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Assessing the Efficiency of Takaful and Insurance Companies in Emerging Markets

Muhammad Furqan	Ph.D. Scholar, Department of Business Administration, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan.
Muhammad Ramzan	Ph.D. Scholar, Business School, Central South University, Changsha, Hunan, China.
Barkat Ullah	UE Business School, Division of Management and Administrative Sciences, University of Education, Lahore, Punjab, Pakistan.
Mohsin Hayat	Ph.D. Scholar, Department of Business Administration, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan.
Jawad Khalil	MS Graduate, Department of Business Administration, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan.

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Corresponding Author:

Muhammad Furqan
Email: mfurqan666@gmail.com

Abstract: This research was conducted to compare and contrast the effectiveness of Takaful and Conventional insurance providers in developing markets like Pakistan. This was achieved by collecting and analyzing information from the databases of four Takaful and four traditional insurance providers covering 2012–2018. The technical, cost and allocative efficiencies were determined using data envelopment analysis. Total assets and employee count were inputs, while investment income, net premium revenue, and other income were measured as outcomes. Labour and asset costs were included in determining profitability. As of 2012, Pakistan's Takaful insurance sector was considered extremely technically efficient. Conventional insurance companies were more technically efficient than Takaful insurance companies throughout the review period, with an average technical efficiency score of 0.890 compared to 0.730 for Takaful insurance companies. Pak-Qatar General Takaful was found to be the most technically efficient (0.855), Pak-Qatar Family Takaful most allocative (0.703) and cost-efficient (0.597) among all Takaful insurance firms in Pakistan. On average the technical efficiency score is 0.810, allocative efficiency 0.490 and cost efficiency 0.407. Tobit regression estimates found that investment income, size of the firm and number of employees significantly affects the efficiency scores of insurance companies. Based on the above discussion the researcher concludes that conventional and Takaful insurance companies require to improve their technical, allocative and cost efficiencies.

Introduction

The insurance industry dramatically influences the evolution of financial institutions. The insurance industry provides excellent financial services for the long-term expansion and expansion of the overall economy (Akotey et al., 2013, Shafiq et al., 2023). According to Yuvaraj and Abate (2013), insurance firms perform an essential part in the financial sectors by aiding in an effectively and efficiently functioning

financial system through collaboration, risk payments, financial intermediation, and mobilization. The insurance business mobilizes the nation's surplus funds, which benefits the economy. The mobilization of surplus cash in an economy produces increased output and new job possibilities. According to Shahid et al. (2017), the insurance business has a significant role in societal development by reducing

unpredictability, mitigating losses through the payment of claims, increasing employment, and reducing anxiety. In today's world, the health insurance industry may be vital to the nation's economic growth. It also aids in preventing unanticipated losses, producing benefits for insurers and investors alike, as well as corporate efficiency and profitability, all of which boost economic activity and job possibilities (Chakraborty and Harper, 2017, Ramzan et al., 2023, Khan et al., 2023).

Their primary objective is to raise the effectiveness of financial companies due to more effective businesses can make better use of their contributions and produce more. There are several practical ideas, each offering different data about the financial organization. For instance, technical efficiency, or the company's operational efficiency, assesses its capacity to optimize output with a given form of resources. Fortunately, to maximize production, distributive effectiveness examines high-input mixtures by considering each input's comparable costs. Collectively, allocation and technological effectiveness assess the company's financial performance, which accurately depicts how well the company is operating while taking expenses into account. According to Afza and Asgher (2010) and Hayyat et al., (2023), cost efficiency examines the overall drop in costs that may be realized if the company is both allocated and technologically effective.

The effectiveness of the company may be evaluated using both performance- and input-focused strategies. The contribution level is reduced to the lowest point feasible in the input-oriented strategy to achieve continuous manufacturing. In contrast, the production-oriented approach maximizes productivity at a given amount of resources. While the output-oriented approach relies on variable returns to scale, the input-oriented approach is predicated on steady profits to scale (Eling and Luhn, 2010, Khan et al., 2023). Such barriers are measured using two different approaches: a parametric approach and a non-parametric

technique. The profit and cost border, the error term, and the functional shape of the production function are all presupposed in the parametric method of efficiency estimation. Contrarily, the non-parametric method (Charnes et al., 1978; Iqbal et al., 2023; Ali & Asim, 2023) makes no assumptions on the functional shape of the manufacturing function while calculating efficiency and does not account for the error factor. Profitability is determined by the values of the indicators for the examined topic, whereas efficiency compares one entity's achievements to those of others that are similar, efficiency is an approximate measure. As a result, insurance firms see efficiency and profitability as critical components in attaining their goals. Insurance businesses may enhance their performance management and find activities that aid them in achieving their shareholder-set goals by assessing the link between the two (Grmanova & Strunz, 2017; Nosheen et al., 2023; Ramzan et al., 2023).

During the last decade, the concept of "kafala" was used by some newly born Islamic takaful companies in Pakistan, a country where the dominance of conventional insurance is inevitable. The takaful firms are currently experiencing stiff competition, and it is crucial for them to achieve efficient operational performance. Studies like Ali and Asim, 2023, Nosheen et al., 2023, Qureshi and Abbas, 2019; Ishtiaq and Siddiqui, 2019; Abbas et al. 2018; Shahid et al. 2017; Noreen and Ahmad, 2016; Arshad et al., 2022, Janjua and Akmal, 2015; Afza and Aghar, 2014; Malik, 2011; Afza and Asghar, 2010 have already examined the efficiency of Takaful and conventional firms in Pakistan but the effect of efficiency on a firm's operational success has received little attention. This research will examine the effectiveness and success of Islamic takaful companies doing business in Pakistan.

Improving efficiency is a crucial goal for insurance companies. Several studies in the literature, such as those conducted by Noreen (2009), Afza and Asghar (2010), Janjua and

Akmal (2015), Arshad et al., (2022) and Hayyat et al., (2023), have estimated and associated the efficiency of Takaful and conventional insurance companies. However, these studies only focused on estimating the efficiency scores and did not investigate the economic factors that impact Takaful and conventional insurance firms in Pakistan. Since both types of insurance companies operate in Pakistan, analyzing their efficiency can help investors identify the most efficient firms and make informed investment decisions between Islamic and conventional insurance firms based on the efficiency investigation.

The determination of influences on the efficiency of insurance companies is helpful for insurance firms in knowing which factors require the most attention to improve the efficiency of the firm. The efficiency and performance of the firms are based on different factors the outcomes of this study will provide some important factors that significantly influence the efficiency of firms. This study is crucial for Takaful and conventional insurance firms, as well as strategy makers, as it can help identify weaknesses in the insurance sector in Pakistan.

Literature Review

Research on the profitability characteristics of Takaful and Non-Takaful insurance companies before and after the financial disaster was done by Asadullah et al. in 2021; Kumar & Khan, 2023. Their research used Return on Assets as a profitability metric, with independent variables including GDP, inflation, and industry-specific factors including liquidity, leverage, and size. Insights from a panel regression analysis showed that, although industry-specific factors had a mixed impact on profitability, macroeconomic variables had no impact on the insurance market's profitability during any of the three stages. Additionally, during the post-financial crisis era, it was discovered that Takaful insurance businesses had better control over liquidity than non-Takaful insurance companies, resulting in higher earnings. In a different

research, the effectiveness of Sharia life insurance in Indonesia and Malaysia from 2015 to 2018 was evaluated by DI (2020) and Aqib et al. (2023) Five Sharia life insurance firms in Malaysia and 12 in Indonesia were employed in the research. This research used the Data Envelopment Analysis (DEA) method under the premise of a variable return to scale (VRS) with input orientation. Capital, total costs, and total investment were the input factors. Total profit and total investment income were the output variables. The research showed that Indonesia had a lower average total value for Sharia life insurance efficiency compared to Malaysia. Additionally, between 2015 and 2018, Sharia life insurance's effectiveness fell in Malaysia and Indonesia. The Sharia life insurance system's inefficiency in Indonesia and Malaysia will be traced to the total costs variable. In order to compare and assess the effectiveness of conventional and Islamic life insurance companies in Indonesia from 2014 to 2018, Saputra et al. (2020) did research.

The authors selected 10 regular and 10 Shariah life insurance firms using purposive sampling. Premiums and investment income were production factors, whereas assets, capital, G&A expenses, and commission charges were input variables. Based on the BCC and CCR models, conventional life insurers outperformed Islamic ones. Shettima (2020) and Mehmood and Hayat (2022) examined how information asymmetry affects consumer impressions of conventional and Islamic insurance (Takaful) in Nigeria. Utilizing the convenience sample approach, the author distributed 200 questionnaires in Nigeria's three largest cities—Abuja, Kano, and Lagos—to analyze consumer attitudes concerning four key areas. The frequency distribution was used to analyze the data, and the paired sample t-test and chi-square test were each used to assess the association and difference hypotheses, respectively. The results showed that customers had a more negative view and comprehension of conventional insurance since there is greater information asymmetry in traditional insurance

than in Takaful. Additionally, it was shown that the overall customer experience and mood were related to education and income levels. In Indonesia, between 2011 and 2018, Ulansari & Septiarini (2020) researched the efficiency ratios of traditional insurance companies and the Islamic Sharia Business Unit (ISBU) of Sharia insurance, including life and general insurance. They employed comprehensive resources, expenses, and revenue as input and production factors. To calculate the utility benefit for each insurance sector, stochastic frontier analysis (SFA) was applied. Using independent sample t-test methodology, the efficiency values of traditional insurance providers and ISBU Sharia insurance were compared. The analysis comprised 12 ISBU Sharia insurance firms (nine Sharia life insurance and three Sharia general insurance companies) registered on the Financial Services Authority website and 28 conventional insurance companies (21 life insurance and seven general insurance companies). The study's conclusions demonstrated no difference in productivity between ISBU Sharia Insurance and traditional insurance companies. Shieh et al. (2020) carried out research to assess the effectiveness of insurance providers in China and Taiwan. With inputs like total assets and total workers and outputs like investment revenue, insurance revenue, and other income, they employed envelopment analysis to obtain the efficiency ratings. According to the survey, Taiwanese life insurance businesses were more efficient in 2008 than Chinese, with efficiency ratings in the regional border ranging from 14.01% to 26.64%.

The authors advised insurance businesses to concentrate on enhancing management in order to increase efficiency. Similarly, Benyoussef and Hemrit (2019) and Aqib et al. (2022) used data envelopment analysis to assess the effectiveness of insurance businesses in Saudi Arabia. The research used gross and capital profits as input factors, investment and claims as output variables, and efficiency ratings of Takaful and cooperative businesses in 2014. According to the data, cooperative insurance firms were less

effective than takaful insurance companies, which had more resources than cooperative companies. The authors suggested that resource allocation within cooperative insurance groups needed to be improved. The effectiveness of Islamic insurance companies in Indonesia was examined by Sarah et al. (2019) using data envelopment analysis on a dataset of thirteen businesses from 2012 to 2016. Expenses, assets, and claim payments were input factors, while investment income and premium money were output variables. The findings demonstrated that none of the thirteen firms attained efficiency throughout the study period, and all thirteen companies had inefficiencies, mostly due to high operating expenses. The authors suggested implementing regulations to enhance marketing tactics and boost efficiency to overcome inefficiencies. Using data from 2010 to 2017, Qureshi and Abbas (2019) and Mehmood and Hayat (2022) looked into what might be done to increase the profits of banks in Pakistan, including 15 regular banks and two Islamic banks. The size and type of the bank, the governance structure, and the CAMEL ratio were the explanatory variables that were employed. The results demonstrated that the CAMEL ratio and the size and type of the bank had a substantial impact on bank performance.

According to a descriptive study, compared to conventional banks, Islamic banks had higher log ratios for total deposits, the board size, total deposits, and loan loss reserve to gross loans. In order to better understand the variables affecting the financial performance of Pakistani life insurance businesses, Ishtiaq and Siddiqui (2019) conducted the research. Net premium, premium increase, liquidity, debt-to-equity ratio, inflation, market share, and gross domestic product were all identified as potential explanations in the study. The research used ROA as the primary performance indicator. Data from one publicly traded and eight privately held life insurance companies were analysed between 2008 and 2017 using the panel ordinary least square approach and the generalised method of the moment. While indicators including

underwriting risk, equity capital, inflation, debt-to-equity ratio, and capital surplus did have a statistically significant effect on the financial performance of Pakistani life insurance businesses, market share, net premium, insurance leverage, and GDP did not. Jaloudi (2019) examined and determined the parameters influencing the technical effectiveness of insurance businesses in Jordan. The research will utilize data from 22 insurance firms, which used a Logit model to identify efficiency determinants and data envelopment analysis to estimate technical efficiency. Owner equity was determined to be the most important element determining technical efficiency, and the research concluded that insurance businesses in Jordan were technically efficient throughout the period under review. The research also discovered a strong relationship between efficiency, return on assets, and the size and kind of insurance firm. Using the data envelopment approach, Nourani et al. (2018) researched the technical effectiveness of Malaysian insurance companies. The research used equity capital, business services costs, labor, and loan capital as input variables, while the premium accumulation function was used as an output variable. The study used data from 2007 to 2014. Due to excessive input utilization and a lack of investment, especially among local insurers, the findings revealed that local insurers lacked capacity in the investment capability function. Using information from 2010 to 2015, Abbas et al. (2018) and Mastoi (2022) looked at the performance analysis of traditional and Takaful insurance companies in Pakistan.

The research utilized Tobit regression to look at the factors influencing the efficiency effects and the data envelopment technique to obtain efficiency scores. The findings revealed that business size and leverage were the primary determinants of efficiency ratings, with scores for conventional and Takaful enterprises being equal. Using information from five insurance businesses from 2008 to 2015, Shahid et al. (2017) evaluated the variables that influence the performance of life insurance companies in

Pakistan. As independent factors in the research, management costs, leverage, firm size, premiums, interest rates, and GDP were employed. Sales, investment profitability, and underwriting profit will be dependent variables. Inverse relationships between company size and investment and sales profit were found, while no significant relationships were found between the dependent variables and reinsurance, interest rates, claims, or GDP. However, the variable gross written premium significantly influenced all three dependent variables. Using data from 14 life insurance companies and 18 non-life insurance businesses over eight years, Chakraborty and Harper (2017) examined the efficiency of Indian insurance companies. The research used Malmquist productivity and the data envelopment technique to assess efficiency scores and determine total factor productivity. The study found that throughout the analysed time period, productivity growth in life insurance companies slowed by 11.8%, whereas growth in non-life insurance companies slowed by just 0.4%. The Tobit regression analysis revealed a substantial correlation between the claim ratio, distribution ratio, and input cost ratio and their effects on the efficiency ratings of insurance companies.

According to the report, insurance businesses must improve their operational performance to boost client knowledge of finance and decrease their combined ratios. In order to better understand the connection between technical effectiveness and financial success in Slovakian insurance businesses, Grmanova and Strunz (2017) performed research. From 2013 to 2015, they gathered information from fifteen insurance businesses, using return on assets and asset size as dependent variables to calculate profitability. Tobit regression analysis uses to determine the variables influencing technical efficacy. The survey discovered that although some businesses were technically efficient, others were not. On the other hand, there was little effect on technical efficiency ratings from return on equity and return on assets. Using information from 2010 to 2015, Akhtar (2017)

assessed the effectiveness of Islamic and traditional insurance businesses in Saudi Arabia. The effectiveness of insurance businesses will be evaluated using data envelopment analysis, including explanatory factors such as capital structure, profitability, and market share. The results showed that from 2010 to 2015, the average efficiency score for insurance businesses was 0.83 percent. The author recommended that bigger businesses enhance their operations to take advantage of scale efficiencies. Insurance businesses' management practices must also be enhanced to increase productivity and efficiency ratings.

Using data from 2000 to 2009, Noreen and Ahmad (2016) examined the impact of financial segment changes on the effectiveness and productivity of insurance businesses in Pakistan. The information was analyzed via the data envelopment concept, the Tobit regression model, and the Malmquist index. The findings showed that Pakistani insurance businesses were 58 percent inefficient in cost because they used the wrong inputs. The overall productivity of all factors increased by around 3% in the insurance industry. Additionally, compared to private non-life insurance companies, public non-life insurance companies could have been more effective. In terms of allocation efficiency, large businesses were likewise inefficient. The authors proposed that productivity may be increased by using cutting-edge technologies and establishing a hostile atmosphere among insurance providers.

Using data from 2006 to 2011, Janjua and Akmal (2015) evaluated the effectiveness of conventional and Islamic insurance firms in Pakistan. Ratio analysis and data envelopment analysis were used to determine the economic effectiveness of insurance businesses. The findings demonstrated that Islamic insurance companies had superior cost efficiency and allocation efficiency ratings compared to traditional insurance businesses. However, compared to traditional insurance businesses, the likelihood of Islamic insurance companies entering the market was lower.

Using information from 2006 to 2012, Bawa and Bhagat (2015) assessed the effectiveness of insurance firms in Punjab state, India. The research comprised 13 insurance firms, and data envelopment analysis was employed to determine efficiency ratings. According to the report, LIC was Punjab's most influential private insurance company regarding technical efficiency, followed by Aviva and SBI. Life insurance firms were found to have a technical efficiency of 55.0 percent, a scaling efficiency of 80.5 percent, and a pure technical efficiency of 67.9 percent.

Afza and Aghar (2014) used data from 2005 to 2010 and the Stochastic Frontier Approach to perform research to assess the effectiveness of modaraba and leasing companies in Pakistan. They found that leasing businesses were 86.5 percent technically proficient, 86.4 percent profitable and 89.1 percent cost-effective, whereas modaraba enterprises were just 51. The financial crisis of 2009 had a detrimental effect on the profitability of leasing companies.

Nandi (2014) used data from 2002 to 2012 and the data envelopment approach to analyze the effectiveness of Indian insurance firms. According to the research, life insurance businesses had an average technical efficiency of 82.6 percent, pure technical efficiency of 87.5 percent, and scale efficiency of 94.7 percent. In India, the life insurance company outperformed other businesses. The author argued that less effective insurance businesses might become more effective by reducing operational costs and commission payments to boost net benefit and premium revenue.

Data envelopment analysis was used by Kader et al. (2014) to assess the cost-effectiveness of Takaful non-life insurance providers in ten Islamic nations. According to the research, the size of the business and the board had a beneficial impact on how cost-effective Takaful non-life insurance firms were. It was determined that non-executive directors had little bearing on cost-effectiveness.

Ahmad et al. (2013) used data from 2007 to 2009 using data envelopment analysis to determine the effectiveness of Malaysian life insurance businesses. The research concluded that certain insurance companies were technically efficient and advised businesses to develop marketing plans to attract clients who would be advantageous to the insurance company. Data from 2006 to 2010 and data envelopment analysis were used by Sabet and Fadavi (2013) to examine the performance of Iranian insurance businesses. According to the survey, just four businesses were effective, while the others were ineffective. The authors recommended ensuring a competitive environment to increase the effectiveness of insurance businesses in Iran.

Ansah-Adu (2012) used data from 2006 to 2008, data envelopment analysis, and regression analysis to investigate the effectiveness of Ghana's insurance businesses. Compared to non-life insurance enterprises, the research discovered that life insurance companies had a higher mean efficiency score. According to the regression's findings, market share, equity and invested assets ratios, and company size significantly affects how efficiently businesses operate. The research suggested that effective management practices were required to improve the performance of insurance businesses in Ghana.

Several studies have been carried out to assess the effectiveness and productivity of insurance businesses in various nations. For instance, al-Amri et al. (2012) employed data envelopment analysis and the Malmquist index to examine the performance of 39 insurance companies in the nations of the Gulf Cooperation Council from 2005 to 2007. The findings indicated that these businesses needed to improve since they were only moderately technically efficient. Using information from 2005 to 2009, Lin et al. (2011) and Mastoi (2022) assessed the effectiveness of the Taiwanese life insurance market. They discovered that the sector had poor efficiency ratings, yet other

businesses had increased productivity. To increase productivity and efficiency, the authors advised life insurance businesses to compete in a cutthroat environment and step up their collaboration with the financial sector.

Malik (2011) examined the variables influencing Pakistani insurance businesses' financial success. The research looked at how capital volume, loss ratio, business size and age, and leverage ratio affected profitability using data from 2005 to 2009. The findings demonstrated that, in contrast to the leverage ratio and loss ratio, size and volume of capital had a positive and statistically significant influence on profitability.

Data envelopment analysis and the Malmquist index were used by Saad et al. (2011) to assess the effectiveness of life insurance providers in Malaysia and Brunei from 2000 to 2005. The findings demonstrated that efficiency and technological advancement were responsible for the development of total factor productivity, with scale efficiency substantially impacting efficiency. Using data envelopment analysis, Bawa and Ruchita (2011) evaluated the effectiveness of health insurance providers in India from 2002 to 2010. They discovered that private-sector businesses outperformed the public sector when it came to boosting operational returns.

Using information from 2003 to 2007, Afza and Asghar (2010) assessed the effectiveness of insurance providers in Pakistan. The insurance industry in Pakistan was technically efficient, but there was space for improvement in terms of cost and allocation efficiency, according to their estimates of allocation, cost, and technical efficiency. The effectiveness of life insurance firms in China was examined by Chen et al. (2009), who found that local insurers were less effective than overseas insurers. They suggested that inefficient insurers enhance their use of inputs and that foreign insurers concentrate on scale efficiency.

Research on Taiwan's life insurance industry's effectiveness by Jeng and Lai (2008) concentrated on the effects of deregulation and liberalization. With equity capital, business services, office labor, and agent labor serving as input factors and benefit payment serving as the output variable, the research sought to determine the firms' cost, technical, and revenue efficiency. The researchers employed data envelopment analysis and Malmquist analysis to study the data. According to the report, the established domestic insurance companies threatened the newly established businesses.

Using data from 1994 to 2003, Borges et al. (2008) investigated the technical effectiveness of insurance firms in Greece. Data envelopment analysis was used to evaluate technical effectiveness with input variables, including labor cost, equity capital, and non-labour cost, and output variables, including reinsurance reserves and invested assets. According to the survey, Greek insurance businesses were technically efficient. The authors advised insurance businesses to enhance management to boost output, effectiveness, and operational scope.

Using information from 2003 to 2006, Sinha (2007) looked at how well life insurance was providers. The total number of agents, equity capital, market share, net premium revenue, and operating income were used as input variables in the research, and efficiency scores were computed using data envelopment analysis. The results showed a rise in technical efficiency in

2004, which persisted through 2005 but fell after that.

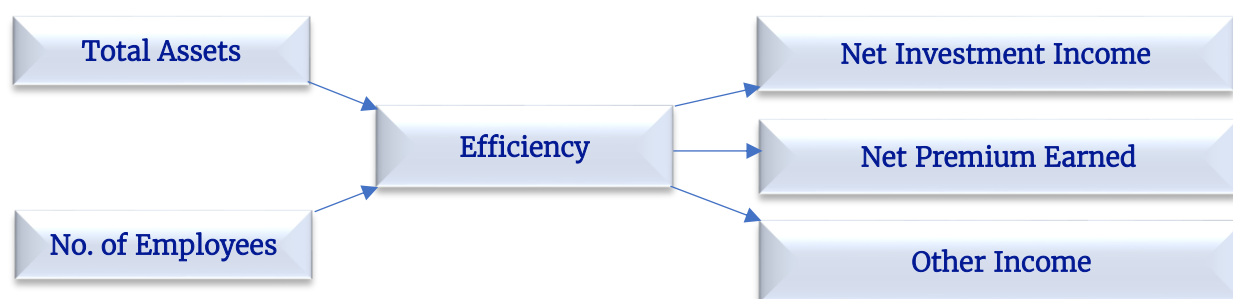
Focusing on the variables that affect efficiency, Nosheen et al. (2023) examined the effectiveness of insurance businesses using data from 1999 to 2004. In order to determine efficiency scores, data envelopment analysis was employed, and regression analysis was used to look at the efficiency-affecting variables. Efficiency was significantly influenced by company size, business model, human capital, and ownership structure. The authors recommended that businesses utilize their inputs effectively to maximize production and boost technical efficiency.

Barros et al. (2005) studied the efficiency of Portuguese insurers from a technical standpoint between 1995 and 2001. The study set out to determine which practices boost insurance business productivity. Data envelopment analysis was used, and inputs included claims and paid profits, while outputs included things like investment, capital, and premiums issued. According to the study results, the productivity of the insurance industry as a whole has gone up and down. Insurance companies may function more efficiently if their openness and governance are improved.

H1: Takaful insurance firms are more efficient than conventional insurance firms in Pakistan

H2: Takaful insurance firms are performing better than conventional insurance firms in Pakistan.

Figure 1
Theoretical Framework



Research Methodology

Sample and Data Collection

This is a quantitative research study that utilizes longitudinal data from insurance firms operating in Pakistan from 2012 to 2018. The study utilizes secondary sources of data, specifically the annual financial reports of both conventional and Takaful insurance companies. The population of the study is composed of 50 conventional insurance companies, 9 life insurance companies, and 41 non-life insurance companies, including 5 Islamic insurance firms (Pakistan Economic Survey, 2019).

For the purpose of comparing the efficiency of conventional and Takaful insurance companies in Pakistan, this study selected conventional insurance companies with asset sizes comparable to Takaful insurance companies. Out of the 45 conventional insurance companies operating in Pakistan, only four were selected for this study: Alfah Insurance Company Limited (AICL), Jubilee General Insurance Limited (JGIL), Asia Insurance Company Limited (ASICL), and Saudi-Pak Insurance Company Limited (SPIL). Similarly, only four Takaful insurance companies were selected: Dawood Family Takaful Limited (DFTL), Pak-Qatar Family Takaful Limited (PQFTL), Pak-Qatar General Takaful Limited (PQFTL), and Takaful Pakistan Limited (TPL). The data used for conducting the efficiency analysis was collected from the annual financial reports of these companies from the years 2012 to 2018, resulting in a total of seven years of data.

Data Analysis and Discussion

Descriptive Statistics

The average net premium revenue of the Takaful firms in 2012 is 938568579Rs, the minimum value is 3144491000, and the maximum net premium revenue earned in 2012 is

3144491000Rs. The average investment income of the Takaful firms in 2012 is 40433962.3Rs, the minimum value is 22014167, and the maximum investment income in 2012 is 65119682Rs. The average other income of the Takaful firms in 2012 is 1660220Rs, the minimum value is 32000Rs, and the maximum other income earned in 2012 is 4930980Rs. The number of employees in the Takaful firms in 2012 is 279, the minimum value is 179, and the maximum number of employees in 2012 is 354. The average total assets of the Takaful firms in 2012 are 1535927697Rs, the minimum value is 498099000Rs, and the maximum value of total assets in 2012 is 3929089000Rs.

Descriptive Analysis of Takaful and Convectional Insurance Firms

In the efficiency analysis, it has been observed that the conventional insurance industry originated to be the efficient insurance industry. Descriptive analysis of the variables that have been used to compute the efficiency scores is important this analysis is helpful in determining and comparing the assets, premium earned, other income, and number of employees. This analysis answers the question of why conventional insurance firms are found to be more efficient firms in Pakistan during the period under consideration. The average value of all input and output variables of the conventional insurance firms is greater than the average value of all the input and output variables of Takaful insurance firms. It suggests that the high large size, high value of the investment and other income, more number of employees, and high value of net premium revenue leads the conventional insurance firms to become more efficient in terms of technical, allocative and cost efficiency.

Table 1

Comparative Analysis of Descriptive Statistics of Takaful and Conventional Insurance Firms in Pakistan (Million Rupees)

Type	Takaful				Conventional			
Variables	Min	Max	Mean	SD	Min	Max	Mean	SD
NPE	26.22	6316.77	1203.43	1807.70	29.00	4923.00	1388.00	1596.82
ININC	1.19	73.41	26.06	17.83	10.17	1111.44	254.08	388.31
OINC	0.03	48.11	4.41	8.93	0.21	134.88	31.42	40.27
NEMP	58	608	278	169.227	45	734	329	217
TASTS	448.04	21895.90	4367.08	6043.39	529.82	21313.20	4974.78	6499.70

Efficiency Analysis of Takaful and Conventional Insurance Firms

Table 2 presents the efficiency scores of Takaful and conventional insurance firms. The results indicate that the Takaful insurance industry in Pakistan was highly technically efficient in 2012, with a technical efficiency score greater than that of conventional insurance firms. However, apart from the year 2012, conventional insurance firms were found to be more efficient in terms of technical, allocative, and cost efficiency. The average technical efficiency score of Takaful

insurance firms was 0.730, whereas the conventional insurance firms had an average score of 0.890, indicating that conventional insurance firms were more technically efficient than Takaful insurance firms during the study period. Similarly, the allocative and cost-efficiency scores were also found to be greater for conventional insurance firms, suggesting that they were technically, allocative, and cost-efficient from 2012 to 2018. Based on these findings, the null hypothesis that conventional insurance firms are more efficient than Takaful insurance firms in Pakistan is accepted.

Table 2

Comparative Analysis of the Takaful and Conventional Insurance Industry

Company	Takaful			Conventional		
Years	TEE	ALE	COE	TEE	ALE	COE
2012	0.920	0.188	0.173	0.768	0.458	0.352
2013	0.653	0.496	0.324	0.866	0.475	0.411
2014	0.620	0.425	0.263	0.899	0.476	0.428
2015	0.719	0.637	0.458	0.932	0.476	0.444
2016	0.777	0.421	0.327	0.959	0.566	0.543
2017	0.770	0.502	0.387	0.939	0.647	0.607
2018	0.652	0.585	0.381	0.870	0.508	0.442
Average	0.730	0.465	0.330	0.890	0.515	0.461

Correlation Analysis

A correlation coefficient was calculated to investigate the closeness and direction of the relationship between the two variables. A

coefficient value of 1 indicates a perfect or 100% correlation between the variables, whereas a value of 0 indicates no association. The greater the proximity of the correlation coefficient to 1

indicates a strong relationship between the variables being measured. The direction of the relationship may be inferred from the sign of the correlation coefficient. Both variables have a positive correlation if the sign is positive and a negative correlation if the sign is negative. Table 4.10 shows the correlation matrix of the variables. It can be analyzed that technical efficiency is positively correlated with cost efficiency, allocative efficiency, total assets (TASTA),

investment income (INVI), other income (ONVI), the net premium earned (NPE) and the number of employees (NEMP). The correlation coefficient value between technical efficiency and cost efficiency is 0.456 which indicates that as the technical efficiency increases the cost efficiency also increases by 0.456 units. Likewise, the correlation between different variables can be analyzed in Table 3.

Table 3

Correlation Analysis

Variables	TEE	COE	ALE	TASTA	INVI	OINC	NPE	NEMP
TEE	1.000							
COE	0.456	1.000						
ALE	0.136	0.909	1.000					
TASTA	0.279	0.750	0.657	1.000				
INVI	0.338	0.675	0.554	0.696	1.000			
OINC	0.398	0.744	0.602	0.519	0.773	1.000		
NPE	0.362	0.745	0.638	0.953	0.637	0.477	1.000	
NEMP	0.195	0.757	0.775	0.853	0.745	0.568	0.811	1.000

Discussions

The effectiveness of financial institutions is frequently evaluated based on how well they meet their goals with limited means. This research aimed to compare and contrast the performance of Takaful and Conventional insurance providers in Pakistan. To do this, we compiled information from eight different insurance providers covering 2012–2018, including four Takaful insurers and four traditional insurers. We used Data Envelopment Analysis (DEA) to derive technical, cost, and allocative efficiency scores using information from the companies' annual financial reports. To conduct the DEA analysis, we utilized STATA and Excel. Investment income, net premium revenue, and other income were the study's outcomes, with total assets and workers serving as the inputs. We factored in the labour cost and helped determine how efficient we were. The cost of delivery was determined by dividing the total

payroll by the total number of workers, whereas the price of assets was determined by dividing total depreciation by the full value of those assets. Once we had our efficiency ratings, we fed them into a Tobit regression model to see the variables associated with higher efficiency.

We found that the Takaful insurance industry in Pakistan was highly technically efficient in 2012, with a higher technical efficiency score than conventional insurance firms. However, over the entire period from 2012 to 2018, conventional insurance firms were found to be more efficient in terms of technical, allocative, and cost efficiency. The average technical efficiency score for Takaful insurance firms was 0.730, while conventional insurance firms had an average score of 0.890, indicating that conventional insurance firms were more technically efficient than Takaful insurance firms during the study period. Similarly, allocative and

cost efficiency scores were also higher for conventional insurance firms, indicating that they were more efficient in these areas as well. Based on these findings, we accepted the null hypothesis that conventional insurance firms are more efficient than Takaful insurance firms in Pakistan.

After analyzing the data of four Takaful and four conventional insurance firms from the period 2012 to 2018, it was observed that Jubilee General Insurance Limited was the most efficient firm in terms of technical, allocative, and cost efficiency among all insurance firms in Pakistan. Pak-Qatar General Takaful was found to be the most technically efficient (0.855), while Pak-Qatar Family Takaful was found to be the most allocative (0.703) and cost-efficient (0.597) among all Takaful insurance firms in Pakistan. The highest technical efficiency score was observed in the year 2016 (0.868), indicating that the insurance industry in Pakistan was technically efficient during that year. On average, the technical efficiency score was 0.810, the allocative efficiency was 0.490, and the cost efficiency was 0.407. Furthermore, the Tobit regression model showed that investment income, size of the firm, and number of employees significantly affect the efficiency scores of insurance companies.

Conclusion

The analysis showed that conventional insurance firms were more technically, allocative, and cost-efficient than Takaful insurance firms from 2012 to 2018 in Pakistan. Based on this, the null hypothesis was accepted that conventional insurance firms are more efficient than Takaful insurance firms. Additionally, Tobit regression estimates revealed that investment income, firm size, and number of employees significantly affect the efficiency scores of insurance companies.

To improve their technical, allocative, and cost efficiencies, both conventional and Takaful insurance firms should minimize costs and user

input and output variables that enhance cost efficiency. Takaful insurance firms, being relatively new entrants in Pakistan compared to conventional insurance companies, need to focus on cost minimization to increase their profits.

The study offers several recommendations to improve the efficiency and performance of both Takaful and conventional insurance firms in Pakistan. To maximize efficiency scores, it is crucial to achieve an optimal level of inputs and reallocate resources effectively. Improving managerial skills can also help in achieving full efficiency scores. Decreasing management expenses and operating costs can help increase profitability by enhancing cost efficiency. Investing income in profitable and healthier projects can be a positive determinant of technical, cost, and allocative efficiency. To increase market share, Takaful firms should focus on expanding their customer base under the Shariah-compliant Takaful system. As conventional insurance firms are found to be larger than Takaful insurance firms and firm size is a positive determinant of efficiency scores, Takaful firms should adopt policies to enhance their size and improve their efficiency scores.

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