on the board as a proportion of the main board size. Takaful model (*TAKMOD*) is a dummy variable that captures the flexibility of the use of the *mudharabah*, *wakalah* or *hybrid* models and is coded 1 where takaful insurers located in jurisdictions that have flexible business models (e.g., the UAE and Malaysia) and 0 otherwise.

Product-mix (*MIX*) is measured by a Herfindahl concentration index such that:

$$MIX = \sum_{j=1}^{4} S_j^{\,2} \quad (5)$$

[8] For the most efficient takaful insurance firms (with efficiency scores equal to one), we subtract a small figure (i.e., 0.00005) from cost efficiency scores to allow the transformation. The choice of 0.00005 as an adjustment figure is arbitrary. However, our results are not sensitive to choosing other figures (e.g., 0.0005 or 0.0001).

[9] Alternative measures of ownership structure (e.g./, the total percentage of shareholdings above 5%) and firm size (e.g., the natural log of annual premiums written) produced qualitatively similar results.

where S_j is the amount of annual premium income written in the *j*th line of insurance divided by the total premium income of the insurer; and *j* represents motor, property (fire), transportation, and other insurance lines. The closer the Herfindahl index is to one, the more concentrated the product function of the insurer.

Macroeconomic effects are proxied by the annual average rates of interest (*INT*) and consumer price inflation (*INF*). Location (*LOC*) is a dummy variable where takaful insurers located in jurisdictions with established regulatory and legislative systems (e.g., Bahrain, UAE, and Malaysia) are coded 1 and 0 otherwise. Time dummies are included to control for time-effects (e.g., regulatory changes). To take care of the issue associated with using multiplicative interaction terms between continuous variables in regression analysis – that is, the potential multicollinearity problem arising from correlation between each interaction term (e.g., *NEXECS* × *BSIZE*) and its constituent parts (e.g., *NEXECS* and *BSIZE*) – we follow the "centering" transformation procedure by Jaccard et al.(1990). This procedure involves "centering" corresponding continuous variables by subtracting sample means before constructing multiplicative interaction terms. The centered forms of the corresponding constituent variables are then used in the regression analysis. We find that such a transformation effectively reduces the correlation between the product term and the component variables.

5. Key Findings

5.1 Efficiency Scores

Table 1 summarizes the average DEA estimates of technical efficiency (TE), pure technical efficiency (PTE), allocative efficiency (AE), scale efficiency (SE) and overall cost efficiency (CE) for the takaful insurance companies in our sample for each of the four years of the study (2004-7 inclusive).[10]

[Table 1 here]

All of the efficiency scores take values between 0 and 1, where a value of 1 represents perfect efficiency. It is clear from the table that, relative to the best

[10] As a robustness check on our efficiency scores, we calculated rank correlation coefficients between TE and an accounting measure of labour productivity (computed as total premiums ÷ the labor force) and between CE and an accounting measure of cost performance (computed as total premiums / total cost). As expected, the resulting correlation coefficients were both positive and statistically significant (+0.27 and +0.30 respectively).

practice firms in the sample, takaful insurers generally exhibit high levels of allocative efficiency, with a four-year average score of 0.851. However, at the same time, there appear to be relatively high levels of technical inefficiency among takaful insurers, which lead to relatively high levels of overall cost inefficiency. The four-year average technical efficiency score of 0.409 suggests that, in general, the takaful insurers in our sample were producing only 40.9% of the insurance services that they could have provided if they had been operating with perfect technical efficiency. The four-year average cost efficiency score of 0.355 implies that the best practice takaful insurers were operating with total cost levels that were only 35.5% of the sample average. The average scale efficiency score of 0.625 suggests that some takaful insurance firms could reduce their unit costs by a change of scale. For our sample, 84% of the firms exhibited increasing returns to scale, 8% exhibited decreasing returns to scale and the remaining 8% exhibited constant returns to scale. This evidence suggests that there are economies of scale available for the majority of takaful insurers.

While it is not possible to make accurate direct comparisons of efficiency scores estimated on different frontiers and using different output and input measures, it is interesting nevertheless to note that the results reported in Table 1 are a little lower than those reported by Cummins & Santomero (1999), who found an average annual cost efficiency score of 0.46 for a sample of US life insurers, and a lot lower than the average annual cost efficiency score of 0.80 reported in a more recent study from the US property-liability insurance industry by Huang et al. (2011). The takaful insurers' scores are also lower than the efficiency scores found for UK non-life companies by Hardwick & Guiguis (2007), who reported PTE, AE and CE scores of 0.71, 0.94 and 0.66 respectively. Similarly, Wang et al. (2007) report an average CE score of 0.72 in their analysis of the Taiwanese non-life insurance market. Thus, there is some evidence that, relative to best practice firms, takaful insurers have on average been achieving lower levels of cost efficiency than those achieved by traditional insurers in developed countries. Prior studies (e.g., Huang et al., 2011) attribute cost efficiency gains in insurance firms in recent years mainly to technological and operational advances. This suggests that compared with their counterparts in more developed insurance markets takaful insurers are not realizing the efficiency benefits of new technology and the use of the latest business practices. The overall average cost efficiency score of 0.355 reported here is also lower than the comparative figure of 0.70 reported in Abdul Kader et al. (2010). This observation probably reflects the effect that compared with previous research we now include data from more and less

developed Islamic countries. The relatively low efficiency scores reported in the present study are also consistent with the results of recent comparative efficiency studies of conventional and Islamic banks (e.g., see Srairi, 2010).

5.2 Second-Stage Regression Results

Table 2 Panel A presents descriptive statistics for the variables used in the second-stage regressions. It shows that the average board size is over 9 members, which is greater than the maximum board size (n ≤ 8) recommended by Jensen (1993) and slightly smaller than the average board size of 11 members reported by both Wang et al. (2007) in their study of the Taiwanese life and non-life insurance markets and Huang et al. (2011) in their study of the US property-liability insurance market. The non-executive directors, on average, account for a very small proportion of the entire boards (approximately 11 percent). This proportion is much smaller than the mean of 40 percent of outside director representation in UK life and non-life insurers reported by O'Sullivan & Diacon (2003). Furthermore, firm size *(LSIZE)* varies substantially (logged standard deviation = 1.9) probably because the majority of takaful insurers in our sample are small to medium-sized entities by international standards. The unlogged average total asset value is US$6.5 million for our sample in 2007. Moreover, the panel shows that 17 percent of the insurers in our sample are located in jurisdictions with established regulatory and legislative systems, 75 percent are located in jurisdictions that have flexible business models and 86 percent of them separate the CEO and Chairman positions.

[Table 2 Here]

Panel B of Table 2 presents the correlation coefficients between efficiency scores and the various board characteristics and control variables. The positive and statistically significant correlation coefficients between *LSIZE* and cost efficiency scores (at p ≤ 0.10, two-tail) suggest that large firms appear to be more efficient than small firms. In addition, the negative and statistically significant correlation coefficients between *INF* and cost efficiency scores (at p≤ 0.05, two-tail) suggest that takaful companies tend to be less efficient during inflationary periods. This contrasts to the finding that high interest rates appear to be negatively related to the cost efficiency scores of takaful insurers (statistically significant at p≤ 0.01, two-tail).

Overall, the correlation coefficients between pairs of explanatory variables reported in Panel B of Table 2 are generally modest. For example, the strongest correlation coefficient value of 0.51 (significant at p≤ 0.01, two tailed) is between *LSIZE* and *SE.* Moreover, the results from computing the overall all variance inflation factor (*VIF*) is less than the recognized threshold of 10 (Kennedy, 2003).[11] Therefore, multicollinearity does not seem to pose a problem in our analysis.

To enable us to investigate the joint influence of all the independent variables on the cost efficiencies of takaful insurers we report random-effects rather than fixed-effects panel estimations for two main reasons. First, some board characteristics (e.g., *CEO* and *NEXECS*) have very limited time-series variations. Second, Zhou (2001) argues that a fixed-effects estimation that removes within-firm differences may not be able to detect the effects of board characteristics (e.g., *CEO*) with limited variations – as is the case in this study.

[Table 3 Here]

Table 3 Panel A reports five model estimations using the five cost efficiency measures as dependent variables. The existence of statistically significant interaction terms between different board characteristics implies that their effects on takaful insurers' cost efficiency could be conditional on other governance mechanisms. As noted by Jaccard et al. (1990), in the presence of interaction terms, the relation between an explanatory variable (e.g., *NEXECS*) and the dependent variable (cost efficiency) thus needs to be evaluated together with the estimated coefficients on the interaction terms; hence, the coefficient of *NEXECS* is (*β1+ β12*BSIZE*). This means that the *NEXECS-CE*, *NEXECS-TE*, *NEXECS-PTE, NEXECS-SE and NEXECS-AE* relations are likely to vary according to the number of directors on the board.

Since theory does not specify what value of the moderating variable (e.g., *BSIZE)* should be used to evaluate the directional effect, we follow the procedure of Jaccard et al. (1990) to examine the impact of *NEXECS*. Specifically, we use three different levels: "low" measured by the sample mean minus one standard deviation, "averaged" by the sample mean and "high" by the sample mean plus one standard deviation (see Panel B of Table 3).[12] We then conduct a Wald test of the significance

[11] *VIFs* are computed as $1/(1 - R^2)$ where R^2 is derived from the regression of individual explanatory variables on all other explanatory variables.

[12] Because all continuous variables in interaction terms have been 'centered', the sample means of these variables are in fact equal to zero.

of the (marginal) coefficient estimate for *NEXECS* at each of the three levels of *BSIZE*. Panel B of Table 3 presents the evaluation of marginal effects of the coefficients of the three governance mechanisms in the presence of interaction terms.

Regarding H1, we find that the proportion of non-executive directors on the board (*NEXECS*) likely has a negative and statistically significant effect (at $p \leq 0.01$, one tailed) on the insurer's cost efficiency when the number of directors on the board is below the mean thereby not supporting our prediction. This observation is consistent with the general conclusions reported in Abdul Kader et al. (2010). However, the effect of *NEXECS* on cost efficiency becomes positive and statistically significant when the number of directors on the board is above the mean thus supporting our prior hypothesis. These results suggest that non-executive directors as such do not automatically contribute to insurers' cost efficiency. Instead, they may play a more helpful role in monitoring board-level executives when there is additional expertise and other benefits afforded by a large board, thus contributing the more efficient use of resources. This could arise because non-executive directors may not have professional knowledge of, and/or experience in the insurance business (e.g. see Faculty and Institute of Actuaries, 2001).

Regarding H2, the separation of the CEO and board chairman positions (*CEO*) is found to have a negative and statistically significant effect on cost efficiency when the number of directors on the board is below the mean (at $p \leq 0.01$, one tailed) thereby lending support to the alternative prediction. Otherwise, its effect on cost efficiency is positive and significant (particularly when the number of directors on the board is at the sample mean), supporting our hypothesis H2.

Regarding H3 and the effect of board size, we find that when the proportion of non-executive directors is at or above the mean (whether there is duality of CEO and board chairman or a separation between the two positions), the board size seems to have a positive and statistically significant effect on cost efficiency (at $p \leq 0.01$, one tailed). This finding is consistent with hypothesis H3. In other words, directors on board seem to be able to contribute to takaful insurers' cost efficiency only when the proportion of non-executive directors on the board is higher than average.

Turning to the control variables, we find firm size is positive and statistically significant in all regressions (at $p \leq 0.05$ or better, one tailed). This finding is consistent with our expectations, suggesting that large takaful insurers are more cost efficient than small takaful insurance firms. This could, for example, arise because

increased firm size may enhance operational efficiency through the realization of economies of scale (e.g., see Diacon et al., 2002). However, we find that the interest rate (*INT*), although statistically significant (at $p \leq 0.05$ or better, one tailed) is negatively signed in all of the five regressions reported in Table 3, panel A. This implies that high interest rates in fact reduce the operational efficiency in takaful insurance firms possibly because improved yields on bond portfolios resulting from increasing rates of interest reduce the incentives for managers to better manage existing resources. Furthermore, we find no significant difference between the cost efficiency scores and ownership structure, product-mix, Shariah board and inflation rate. We also find no statistically significant evidence to support the notion that better regulated jurisdictions tend to promote better resource use efficiency in the takaful market. Finally, we find no evidence of a link between takaful insurers located in jurisdictions that allow flexible takaful business models and their cost efficiency.

6. Conclusions

This study applies DEA to examine the cost efficiency among an unbalanced panel of composite/non-life takaful insurers operating in 17 different countries over four years 2004-2007. Several important results emerge from this study.

First, we find that the cost efficiency scores of our sample of takaful insurers (with a mean of 0.36) are below the average levels of the cost efficiency of insurers relative to best practice insurance firms in developed insurance markets. For example, Hardwick & Guirguis (2007) report an average score of 0.66 for the UK non-life insurance market and Wang et al. (2007) report an average score of 0.72 in their analysis of cost efficiency in the Taiwanese non-life insurance market. This observation is consistent with prior takaful insurance research (e.g., Abdul Kader et al., 2010) and comparative efficiency studies of conventional and Islamic banks (e.g., Srairi, 2010). The results thus highlight the existence of widespread operational inefficiency, managerial inertia, and organizational constraints in Islamic financial firms.

Second, some board characteristics have statistically significant effects on insurers' cost efficiency measures, but their impacts can be both positive and negative depending on their interaction with other board characteristics. For example, the effect of non-executive directors on cost efficiency is positive and significant (as proposed in H1) but only when the number of directors on the board is above average. However, the effect of non-executive directors on the cost efficiency of

takaful insurers is negative and statistically significant when the total number of directors on the board is below the mean. Therefore, the overall picture portrayed here is that corporate governance is an inherently complex process and that because of the possible interactions among different governance arrangement, the effectiveness of corporate governance and its impact on the economic performance of takaful insurance firms should be evaluated holistically rather than separately for individual mechanisms. Indeed, Hermalin & Weisbach (2003, p.7) note that "…despite their importance, formal economic theory on boards has been quite limited".

We suggest that some of the findings in the current study can have potentially important commercial and policy implications. For example, improving the appointment of skilled and experienced non-executive directors to the board, and clarifying their role in advising on operational and strategic matters such resource allocation and usage could be a potentially important policymaking implication of our research. Furthermore, regulators in takaful insurance markets need to be appreciative of the importance of improving the operational efficiency of takaful insurers' use and allocation of inputs, particularly capital. This would help to improve corporate solvency and ensure better economic returns for shareholders and policyholders. Moreover, our finding that firm size is a principal driver of cost efficiency in takaful insurance markets suggests that legislators and regulators may need to introduce further measures (e.g., tax breaks) to encourage the growth of takaful insurers in order to realize scale and scope efficiencies. We acknowledge that interpretation of the results of our study may need to be tempered by recognition of the inherent limitations of our research design such as the small sample size and limited financial data that are publicly available. However, we have attempted to control for these limitations where possible in order to derive reliable and robust results (e.g., by adopting a panel data design). Finally, we consider that our study lays the foundations for further research to be carried out on the takaful insurance industry, which is poised to become one of the major emerging international markets for insurance over the next decade or so.

References

Abdul Kader, H., Adams, M.B. and Hardwick, P. (2010). The cost efficiency of takaful insurance companies, *Geneva Papers on Risk and Insurance: Issues and Practice 35,* 161-181.

Abouzaid, C. (2007). The role of pure re-takaful operators versus conventional reinsurers: Envisioning the future, in: Jeffer. S. (Ed.), *Islamic insurance: Trends, opportunities and the future of takaful*. London: Euromoney.

Al-Suwailem, S.I. (2002). Decision-making under uncertainty: An Islamic perspective, in: Iqbal, M. and Llewellyn, D., *Islamic banking and finance*. Cheltenham: Edward Elgar, UK.

Banker, R.D., Charnes, A. & Cooper, W.W.(1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis, *Management Science 30*, 1078-1092.

Barnhart, S.W. & Rosenstein, S. (1998). Board composition, managerial ownership and firm performance: An empirical analysis, *Financial Review 33,* 1-16.

Bhatty, A. (2007). The growth and global market for takaful, in: Jeffer. S. (Ed.), *Islamic insurance: Trends, opportunities and the future of takaful*. London: Euromoney.

Brickley, J.A., Coles, J.L. & Jarrell, G.A.(1997). Leadership structure: Separating the CEO and Chairman of the board, *Journal of Corporate Finance 3*, 189-220.

Cummins, J.D. (1999). Efficiency in the US life insurance industry: Are insurers minimizing costs and maximizing revenues? In: Cummins, J.D., Santomero, A.M. (Eds.), *Changes in the life insurance industry: Efficiency, technology and risk management*. Norwell, MA: Kluwer Academic Press.

Cummins, J.D. & Santomero, A. (1999). *Changes in the life insurance industry: Efficiency, technology, and risk management*. Bostom, MA: Kluwer Academic Press.

Cummins, J.D. & Weiss, M.A.(2001). Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods, in: Dionne, G. (ed.), *Handbook of insurance.* Boston, MA: Kluwer Academic Publishers.

Cummins, J.D. & Zi, H. (1998). Measuring economic efficiency of the US life insurance industry: Econometric and mathematical programming techniques, *Journal of Productivity Analysis 10*, 131-152.

Diacon, S.R., Starkey, K., & O'Brien, C.D. (2002). Size and efficiency in European long-term insurance companies: An international comparison, *Geneva Papers on Risk and Insurance: Issues and Practice 27*, 444-466.

Ernst & Young, 2009. *The world takaful report*. London: Ernst & Young.

Faculty & Institute of Actuaries (2001). *Report of the Corley Committee of Inquiry regarding the Equitable Life Assurance Society*, Edinburgh & London: Faculty & Institute of Actuaries, UK.

Fama, E.&Jensen, M.C.(1983). Agency problems and residual claims, *Journal of Law and Economics 26*, 327-352.

Grossman, S. & Hart, O. (1980). Takeover bids, the free rider problem, and the theory of the corporation, *Bell Journal of Economics 11,* 42-64.

Greuning, H. & Iqbal, Z. (2008). Governance issues in Islamic banks. Chapter 11 in *Risk analysis for Islamic banks*. Washington, DC: The World Bank.

Gutiérrez, L. & Pombo, C. (2009). Corporate ownership and control contestability in emerging markets: The case of Colombia, *Journal of Economics and Business, 61*, 112-139.

Hao, J. (2008). Measuring cost efficiency in the Taiwan life insurance industry, *International Journal of Management 25*, 279-286.

Hardwick, P. & Guirguis, M. (2007). The UK insurance industry – structure and performance, in: Cummins, J.D., Venard, B. (Eds.), *Handbook of international insurance: Between global dynamics and local contingencies*. New York:Springer Publications.

Hardwick, P., Adams, M.B. & Zou, H. (2011). Board characteristics and profit efficiency in the United Kingdom life insurance industry, *Journal of Business Finance and Accounting 38*, 987-1015.

Haley, J.D. (1993). A cointegration analysis of the relationship between underwriting margins and interest rates, *Journal of Risk and Insurance*, *60*, 480-493.

Hermalin, B.E. & Weisbach, M.S. (1991). The effects of board composition and direct incentives on firm performance, *Financial Management 20*, 101-112.

Hermalin, B.E. & Weisbach, M.S. (2003). Boards of directors as an endogenously determined institution: A survey of the economic literature, *Federal Reserve Bank of New York Economic Policy Review*, *9*, 7-26.

Hossain, M., Cahan, S.F. & Adams, M.B. (2000). The investment opportunity set and the voluntary use of outside directors: New Zealand evidence, *Accounting and Business Research 30*, 263-273.

Huang, L-Y., Lai, G.C., McNamara, M., & Wang, J. (2011). Corporate governance and efficiency: Evidence from the US property-liability insurance industry, *Journal of Risk and Insurance 78*, 519-550.

Islam, M.M. (2003). Regulations and supervision of financial institutions in GCC countries, *Managerial Finance 29*, 17-42.

Jaccard, J., Turrisi, R. & Wan, C.K. (1990). *Interaction effects in multiple regression*. Sage University Paper Series on Quantitative Applications in the Social Sciences: 07-069. Newbury Park, CA: Sage Publications.

Jensen, M.C. (1993). The modern industrial revolution, exit, and the failure of internal control systems, *Journal of Finance 48*, 831-880.

Jensen, M.C. & Meckling, W.H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics 3*, 305-360.

Kassim, Z.A.M. (2007). Takaful: A question of surplus, in: Jeffer. S. (Ed.), *Islamic Insurance: Trends, Opportunities and the Future of Takaful*. London: Euromoney.

Kennedy, P. (2003). *A guide to econometrics,* Oxford: Blackwell.

Khaled, M., Adams, M.B. & Pickford, M. (2001). Estimates of scale and scope economies in the New Zealand life insurance industry, *The Manchester School 69*, 327-349.

Khorshid, A. (2004). *Islamic insurance: A modern approach to Islamic banking,* New York: Routledge.

Klein, A. (2002). Economic determinants of audit committee independence, *Accounting Review*, *77,* 435-452.

Klumpes, P.J.M. (2005). Managerial use of discounted cash flow or accounting performance measures: Evidence from the UK life assurance industry, *Geneva Papers on Risk and Insurance: Issues and Practice, 30*, 171-186.

Kwon, W.J. (2007). Islamic principles and takaful insurance: Re-evaluation, *Journal of Insurance Regulation 18*, 109-132.

Marie, A., Rao, A. and Kashani, H. (2009). Cost efficiency and value driver analysis of insurers in an emerging economy, *Managerial and Decision Economics 30*, 265-280.

Nelson, J. (2005). Corporate governance, CEO characteristics and firm performance, *Journal of Corporate Finance 11*, 197-228.

O'Sullivan, N. & Diacon, S.R.(2003). Board composition and performance in life insurance companies, *British Journal of Management 14,* 115-19.

Pearce, J. & Zahra, S. (1992). Board composition from a strategic contingency perspective, *Journal of Management Studies 29*, 411-438.

Perry, T. & Shivdasani, A. (2005). Do boards affect performance? Evidence from corporate restructuring, *Journal of Business 78*, 1403-1431.

Pi, L. & Timme, S.G. (1993). Corporate control and bank efficiency, *Journal of Banking and Finance, 17*, 515-530.

Raheja, C.G. (2005). Determinants of board Size and composition: A theory of corporate boards, *Journal of Financial and Quantitative Analysis, 40*, 283-306.

Rediker, K.J. & Seth, A. (1995). Boards of directors and substitution effects of alternative governance mechanisms, *Strategic Management Journal, 16*, 85-99.

Rogers, D. (2002). Does executive portfolio structure affect risk management? CEO risk-taking incentives and corporate derivatives use, *Journal of Banking and Finance, 26*, 271-295.

Schaffnit, C., Rosen, D., & Paradi, J.C. (1997). Best practice analysis of bank branches: An application of DEA in a large Canadian bank, *European Journal of Operational Research, 98*, 269-289.

Srairi, S.A. (2010), Cost and profit efficiency of conventional and Islamic banks in GCC countries, *Journal of Productivity Analysis*, *34*, 45-62.

Swiss Re (2008). *Insurance in the emerging markets: Overview and prospects for Islamic insurance*, Sigma No. 5., Zurich: Swiss Re Publications.

Thompson, S. & Wright, M. (1995). Corporate governance: The role of restructuring transactions, *Economic Journal, 105*, 690-703.

Thompson, S. & Flower, M. (2007). Takaful: Islamic insurance stands the test of Time, *Emphasis, 2*, 2-5.

Wang, J.L., Jeng, V.,& Peng, J.L. (2007). The impact of corporate governance structure on the efficiency performance of insurance companies in Taiwan, *Geneva Papers on Risk and Insurance: Issues and Practice, 32*, 264-282.

World Islamic Insurance Directory (2009). UAE: Takaful Re/Insurance Communications.

Yermack, D. (1996). Higher market valuation of companies with a small board of directors, *Journal of Financial Economics, 40*, 185-211.

Zheka, V. (2005). Corporate governance, ownership structure and corporate efficiency: The case of Ukraine, *Managerial and Decision Economics, 26*, 451-460.

Zhou, X.M. (2001). Ownership and performance: Comment, *Journal of Financial Economics, 62,* 559-571.

Table 1: Summary of Takaful Insurers' Mean Efficiency Scores

Year	TE	PTE	AE	SE	CE
2004	0.383	0.626	0.876	0.553	0.342
2005	0.425	0.653	0.857	0.628	0.379
2006	0.343	0.575	0.884	0.594	0.318
2007	0.475	0.630	0.796	0.705	0.378
2004-7	**0.409**	**0.621**	**0.851**	**0.620**	**0.355**

TE: Technical Efficiency
PTE: Pure Technical Efficiency
AE: Allocative Efficiency
SE: Scale Efficiency
CE: Cost Efficiency

Table 2: Descriptive Statistics and Correlation Coefficients for the Second-stage Regression (n = 180)

Panel A: Descriptive statistics

	Mean	*Median*	*Std. Dev*	*Min*	*Max*
CE	0.355	0.258	0.301	0.01	0.999
TE	0.409	0.302	0.324	0.013	0.999
PTE	0.621	0.594	0.297	0.1	0.999
SE	0.625	0.663	0.309	0.02	0.999
AE	0.851	0.903	0.153	0.256	0.999
NEXECS	0.108	0.000	0.170	0.000	0.333
CEO	0.856	1.000	0.353	0.000	1.000
BSIZE	9.944	9.000	4.862	2.000	28.000
OWN	0.781	0.985	0.269	0.000	1.000
LSIZE	9.790	9.604	1.899	4.277	16.248
MIX	0.381	0.303	0.221	0.120	1.000
SHARD	0.462	0.380	0.388	0.090	3.000
INT	0.045	0.000	0.054	0.000	0.170
INF	0.232	0.090	0.285	0.000	1.200
LOC	0.167	0.000	0.374	0.000	1.000
TAKMOD	0.750	1.000	0.434	0.000	1.000

Panel B: Correlation coefficient matrix

		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
CE	(a)	-									
TE	(b)	0.95***	-								
PTE	(c)	0.67***	0.72***	-							
SE	(d)	0.75***	0.79***	0.23***	-						
AE	(e)	0.38***	0.15**	0.09	0.17**	-					
NEXECS	(f)	-0.08	-0.06	0.07	-0.12	-0.15**	-				
CEO	(g)	-0.12	-0.11	-0.02	-0.12	-0.03	0.35***	-			
BSIZE	(h)	0.04	0.07	-0.05	0.15**	-0.06	0.01	-0.13*	-		
OWN	(i)	-0.01	0.00	0.05	0.01	0.05	-0.16**	-0.17**	0.11	-	
LSIZE	(j)	0.47***	0.49***	0.28***	0.51***	0.13*	0.06	-0.16**	0.10	0.09	-
MIX	(k)	-0.09	-0.04	0.03	-0.07	-0.21***	0.12	-0.08	-0.03	-0.15**	0.02
SHARB	(l)	-0.07	-0.08	0.02	-0.17**	-0.05	0.24***	0.16**	-0.45***	-0.13*	-0.17**
INT	(m)	-0.22***	-0.19***	-0.20***	-0.08	-0.31***	0.30***	0.12	0.00	-0.13*	-0.02
INF	(n)	-0.19***	-0.17**	-0.02	-0.18**	-0.23***	0.13*	0.27***	0.01	0.28***	-0.20***
LOC	(o)	-0.02	0.00	-0.10	0.12	0.03	0.21***	0.01	-0.03	0.05	0.24***
TAKMOD	(p)	0.09	0.10	-0.04	0.21***	0.01	0.03	-0.24***	-0.10	0.12*	0.35***

		(k)	(l)	(m)	(n)	(o)	(p)
MIX	(k)	-					
SHARB	(l)	0.00	-				
INT	(m)	0.18**	0.04	-			
INF	(n)	0.20***	0.01	0.24***	-		
LOC	(o)	0.04	0.19**	0.13*	-0.19**	-	
TAKMOD	(p)	0.00	0.19**	0.46***	-0.53***	0.12	-

Note:

1. *CE*, *SE*, *AE*, *PTE* and *TE* = overall cost, scale, allocative, pure technical and technical efficiency scores computed using DEA; *NEXECS* = the proportion of non-executive directors on the board; *CEO* = dummy variable, 1 = the separation of the CEO from board Chairman, 0 = otherwise; *BSIZE* = the number of directors on the board; *OWN* = the proportion of the total shares held by the top three shareholders; LS*I*ZE = natural log of size, measured by total assets; *MIX* = product mix, measured by a Herfindahl concentration index; *SHARB* = the number of people on the Shariah board as a proportion of the main board size; *INT*= annual average rates of interest; *INF* = consumer price inflation; *LOC* = dummy variable, 1 = insurers located in jurisdictions with established regulatory and legislative systems, 0 = otherwise and *TAKMOD* = dummy variable, 1 = insurers located in jurisdictions that have flexible business models, 0 = otherwise.
2. Pearson correlation coefficients are computed between metric variables and Spearman-rank correlation coefficients are computed between *CEO, LOC* and *TAKMOD* and their correlation with other variables.
3. *** Significant at 1%; ** significant at 5%; * significant at 10% (two tailed).

Table 3: Random Effects Regression Results: Board Characteristics and Cost Efficiencies of Takaful Insurers (n = 180)

Panel A: Regression Coefficients

Our regression model is expressed as: $y_{it}^{*} = f\,(NEXECS_{it}, CEO_{it}, BSIZE_{it}, OWN_{it}, LSIZE_{it}, MIX_{it}, SHARB_{it}, INT_{it}, INF_{it}, LOC_{it}, TAKMOD_{it}, IT_{it}, Years) + u_i + v_{it}$

Dependent Var.		Predicted sign	CE (1)		TE (2)		PTE (3)		SE (4)		AE (5)	
			Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
NEXECS	b1	+/-	1.05***	1.55	1.20	1.43	3.32*	1.95	0.87	1.22	-0.26	1.10
CEO	b2	+/-	0.53	0.68	0.94	0.72	0.38	0.99	0.66	0.72	0.62	0.43
BSIZE	b3	+/-	-0.07	0.10	-0.06	0.10	-0.24	0.15	0.06	0.10	-0.01	0.06
OWN	b4	+	-1.25	1.32	-1.94	1.61	-0.44	1.60	-1.95	1.32	-0.27	0.67
LSIZE	b5	+/-	0.55***	0.20	0.65***	0.17	0.48**	0.21	0.61***	0.16	0.24**	0.13
MIX	b6	-	-1.68	1.81	-0.81	2.14	0.82	1.97	-0.99	1.89	-1.11	0.89
SHARB	b7	-	-0.12	0.56	-0.37	0.64	-0.27	0.77	-0.50	0.59	0.17	0.46
INT	b8	+	-15.44**	6.38	-16.29***	6.20	-13.31*	6.93	-12.12**	5.41	-9.47**	4.38
INF	b9	-	-0.31	1.08	-0.84	1.10	-0.12	1.40	-0.72	1.01	-0.54	0.89
LOC	b10	+	-0.07	1.14	-0.37	1.27	-0.88	1.09	-0.10	1.05	0.00	0.57
TAKMOD	b11	+	0.93	1.02	0.97	1.01	0.39	0.89	1.10	0.92	0.37	0.74
NEXECS×BSIZE	b12	?	-0.42	0.26	-0.44*	0.24	-0.69***	0.24	-0.26	0.21	-0.14	0.19
CEO×BSIZE	b13	?	0.18	0.11	0.20**	0.10	0.28*	0.16	0.09	0.10	0.03	0.08
Constant	b14		-4.50*	2.66	-4.80*	2.64	-2.01	2.71	-3.49	2.30	0.32	1.40
Year dummies			yes		Yes		Yes		Yes		yes	
Adj-R^2			0.24		0.29		0.22		0.32		0.16	
σ_u^2			1.75		2.23		2.33		1.93		0.69	
σ_v^2			2.29		2.20		2.63		1.84		1.96	

Notes:

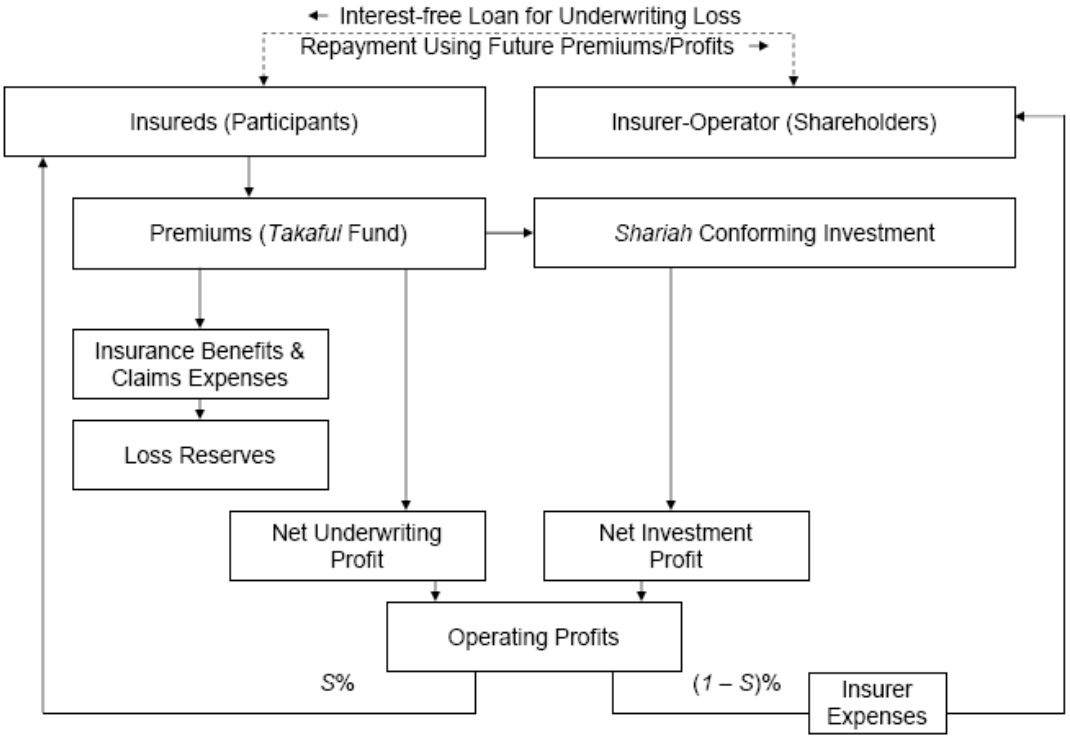
1. *CE, SE, AE, PTE and TE* = overall, scale, allocative, pure technical and technical scores computed using DEA ; *NEXECS* = the proportion of non-executive directors on the board; *CEO* = dummy variable, 1 = the separation of the CEO from board Chairman, 0 = otherwise; *BSIZE* = the number of directors on the board; *OWN* = the proportion of the total shares held by the top three shareholders; *LSIZE* = natural log of size, measured by total assets; *MIX* = product mix, measured by a Herfindahl concentration index*; SHARB* = the number of people on the Shariah board as a proportion of the main board size*; INT*= annual average rates of interest; *INF* = consumer price inflation; *LOC* = dummy variable, 1 = insurers located in jurisdictions with established regulatory and legislative systems, 0 = otherwise and *TAKMOD* = dummy variable, 1 = insurers located in jurisdictions that have flexible business models, 0 = otherwise.
2. *** Significant at 1%; ** significant at 5%; * significant at 10% (one tailed).
3. The continuous variables (e.g., *NEXECS*) that enter multiplicative interactions are centered (i.e., subtracting sample mean) before constructing interactions. The centered form of these continuous variables is also used in the regression.

Panel B: Evaluation of Marginal Effects of Board Characteristics

Variables	Coefficient	*CE*	*TE*	*PTE*	*SE*	*AE*
NEXECS	β1+β12**BSIZE*					
	If *BSIZE* = high	50.17***	56.82***	53.53	44.81**	29.53**
	If *BSIZE* = average	4.15	2.49	2.76	0.56	2.05
	If *BSIZE* = low	-60.50	-57.39	-18.39**	-66.24*	-43.51
CEO	β2+13* *BSIZE*					
	If *BSIZE* = high	-10.28	-8.55	-14.17	-0.88	-5.00
	If *BSIZE* = average	1.15	2.08*	0.64	1.57**	0.40
	If *BSIZE* = low	-82.36***	-78.25***	-119.31***	-87.60***	-28.65
BSIZE	β3 + β12**NEXECS* + β13**CEO*					
	If *NEXECS* =high & *CEO* =1	-0.17	0.68***	1.23***	0.45	0.74***
	& *CEO* =0	-	-	-	-	-
	If *NEXECS*=average & *CEO* =1	0.07**	0.05	0.01	0.07*	0.02*
	& *CEO* =0	0.22	0.06	-0.31	0.37***	0.04
	If *NEXECS* =low & *CEO* =1	-	-	-	-	-
	& *CEO* =0	-	-	-	-	-

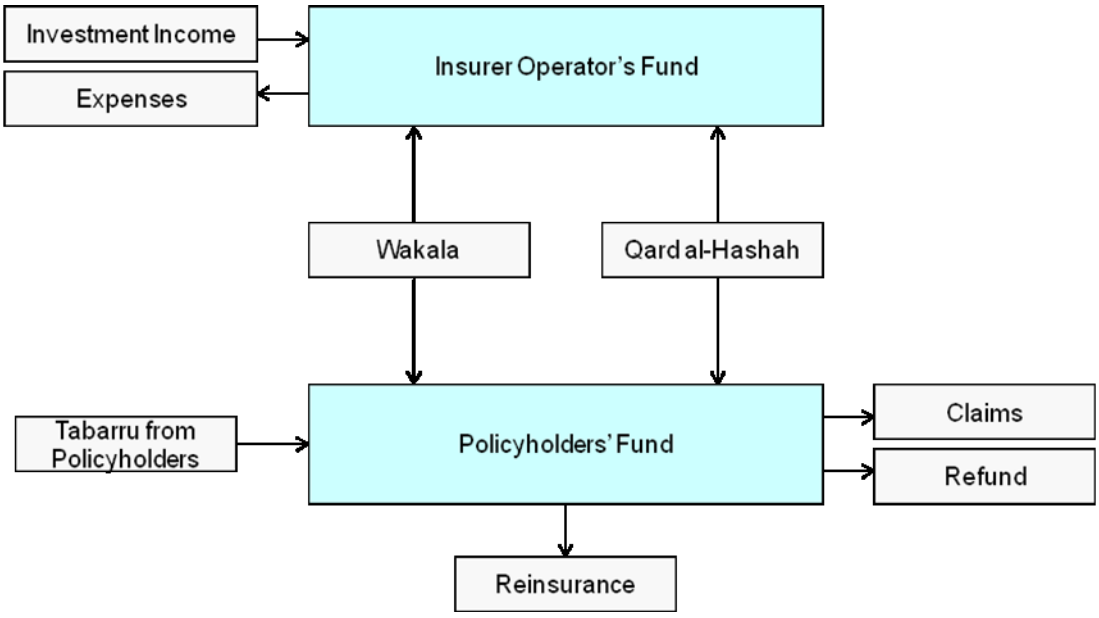
Notes:
1. Low = (mean – 1 std. dev.); average = mean; high = (mean + 1 std. dev.), where mean and standard deviation are the sample mean and standard deviation of corresponding variable (after centering).
2. *** Significant at 1%; ** significant at 5%; * significant at 10% (one tailed).

Figure 1: The Mudharabah Model in Takaful Non-life Insurance



Source: Kwon (2007)

Figure 2: The Wakalah Model in Takaful Non-life Insurance



Source: Thompson and Flower (2007)