Determinants of profitability of takaful operators: new evidence from Malaysia based on dynamic GMM approach

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Determinants of profitability of takaful operators: new evidence from Malaysia based on dynamic GMM approach

Arif Hodori\textsuperscript{1} and Mansur Masih\textsuperscript{2}

Abstract

Takaful or Islamic Insurance is a branch of Islamic Finance that is frequently overlooked, with very few empirical studies done in the field. In Malaysia, Takaful’s asset base had grown from just RM$1.4 million in 1986 to RM$23 billion in 2014. Despite this significant growth, there has been very few empirical studies done in the field, especially on the determinants of Takaful operators’ profitability. Motivated by this, this paper aims to investigate the determinants of profitability of Takaful operators by using the dynamic GMM estimator. This study finds that Takaful operators’ size and age are significant determinants of its profitability. However, there are various limitations and challenges that this paper faced, especially on data availability which forced us to resort to manually extracting the data from the financial statements of the companies from their websites at a heavy cost of time and effort. This indicates the attention, work and effort that researchers in the field of Islamic Finance should give to this relatively unexplored field as deeper understanding of this field is crucial for supporting its growth and innovation.

Keywords: Islamic insurance, profitability, Malaysia, dynamic GMM

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Introduction

Takaful, or Islamic Insurance, has been growing for the past few years in Malaysia. The three decades of takaful evolution in this country has been characterised by the steady growth of market participants, including players, agents, consumers, and dedicated infrastructure capacity building. From an initial asset base of just RM$1.4 million in 1986, the asset base of Malaysia’s takaful industry has grown manifold to a staggering estimate of RM$23 billion in 2014\(^3\). Malaysia’s takaful market has been on a dynamic growth track, achieving double-digit growth momentum of about 19% and currently, In 2014, Malaysia was the largest Takaful market in Southeast Asia with expected gross Takaful contributions of US$2.9 billion. Although growing, the challenge remains for Takaful industry to raise its performance standards to be on par with the conventional insurance industry, and for the industry to maintain its growth, profitability of the Takaful operators should be seen as an important factor as with better profitability of the Takaful operators, it will enhance the growth of the industry. Moreover, even though the industry has been in Malaysia for three decades, the fact remains that it is an industry that is not fully mature yet, as evident from new Takaful operators coming in into the industry in recent years, setting up themselves alongside a handful of established Takaful operators that has been around for quite some time.

Nevertheless, we can’t deny the potential of the industry, thus, understanding the factors that determining Takaful operators’ profitability are crucial in order for the managers to be able to lay out business and managerial strategies and focus, with aim to grow the company, thus the industry. Despite the vast, ever-expanding body of Islamic finance literatures and empirical researches that has been published, Takaful seems to be getting less attention in the body of literature, with empirical works on Takaful operators’ profitability in Malaysia are very limited. Motivated by this, I am making a humble attempt to study on the determinants of a Takaful operator’s profitability for Malaysia’s Takaful industry. The implication of this study is that, by gaining the understanding of the significant determinants of Takaful operators’

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profitability, Takaful operators’ managers are able to use this information to better strategize their business, in order for Takaful operators to be able to compete with their conventional counterpart.

Overview of Takaful Industry

Takaful is an Islamic insurance concept which is based on Islam Muamalat (banking transactions), to comply with the rules and regulations of Islamic law. This concept has been practiced in various forms for over 1400 years. According to Fisher and Taylor (2000) the concept of takaful has reportedly been practised in various forms since 622 AD on the basis of shared responsibility which laid the foundation of mutual insurance. It comes from the Arabic word Kafalah, meaning "the guarantee of each other" or "joint guarantee" against certain losses. It is said that the practices of kafalah has been used by the pre-Islam Arabs. There are various views on how Takaful came about to practice. It is said that the ancients Arabs practice a strong tribal system, and if a member of a tribe committed murder, it could lead two outcomes; either a tribal war, or by reaching a settlement by paying “blood money”, which was used to compensate the loss of life came from tribal fund which was collected from donations by the members. Once the donation is made to the fund, no refund was allowed, and the fund was used mainly to settle compensation in tribal dispute. This was said as a obvious example of mutual Takaful, wherein the whole community stood as guarantee against the loss to any of its member, thus, according to Muslehuddin (1969) the communal enterprise is seen as social in character but economic in consequences. According to Porter et al (1933), “the underlying principle in mutual takaful is that the individual members are themselves the insurers as well as the insured”.

According to Lailatul Faizah Abu Hassan et al. (2014), another theory on the early practice of Takaful is that Islamic insurance was first established in the early second century of Islamic era when Muslim Arabs started to expand their trade to India, the Malay Archipelago and other countries in Asia. Often, they had to suffer heavy losses as mishaps and misfortunes or robberies along the way. Based on Islamic principles of mutual assistance and cooperation in good and noble action, all the dealers agreed to contribute to a fund before they begin their journey. These funds were used to provide compensation to anyone in the group
that suffered losses through any mishap in dire times of need. It was said that this was later copied by Europeans who later used to develop the concept of marine insurance.

The development of Takaful not only important for the development of Islamic economy, but also to the wellbeing of the people. According to Fisher (1999), Takaful is the second most important social institution in the Islamic community to counter poverty and deprivation. The Takaful is operated as an enterprise providing services on a self-sustaining model rather than as a charity Takaful has become one of the leading segments of the financial sector across the Asian, Arab and African regions with growth rates of 10% to 30% over the last couple of years. The global Takaful market is expected to grow at 14% annually over 2013-2016 and total worldwide direct Takaful premiums covering both non-life and life are expected to reach US$18.5 billion by 2016. Of this estimated amount, nearly US$2.6 billion in annual premiums would be written in GCC markets, US$6.4 billion written in the ASEAN region, and US$8.5 billion from Saudi Arabia. As the Malaysian authorities became comfortable with the growth and regulation of the Islamic market, the Government introduced further legislation to allow other conventional banks to offer Islamic products through their designated premises. Whilst sustaining the current pace of development, the growth prospect remains strong for the Malaysian Takaful sector, in view of the large untapped potential, where out of the 55.7% market penetration rate for both Takaful and insurance, the market penetration rate for Takaful was merely 14.5% in 2014. According to Malaysian Takaful Association, as of 2017, there are 11 Takaful operators, 3 Retakaful operators operating in Malaysia.

**Literature Review**

It is very important to note that there has been no empirical studies / literature found on Takaful’s profitability and efficiency determinants. Thus, this study relies heavily on empirical research and evidences of conventional insurance as literature reviews to construct the study.
**Firm Size**

In terms of firm size, majority of studies argue that there is a positive relation between size and efficiency, as explained by the fact that large insurers have significant economies of scale advantages. In the insurance sector, it is usually assumed that a larger scale of operation reduces income volatility, since the pooling of risks works better the larger the risk pool (Cummins and Rubio-Misas, 2006). Many studies find results in line with the theoretical predictions of a positive relationship between size and efficiency (Cummins and Zi, 1998; Luhnen, 2009; Eling and Luhnen, 2010). However, there are studies that argue differently in a way that the very largest firms suffer from diseconomies of scale, for example, due to complexity of operations, so that they are not as efficient as middle-sized insurers (Fenn et al., 2008). However, Yuengert (1993) concludes that size and efficiency are statistically unrelated. On a different perspective, Zanghieri (2008) states that there is a nonlinear relationship between size and efficiency, which for life and non-life insurance he shows concave relations between size and cost/profit efficiency.

**Leverage**

Often, Risk-based capital standards will result in the increase of the required capital compared to simple ratio-based capital schemes. The increased security level associated with higher equity capital holdings of insurance firms comes at the expense of expensive equity capital, thus, an increase in equity, reflected in a decrease of leverage ratios, *ceteris paribus*, leads to a reduction in productivity. Moreover, it is argued that in the long run, increased security levels will be reflected in an increased volume of premiums because policyholders value low levels of insolvency risk (Epermanis and Harrington, 2006). Based on the economic argumentation, both directions could be supported. Cummins and Nini (2002) analyse capitalization of the U.S. property/liability (p/l) insurance industry for the period 1993–1998 and find that most insurers are significantly over-utilizing equity capital, which translates to significant revenue and cost of capital penalties, resulting in efficiency losses. In a study of the German p/l market for 1995–2006, Luhnen (2009) finds evidence of a positive relationship between leverage (his definition is equity to assets, which is sometimes discussed under the term “solvency” and efficiency (Eling and Luhnen, 2010).
Company’s Age

There are two opposing arguments regarding the impact of age on efficiency. On the one hand, the long-term persistence of a firm in each market might indicate its ability to successfully adapt its technology and operations to changing market conditions, thus suggesting above-average efficiency and productivity. Moreover, firms with a long history and experience are also likely to be more well-known and to enjoy a good reputation. On the other hand, relatively new firms might be more innovative in the use of state-of-the-art production technology, signifying competitive and efficiency advantages for “young” firms. Both Hussels and Ward (2007), for the German and U.K. life insurance markets, and Biener and Eling (2011) for the microinsurance market, found that older firms tend to be less efficient in comparison to the younger ones.

Investment Income

Insurance companies have two main sources of revenue: premiums from underwriting activities and returns on investment income. Insurance companies invest premiums in order to generate a profit. Insurers invest in a wide array of assets, and must balance the desire to earn a higher return through riskier investments with the need to maintain liquidity to cover the liabilities associated with claims made against the policies that they underwrite. According to Nissim (2010) investing activities are particularly important for insurers, as for many, the spread between the return on investments and the interest cost of insurance liabilities is the primary source of income. Investment income is also significant for insurers where they accumulate substantial funds due to the time gap between the receipt of premiums and payment of claims, and they invest and manage these funds to generate investment income. This income contributes to earnings and so affects the pricing of insurance policies. In regards of Takaful companies, although the operations is different (due to the Shariah principles and arrangement of the contracts), the same principle do apply, where income from invested funds are one of their main source of revenue.
Data & Methodology

Data

For this study, the sample of the dataset is made up of 10 Takaful operator and ranges from the year 2011 to year 2015. All data are extracted manually from each of the companies’ annual financial statement for every year, due to the lack of secondary data from databases.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit/Loss</td>
<td>The total comprehensive income / loss for the period.</td>
</tr>
<tr>
<td>Investment Income Ratio</td>
<td>The ratio of investment income to the net earned contribution of the Takaful operator for the period.</td>
</tr>
<tr>
<td>Size</td>
<td>The size of the Takaful operator, which was valued by the total asset of the Takaful operator.</td>
</tr>
<tr>
<td>Leverage Ratio</td>
<td>The leverage ratio of the takaful operator, which was calculated by the ratio of total debt/liabilities to total assets.</td>
</tr>
<tr>
<td>Company’s Age</td>
<td>The age of the company from the date it is incorporated.</td>
</tr>
</tbody>
</table>

Table 1 – Variables Description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnProfit</td>
<td>Overall</td>
<td>16.89563</td>
<td>2.641009</td>
<td>0</td>
<td>19.08314</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>1.657108</td>
<td>12.91828</td>
<td>18.74436</td>
<td>n = 10</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>2.101583</td>
<td>3.977351</td>
<td>20.82454</td>
<td>T-bar = 4.9</td>
</tr>
<tr>
<td>IIR</td>
<td>Overall</td>
<td>.1771784</td>
<td>.4200304</td>
<td>.0237012</td>
<td>3.00984</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>.2303413</td>
<td>.0295291</td>
<td>.8212063</td>
<td>n = 10</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>.3676312</td>
<td>-.5744038</td>
<td>2.365812</td>
<td>T-bar = 4.9</td>
</tr>
<tr>
<td>lnSize</td>
<td>Overall</td>
<td>20.58071</td>
<td>1.501742</td>
<td>16.23062</td>
<td>23.29573</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>1.240042</td>
<td>18.73089</td>
<td>22.56865</td>
<td>n = 10</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>.9399428</td>
<td>15.06853</td>
<td>22.13364</td>
<td>T-bar = 4.9</td>
</tr>
<tr>
<td>Lev</td>
<td>Overall</td>
<td>45.30442</td>
<td>37.15947</td>
<td>19.94019</td>
<td>256.3879</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>27.23903</td>
<td>25.13588</td>
<td>107.8004</td>
<td>n = 10</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>26.30183</td>
<td>-22.31672</td>
<td>193.892</td>
<td>T-bar = 4.9</td>
</tr>
<tr>
<td>lnAge</td>
<td>Overall</td>
<td>1.949372</td>
<td>.7753227</td>
<td>0</td>
<td>3.465736</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>.7573643</td>
<td>.7945135</td>
<td>3.400084</td>
<td>n = 10</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>.3010057</td>
<td>.9918734</td>
<td>2.601311</td>
<td>T-bar = 4.9</td>
</tr>
</tbody>
</table>
Table 1 shows the list of variables used for this study and its descriptions. The variable \( \ln \text{Profit} \) is taken as the measurement of a Takaful profitability, while \( \text{IIR}, \ln \text{Size}, \text{Lev}, \) and \( \ln \text{Age} \) are the variables that this paper aim to test if it is a determinant of a Takaful operator’s profitability. The dataset is an unbalanced panel which consist of 10 companies (groups). Table 2 is the summary statistics of the panel dataset.

*Estimation Method*

Traditional econometric methods (OLS, fixed effect and generalized effect) do not avoid the endogeneity problem arising from a causal relationship between the independent and dependent variables due to lagged dependent variables unlike a dynamic panel GMM. To solve this problem, the generalized moment method (GMM) is used as a generic tool to estimate a statistical model’s parameters. GMM was proposed by Arellano and Bond (1991) and developed by Arellano and Bover (1995) and Blundell and Bond (1998) to solve the endogeneity problem in the independent variables using a series of instrumental variables generated by lagged variables (simultaneity bias problem of reverse causality and possible omitted variables). Given our focus only on Takaful / Islamic Insurance in Malaysia, we have an extremely small number of firms (N) in the sample, to the size of just 10. OLS gives rise to the endogeneity problem since, by construction, the lagged dependent variable is correlated with the bank-specific time-invariant fixed effect. Accordingly, the standard panel estimators such as the fixed-effect and random-effect estimators would not be appropriate. The small “N” in this study cautions us of instrument proliferation problem in case that an instrumental variable technique, e.g. the first-difference GMM or system GMM estimator, is used. According to Soto (2009), provided that some persistency is present in the series, the system GMM estimator yields the results with the lowest bias, in which the system GMM estimator outperform all the other estimators i.e. OLS, fixed-effects, difference GMM, level GMM, in terms of bias and efficiency. Taking notes of the above, we adopt the system GMM estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998). And for our case, the panel datasets are an unbalanced panel, thus, according to Roodman (2009), it is better to use System GMM and avoid Standard GMM, which has a weakness of magnifying gaps. Additionally, according to Davidson and MacKinnon (2004), in the presence of
heteroskedasticity and serial correlation, the two step GMM uses a consistent estimate of the weighting matrix, taking the residual from the one step estimate, thus addressing the issue. Although it is asymptotically more efficient, the two-step GMM’s standard error tend to be critically downward biased, to which we address by having a robust standard error estimation using the finite-sample correction to the two-step covariance matrix developed by Windmeijer (2005).

**Estimation Result**

Table 3 below shows us the estimation results, in which 6 types of GMM estimation has been estimated, which are one-step difference GMM, one-step difference GMM with robust standard error, two-step GMM with robust standard error, one-step system GMM, one-step system GMM with robust standard error, and two-step GMM with robust standard error. Based from the arguments presented in the previous section, it is agreed that the suitable estimation method to be used for this estimation is the System GMM and for a robust estimation, the two-step system GMM with robust standard error will be our estimation method of choice.

The result of the one-step system GMM with robust standard error is consistent with the result of the two-step system GMM with robust standard error. Interpreting the two-step system GMM with robust standard error, there are two variables that is found to be significant, which are $\ln\text{Size}$, which is the size of firms, and $\ln\text{Age}$, which is the company’s age. For $\ln\text{Size}$, it is highly significant at 99% significance level, and the coefficient indicates a positive relationship between Takaful operator’s size and its profitability. To be more precise, an increase of 1% of the company size will result in an increase of profitability by 0.85%, given that other variables and factors remains constant. This means that the size of the company is a significant determinant of a Takaful operator’s profitability. This is in line with Cummins and Rubio-Misas (2006) where we can view it in a way that a larger scale of operation for the insurer / takaful operator reduces income volatility, due to the better and larger risk pool that a larger takaful operator can have. This can be seen through a basic analysis of the takaful operators’ financial statements. Out of the 10 companies selected for this study, 3 Takaful companies has not been profitable for the period of the sample, which was
from 2011 to 2015, and the other 7 Takaful companies were mostly profitable throughout the period. One common characteristic of the 3 Takaful companies that has not been profitable is that, they only operate in the family Takaful line of business, while the other companies operate in both family Takaful and General Takaful. By operating in both line of business, it allows the Takaful company to have larger size, due to larger customer base, and having a larger pool of risk, while at the same time, diversify the risk through different line of business, instead of just focusing on a single line.

Table 3 – Estimation Results

<table>
<thead>
<tr>
<th></th>
<th>(1) One-Step Diff GMM</th>
<th>(2) One-Step Diff GMM</th>
<th>(3) Two-step Diff GMM</th>
<th>(4) One-step System GMM</th>
<th>(5) One-step System GMM</th>
<th>(6) Two-step System GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnProfit</td>
<td>0.115</td>
<td>0.115**</td>
<td>0.119</td>
<td>0.0445</td>
<td>0.0445</td>
<td>0.0303</td>
</tr>
<tr>
<td></td>
<td>(0.0800)</td>
<td>(0.0492)</td>
<td>(0.0745)</td>
<td>(0.639)</td>
<td>(0.118)</td>
<td>(0.125)</td>
</tr>
<tr>
<td>IIR</td>
<td>3.241</td>
<td>3.241</td>
<td>5.576*</td>
<td>2.297</td>
<td>2.297</td>
<td>1.396</td>
</tr>
<tr>
<td></td>
<td>(4.275)</td>
<td>(3.940)</td>
<td>(3.000)</td>
<td>(40.03)</td>
<td>(7.899)</td>
<td>(7.511)</td>
</tr>
<tr>
<td>lnSize</td>
<td>0.0328</td>
<td>0.0328</td>
<td>-0.0294</td>
<td>0.850**</td>
<td>0.850***</td>
<td>0.867***</td>
</tr>
<tr>
<td></td>
<td>(0.116)</td>
<td>(0.116)</td>
<td>(0.0643)</td>
<td>(0.408)</td>
<td>(0.0591)</td>
<td>(0.0618)</td>
</tr>
<tr>
<td>Lev</td>
<td>0.00360</td>
<td>0.00360*</td>
<td>0.00404***</td>
<td>0.00535</td>
<td>0.00535</td>
<td>0.00521</td>
</tr>
<tr>
<td></td>
<td>(0.00253)</td>
<td>(0.00173)</td>
<td>(0.00108)</td>
<td>(0.0190)</td>
<td>(0.00504)</td>
<td>(0.00508)</td>
</tr>
<tr>
<td>lnAge</td>
<td>-0.539</td>
<td>-0.539</td>
<td>-0.450</td>
<td>-0.990</td>
<td>-0.990***</td>
<td>-0.952***</td>
</tr>
<tr>
<td></td>
<td>(0.570)</td>
<td>(0.488)</td>
<td>(0.428)</td>
<td>(1.576)</td>
<td>(1.62)</td>
<td>(1.27)</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As for the significance of the variable lnAge, it is found that it is significant at 99% significance level. From the estimated coefficient, we can see that there is a negative relationship between the Takaful operators’ age to its profitability. To be more precise, from the estimated coefficient, it can be interpreted that an increase in the firm’s age by 1% will cause a decrease of its profitability by 0.99%. This is similar to the
finding of Hussels and Ward (2007) and Biener and Eling (2011), where it is found that older insurance firms are less efficient in comparison to the younger ones. This can be an explanation to the negative relationship exhibited by the coefficient. Alternatively, in respect of Malaysia’s Takaful companies, after a further analysis of the companies “demographic”, the profitable newcomers (a lot of new Takaful companies were established in the past 5 years) have a common characteristic, apart from operating in two line of Takaful business i.e. Family Takaful and General Takaful, these newcomers all have their conventional counterparts. Could having a conventional counterpart makes a Takaful operator more efficient and profitable? This is a plausible view as by having a conventional counterpart, it might mean better support for the Takaful company. The support could be in form of liquidity and equity assistance, to ensure the viability of the Takaful company business. Alternatively, maybe by having a conventional counterpart, it means that the Takaful company can leverage on their conventional sisters, in terms of customer base and human capital as well. These are some interesting takeaway that can be given attention as this study humbly tries to study the determinants of Takaful operators’ profitability in situation of scarcity of data as well as empirical literatures on the subject matter.

Limitations and Challenges of the Study

This humble attempt of mine to study the determinants of Malaysia’s Takaful operators’ profitability comes with a lot of limitations and challenges that should be acknowledged. Firstly, is the lack of data availability. Databases do not have the data of Takaful operators’ financial statement items. This led me to resort to manually extract the data from the financial statements of the companies from their website. This brings a different set of challenges. Some Takaful companies do not make all their financial statements available online despite having operated for more years than the year of financial statements available on its website. And while some do make it all available online, along the years i.e. in 2011 to 2012, there has been a change of reporting and disclosure format for Takaful companies, which changes some of the items in terms of what they disclosed and the measurement of the items.
Secondly, the challenge and limitations come in the form of the lack of empirical works that has been done in the field. In respect to empirical works in the field of Takaful / Islamic Insurance, it is very lacking and clearly there is a need of attention that should be given to this field. This made me to resort to referring conventional insurance’s empirical works for my references of study. This could be cause by the lack of data availability, which what is faced by myself.

Thirdly, the challenge and limitations come in the technical side of the paper, which is the econometric processes. Due to the nature of the data, which is basically an extremely small “N” and “t”, together with an unbalanced panel dataset, this causes the dataset to be not compatible to be tested by majority of panel unit root tests, panel cointegration tests, and panel VECM tests. Thus, it is not clear on the nature of the datasets, especially on its dynamics, cointegration, and perhaps causality amongst the variable. In addition to that, referring to the rule of thumb that the instruments in GMM estimation should be less or equal to “N”, this renders the choice of instruments to be extremely limited, as well as resulting in the amount of variable that can be included in the estimations.

Despite a lot of limitations and challenges, it is important to emphasize that this study’s main motivation is to make an humble attempt to explore one of the most unexplored regions in the ocean of Islamic finance empirical work. From the findings that is made, interesting part away questions can be risen, thus enabling a future direction of areas to be explored in the field of Takaful empirical research works.

**Conclusion**

In conclusion, this study found that Takaful operators’ size and age are significant determinants of its profitability. The positive relationship between Takaful operators’ size to its profitability might be because of the better and larger risk pool that a larger takaful operator can have with larger size and business line. The negative relationship of the Takaful operators’ age to its profitability might be because of the higher efficiency of the younger firms, like what is mentioned by Hussels and Ward (2007) and Biener and Eling (2011). Another plausible explanation for this is that, after analysing the raw data, it could also be the result
of having conventional counterparts, where the newcomers with conventional sisters can leverage on the
conventional support that they have. It is also important to note the many challenges and limitations of this
study, thus indicating a great amount of work and effort that researchers in the field of Islamic Finance
should give to the field of Takaful, especially in terms of establishing a proper database for the field. Moving
forward, from this study, further research question can be derived for future researches to gain better
understanding of the field, such as the possible relationship or impact of a Takaful operators having
conventional counterparts to their profitability and efficiency, the impact of the choice of business model
i.e. Family Takaful and General Takaful on Takaful operators, and the quality of Takaful operators’ risk
pool and its impact on profitability.
References


Appendix
Panel Unit Root Test

\( \ln \text{Profit} \)
Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 259.3953
\]
\[\text{Prob > chi2} = 0.0000\]

\( \ln \text{IIR} \)
Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 133.4173
\]
\[\text{Prob > chi2} = 0.0000\]

\( \ln \text{Size} \)
Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 209.0464
\]
\[\text{Prob > chi2} = 0.0000\]

\( \text{Lev} \)
Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 60.5423
\]
\[\text{Prob > chi2} = 0.0000\]

\( \ln \text{Age} \)
Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 239.8543
\]
\[\text{Prob > chi2} = 0.0000\]
\(d.\ln\text{Profit}\)

Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 153.5800
\]
\[
\text{Prob > chi2} = 0.0000
\]

\(d.IIR\)

Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 118.9303
\]
\[
\text{Prob > chi2} = 0.0000
\]

\(d.\ln\text{Size}\)

Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 123.1884
\]
\[
\text{Prob > chi2} = 0.0000
\]

\(d.\text{Lev}\)

Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 192.0510
\]
\[
\text{Prob > chi2} = 0.0000
\]

\(d.\ln\text{Age}\)

Fisher Test for panel unit root using Phillips-Perron test (1 lags)
Ho: unit root
\[
\text{chi2}(20) = 0.0000
\]
\[
\text{Prob > chi2} = 1.0000
\]
Dynamic panel-data estimation, one-step difference GMM

Group variable: Company
Time variable: Time

No. of Obs: 29
No. of groups: 10

Obs. Per group:
Min: 2
Avg: 2.9
Max: 3

No. of instrument: 9

F(5, 24) = 1.19
Prob > F = 0.344

| lnProfit | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|----------|--------|-----------|-------|------|---------------------|
| lnProfit L1.      | .1152806 | .0800373 | 1044  | 0.163 | -0.0499083 - 0.2804694 |
| IIR        | 3.241457 | 4.275153 | 0.76  | 0.456 | -5.582025 - 12.06494  |
| lnSize     | .0328073 | .1160297 | 0.28  | 0.780 | -0.2066664 - 0.2722809 |
| Lev        | .0035974 | .002526  | 1.42  | 0.167 | -0.0016161 - 0.008811  |
| lnAge      | -.5392696 | .5698105 | -0.95 | 0.353 | -1.715301 - 0.6367615  |

Instruments for first differences equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
L2.(lnSize Lev IIR)

Arellano-Bond test for AR(1) in first differences: z = -1.87  Pr > z = 0.061
Arellano-Bond test for AR(2) in first differences: z = 1.02  Pr > z = 0.307

Sargan test of overid. restrictions: \( \chi^2(4) = 4.93 \)  Prob > \( \chi^2 \) = 0.294
(Not robust, but not weakened by many instruments.)
Dynamic panel-data estimation, one-step difference GMM (Robust)

Group variable: Company  
Time variable: Time

<table>
<thead>
<tr>
<th></th>
<th>No. of Obs:</th>
<th>No. of groups:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>29</td>
<td>10</td>
</tr>
</tbody>
</table>

Obs. Per group:  
Min: 2  
Avg: 2.9  
Max: 3

No. of instrument: 9  
F(5, 10) 7.35  
Prob > F 0.004

| lnProfit | Coef. | Robust Std. Err. | t | P>|t| | [95% Conf. Interval] |
|----------|-------|------------------|---|---|---------------------|
| lnProfit L1. | .1152806 | .0491837 | 2.34 | 0.041 | .0056925 | .2248686 |
| IIR      | 3.241457 | 3.939539 | 0.82 | 0.430 | -5.536383 | 12.0193 |
| lnSize   | .0328073 | .1157564 | 0.28 | 0.783 | -2.251142 | .2907287 |
| Lev      | .0035974 | .0017316 | 2.08 | 0.064 | -.0002608 | .0074557 |
| lnAge    | -.5392696 | .4881156 | -1.10 | 0.295 | -1.626859 | .5483197 |

Instruments for first differences equation  
GMM-type (missing=0, separate instruments for each period unless collapsed)  
L2.(lnSize Lev IIR)

| Arellano-Bond test for AR(1) in first differences: | z = | -1.20 | Pr > z = | 0.230 |
| Arellano-Bond test for AR(2) in first differences: | z = | 0.58 | Pr > z = | 0.560 |

Sargan test of overid. restrictions:  
\( \text{chi2}(4) = 4.93 \)  
Prob > \text{chi2} = 0.294  
(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions:  
\( \text{chi2}(4) = 3.74 \)  
Prob > \text{chi2} = 0.442  
(Robust, weakened by many instruments.)
Dynamic panel-data estimation, two-step difference GMM (Robust)

Group variable: Company
Time variable: Time

<table>
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<td>Obs. Per group</td>
<td>Min: 2</td>
<td>Avg: 2.9</td>
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<tr>
<td>No. of instrument: 9</td>
<td>F(5, 10) 39.59</td>
<td>Prob &gt; F 0.000</td>
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</tbody>
</table>

| InProfit L1. | Coef.  | Robust Std. Err. | t     | P>|t|   | [95% Conf. Interval] |
|--------------|--------|------------------|-------|--------|-------------------|
| .1193128     | .0745401 | 1.60             | 0.141 | -.046773 | .2853985 |
| IIR          | 5.576078 | 3.000077         | 1.86  | 0.093   | -1.10851 | 12.26067 |
| lnSize       | -.0294346 | .0642546       | -.46  | 0.657   | -.1726028 | .1137336 |
| Lev          | .0040433 | .0010757        | 3.76  | 0.004   | .0016466 | .00644 |
| lnAge        | -.4495581 | .4279152       | -1.05 | 0.318   | -1.403013 | .5038964 |

Instruments for first differences equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
L2.(lnSize Lev IIR)

| Arellano-Bond test for AR(1) in first differences: | z = -1.25 | Pr > z = 0.212 |
| Arellano-Bond test for AR(2) in first differences: | z = 0.71  | Pr > z = 0.477 |

Sargan test of overid. restrictions: chi2(4) = 4.93 Prob > chi2 = 0.294
(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(4) = 3.74 Prob > chi2 = 0.442
(Robust, weakened by many instruments.)
Dynamic panel-data estimation, one-step system GMM

Group variable: Company
Time variable: Time

No. of Obs: 39
No. of groups: 10

Obs. Per group:
Min: 3
Avg: 3.9
Max: 4

No. of instrument: 6

F(5, 34) 118.62
Prob > F 0.000

| lnProfit | Coef.  | Std. Err. | t      | P>|t| | [95% Conf. Interval] |
|----------|--------|-----------|--------|-----|----------------------|
| lnProfit L1. | 0.0445054 | .6390429 | 0.07  | 0.945 | -1.254186 - 1.343197 |
| IIR      | 2.297007 | 40.03398 | 0.06  | 0.955 | -79.06182 - 83.65584 |
| lnSize   | .8504937 | .4077473 | 2.09  | 0.045 | .0218516 - 1.679136  |
| Lev      | .0053495 | .0189931 | 0.28  | 0.780 | -0.0332492 - 0.0439482 |
| lnAge    | -.990258 | 1.575838 | -0.63 | 0.534 | -4.192745 - 2.212229 |

Instruments for first differences equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
L2.(lnSize Lev IIR) collapsed

Instruments for levels equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
DL.(lnSize Lev IIR) collapsed

Arellano-Bond test for AR(1) in first differences: z = -1.21 Pr > z = 0.224
Arellano-Bond test for AR(2) in first differences: z = -0.12 Pr > z = 0.905

Sargan test of overid. restrictions: chi2(1) = 0.01 Prob > chi2 = 0.914
(Not robust, but not weakened by many instruments.)
## Dynamic panel-data estimation, one-step system GMM (Robust)

Group variable: Company  
No. of Obs: 39

Time variable: Time  
No. of groups: 10

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<th>Obs. Per group:</th>
<th>Min:</th>
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<td>Avg:</td>
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<td>Max:</td>
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<table>
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<th>No. of instrument: 6</th>
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<tr>
<td>F(5, 10)</td>
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<td>10858.93</td>
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<tr>
<td>Prob &gt; F</td>
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<tr>
<td>0.000</td>
</tr>
</tbody>
</table>

| lnProfit | Coef.  | Robust Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|----------|--------|------------------|------|-------|---------------------|
| lnProfit L1. | 0.0445054 | .1183892 | 0.38 | 0.715 | -.219282 | .3082929 |
| IIR       | 2.297007 | 7.899109 | 0.29 | 0.777 | -15.3033 | 19.89732 |
| lnSize    | .8504937 | .0590677 | 14.40 | 0.000 | .7188827 | .9821048 |
| Lev       | .0053495 | .0050374 | 1.06 | 0.313 | -.0058744 | .0165735 |
| lnAge     | -.990258 | .1620452 | -6.11 | 0.000 | -1.351317 | -.6291989 |

Instruments for first differences equation  
GMM-type (missing=0, separate instruments for each period unless collapsed)  
L2.(lnSize Lev IIR) collapsed

Instruments for levels equation  
GMM-type (missing=0, separate instruments for each period unless collapsed)  
DL.(lnSize Lev IIR) collapsed

Arellano-Bond test for AR(1) in first differences:  
z = -1.05  
Pr > z = 0.293

Arellano-Bond test for AR(2) in first differences:  
z = -1.42  
Pr > z = 0.155

Sargan test of overid. restrictions:  
chi2(1) = 0.01  
Prob > chi2 = 0.914

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions:  
chi2(1) = 0.51  
Prob > chi2 = 0.473

(Robust, weakened by many instruments.)
Dynamic panel-data estimation, two-step system GMM (Robust)

Group variable: Company
Time variable: Time

No. of Obs: 39
No. of groups: 10

Obs. Per group:
Min: 3
Avg: 3.9
Max: 4

No. of instrument: 6

\[ F(5, 10) = 9564.53 \]
\[ \text{Prob} > F = 0.000 \]

| lnProfit \ L1. | Coef. | Robust Std. Err. | t | P>|t| | [95% Conf. Interval] |
|---------------|-------|------------------|---|-------|----------------------|
| lnProfit L1.  | .030302 | .1246839       | 0.24 | 0.813 | -.247511 - .308115 |
| IIR           | 1.395758 | 7.51121       | 0.19 | 0.856 | -15.34026 - 18.13178 |
| lnSize        | .8672491 | .0617706      | 14.04 | 0.000 | .7296158 - 1.004883 |
| Lev           | .0052147 | .0050836      | 1.03 | 0.329 | -.0061123 - .0165416 |
| lnAge         | -.951594 | .1268418      | -7.50 | 0.000 | -1.234215 - -.6689728 |

Instruments for first differences equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
L2.(lnSize Lev IIR) collapsed

Instruments for levels equation
GMM-type (missing=0, separate instruments for each period unless collapsed)
DL.(lnSize Lev IIR) collapsed

Arellano-Bond test for AR(1) in first differences:
\[ z = -1.05 \]
\[ \text{Pr} > z = 0.292 \]

Arellano-Bond test for AR(2) in first differences:
\[ z = -1.48 \]
\[ \text{Pr} > z = 0.139 \]

Sargan test of overid. restrictions:
\[ \chi^2(1) = 0.01 \]
\[ \text{Prob} > \chi^2 = 0.914 \]
(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions:
\[ \chi^2(1) = 0.51 \]
\[ \text{Prob} > \chi^2 = 0.473 \]
(Robust, weakened by many instruments.)