



Full length article

# A Comparative Performance Analysis of Non-Life Insurance in Tanzania and Kenya

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## ABSTRACT

This study compares the performance of non-life insurance in Tanzania and Kenya. Specifically, the study compares the Technical and Scale Efficiency (TSE) of non-life insurance in the two countries. It further explores the sources of technical inefficiency in non-life insurance in Tanzania and Kenya. The study employs Data Envelopment Analysis (DEA) to estimate the efficiency of the non-life insurance firms by adopting two inputs: management expenses and commission paid, while premiums written, and net investment income were used as output variables. Data were extracted from the annual reports of non-life insurance companies in Tanzania and Kenya for the years 2014-2017 (four years). The study revealed that non-life insurance firms in Tanzania were more technical and scale efficient compared to their Kenya counterparts. When technical efficiency was further decomposed into pure and scale efficiency to examine what largely caused inefficiency, it was revealed that in both Tanzania and Kenya, inefficiency is largely derived from a lack of technical efficiency, which reflects issues of innovation in the sector, inappropriate management practices, operating at sub optimal size of operation and misallocation of resources in production system. This study offers information relevant for investors and policymakers to make informed decisions in the insurance sector in both countries. It further guides insurance firms on the important inputs and proper allocation of the resources in the production system. The findings also contribute to our growing understanding of the effectiveness of non-life insurance in the insurance markets of the two nations.

## 1. Introduction

The financial sector is an integral part of a financial system whose main role is to facilitate the smooth flow of funds from surplus spending units to deficit spending units and vice versa. This is done by extending loans to qualifying businesses (or individuals) who can expand their investment, providing mortgage home buyers and protecting people or companies and their assets. The sector is also very important when it comes to economic development since it promotes savings for retirement (take the example of pension funds) and also the sector

provides employment opportunities. Munangi and Sibindi (2022) added that the financial sector plays a key role in improving economic development. Therefore, friendly and attractive lending strategies are quite imperative since debt is the largest part of finance. Shapoval et al., (2022) contended that the financial system enables the distribution of financial resources, which eventually leads to sustainable economic development. Banking financial institutions make their revenue from loans as well as mortgages, derived from changes in interest rates. For example, when interest rates decline, the economy attracts more new capital projects as well as investment, which calls for more loans from the financial sector. Such a move will benefit the financial sector (particularly banking financial institutions) and eventually further economic growth. Banking and other financial institutions have reached far to ensure sustainable development by contributing towards the realization of some sustainable development goals by focusing on green finance; this implies that the sector is trying to connect financial performance with climate change (Rahman et al., 2022; Mohanty et al., 2023; Kumar et al., 2023).

The good performance and growth of the financial sector are regarded as one of country's most important inspirations. Feye et al., (2011); Kumar (2023); Bearley (2023) argued that there are causal relationships between the development of the insurance sector and economic growth. Research shows that when non-life insurance performs better, it contributes to economic development and risk management (Nyabundi et al., (2023); Joseph and Yusuph, 2021). This is due to the fact that the economic progress of the country largely depends on the performance of the financial sector. Shahid *et al.*, (2010) contended that there is a strong relationship between economic performance and the health of the financial sector. The insurance industry being an integral part of the financial sector, literature stresses that an effective and more productive insurance industry in the country will largely contribute to its economic performance. Literature also reports that one of the means through which security of business and transactions can be guaranteed is through the insurance services in the economy, since they provide security to society as well as businesses for goods and properties. In sub-Saharan Africa, Kenya has the third-lowest insurance penetration rate, with South Africa at 17%. This is because the majority of Kenyans view insurance as a "nice-to-have/easy-to-discard" item rather than a necessity. Kenya has 58 insurers and reinsurers; however, CIC, Jubilee, Britam, ICEA, Lion General, and APA Insurance dominate the industry. With 60% of all gross written premiums in the sector, non-life insurance dominates (KPMG, 2021). In Tanzania, life insurance and general insurance are the two most important market segments, and a large portion of the population lacks any form of insurance. Insurers are developing new products to fill this gap, but low household income, a lack of awareness of insurance among the public, and a negative perception of claims settlement are obstacles to the penetration rate of the insurance sector.

In 2021, the Tanzanian insurance market's gross written premium was TZS974.6 billion (\$417.2 million). From 2021 to 2026, the market is projected to grow at a CAGR of over 8%. Sanlam Life Insurance Ltd (Tanzania), Alliance Life Insurance Co. Ltd, Jubilee Life Insurance Co. (T) Ltd, National Insurance Corp. (T) Ltd, Metropolitan Tanzania Life Assurance Co. Ltd, The Jubilee Insurance Co. (T) Ltd, Strategis Insurance (T) Ltd, and Alliance Insurance Corp. Ltd are a few of the major insurance providers in Tanzania's insurance market. Sanlam Life dominated the life insurance industry in 2021. The business provides whole life, term life, endowment, and microinsurance, among other types of life insurance.

The non-life insurance sector constitutes a crucial component of the financial landscape in both Tanzania and Kenya. It plays a pivotal role in risk management and economic stability. However, despite its significance, a comprehensive analysis of the operational efficiency of non-life insurance firms, specifically within the contexts

of Tanzania and Kenya, is conspicuously absent. While both countries have experienced substantial growth in their respective non-life insurance industries, there exists a considerable knowledge gap regarding the nuanced aspects of efficiency and the potential areas for enhancement.

The motivation for this research stems from the critical role that the non-life insurance sector plays in the economy of both Tanzania and Kenya. As the two countries continue to experience economic growth and development, it becomes imperative to understand and enhance the efficiency of their non-life insurance industries. This study is motivated by several key factors; for example, the non-life insurance sector serves as a cornerstone of financial stability, providing essential risk mitigation services to individuals, businesses, and various sectors of the economy. By conducting a comparative analysis, we aim to identify potential areas for improvement in both Tanzania's and Kenya's non-life insurance industries. Policymakers in Tanzania and Kenya are increasingly interested in fostering a competitive and efficient financial sector. Understanding the technical and scale efficiency of non-life insurance firms will provide critical insights for crafting policies that promote a robust and resilient insurance industry. Comparing the efficiency of non-life insurance firms across Tanzania and Kenya offers an opportunity for mutual learning. Identifying best practices and potential inefficiencies in both countries can lead to knowledge exchange and collaborative efforts to strengthen the industry. In view of the empirical literature on the insurance performance in Tanzania and Kenya, this study generally tries to cover the existing gap in the comparative analysis of the technical and scale performance of the insurance firms in the two countries. The performance in this regard is measured by analyzing the efficiency performance of the non-life insurance. Specifically, the study focuses on:

- i. Comparative analysis of Technical efficiency of non-life insurance in Tanzania and Kenya
- ii. Comparative analysis of Scale efficiency of non-life insurance in Tanzania and Kenya
- iii. Examine the sources of Technical inefficiency of non-life insurance in Tanzania and Kenya.

Findings from this study may be quite fruitful to investors in the insurance sector in Tanzania and Kenya, since East African countries are on the move to liberalize and reduce restrictions on investment and trade among themselves. This is because investors' would like to direct their funds or capital into markets where there are favorable conditions that allow the business to flourish and operate efficiently. Findings may also be useful to the ministries responsible for finance in the two countries, as they may use the results regarding the sources of inefficiency to propose and demand effective policies that will strengthen the performance of the insurance industry as well as the financial sector as a whole. The remaining part of this study is organized as follows: section two is methodology, which narrates techniques involved in the data selection, data sources, variable specification, techniques involved in the data analysis and selection of the general study design. Section three presents the findings and discussion as well as the implications of the result, while the conclusion and recommendations are presented in Section four.

## **2. Literature Review**

Efficiency analysis of the financial sector has been one of the fastest-growing areas of literature in the market. Financial technology is one of the aspects that contribute to efficiency in the financial sector (Ratnawati et al.,2023). Several efficiency studies on the insurance industry have been carried out in recent decades using both parametric and non-parametric approaches. For example, in the US, Gardener and Grace (1993)

examined the efficiency of 561 insurance firms and revealed that some inefficiencies were caused by internal and external factors. Cummins and Xie (2013) also estimated the efficiency of 781 insurance firms (property and liability) in the US from 1993 to 2009 and revealed that some firms were operating at a decreasing return to scale (DRS).

In Europe Fecher *et al.*, (1993) compared the performance of life insurance and non-life insurance firms in France from 1984 to 1989 and revealed that non-life insurance is more efficient compared to the life insurance. Cummins and Turchetti (1996) carried out a study on the efficiency and productivity growth of the Italian insurance sector using a parametric (Stochastic Frontier Approach) and revealed that the efficiency level of insurance sector ranges from 70 to 78%. Noulas *et al.*, (2001); Cummins and Rubio (2001) examined the Greece and Spanish insurance sector simultaneously and revealed that the firms manifested decreasing return to scale (DRS).

In China, Hu *et al.*, (2009) examined the efficiency of the insurance industry from 1999 to 2004 and revealed that there is a relationship between ownership structure and efficiency. It was further reported that insurance firms in China are mixed efficient; initially as well as at last, the firms were performing efficiently, while during the middle, they were less efficient. Another study conducted in China investigated how Chinese non-life insurance companies' operating efficiency is impacted by their intellectual capital (IC). It was found that the effectiveness of insurers decreased virtually monotonically and thus operating efficiency is strongly and favorably correlated with human capital, structural capital, and relational capital (Kweh *et al.*, 2014).

Some researchers in Africa also studied the efficiency and productivity of insurance firms in their countries, for example, Alhassan and Biekpe (2015) examined the efficiency and productivity of the insurance market in South Africa, while Barros and Wanke (2014) examined the efficiency and capacity slack of the insurance sector in Mozambique. Findings from both studies report the existence of technical inefficiency in the sector in the two countries. In Tanzania, Ally and Bwana (2020) examined the efficiency of the non-life insurance firms, their findings revealed that 68% of the firms were found to be efficient, while 32% were less efficient. It was further revealed that 74% manifested efficiency above the average. In another study by Bwana (2021), the productivity of 19 non-life insurance in Tanzania was examined and the findings revealed that 94.5% of non-life insurance firms were experiencing an improvement in productivity by 54.6 % and the productivity was largely derived from efficiency change (catch up effect). Further, only one company was suffering a decline in both efficiency change, and technical efficiency change by 5.8% and 1.2%, respectively. Wanyama and Olweny (2013) conducted a study on the effect of corporate governance on the financial performance of insurance firms in Kenya, while the Owuor (2018) conducted a study on the impact of disruptive technology on the performance of insurance firms in Kenya.

The insurance sector is one of the important parts of the financial sector which also forms a section of the country's economy. The financial sector comprises different financial institutions which render financial services in wholesale and retail forms, such financial institutions include but not limited to banks, investment firms, insurance firms and real estate companies. It is believed that for country's economy to remain strong it is supposed to have a health financial sector. On the other hand insurance firms operate business models by assuming and spreading the risk. In other words the model involves pooling risks and resources from individual insurers and spread it across a larger number of people with similar exposure. Specifically, most insurance

firms make revenue through two approaches: firstly, through premiums charged according to insurance coverage policy. Secondly, after receiving premium then insurance firms may reinvest the premiums into other assets (financial assets) which are interest-generating.

In world of competitive market, insurance firms are striving to minimize the costs and operate efficiently in order to maintain sustainability. Generally, firms' efficiency implies how well they utilize the available resources to produce a given level of output, and an efficient firm also implies performance with the least utilization of the resources. Literature stresses that for insurance firms to operate efficiently, management must observe *Cost Theory*. Cost theory is very applicable to the insurance sector as it helps insurance firms accurately establish costs. As far as the cost in the insurance sector is concern, there are three elements that firms must consider; *cost of claims* - in this regard the firm is required to consider all cost associated with claim (i.e factor that influence probability of loss occurrence, cost of repair and replacing the assets) when setting the insurance premium; *cost of production* – insurance firms also need to be very cautious with production cost when establishing the price of insurance premiums, these cost involves management expenses, salaries, rent and marketing expenses. Proper management in production cost will help to optimize the production of insurance firms; *cost of capital* – this involves the considering cost of capital when investing the insurance premiums, this will give assurance of the viable investment decision that maximize their returns while minimizing their risks. Therefore, performance of the insurance firms is largely built on the extent to which the cost theory has been effectively adopted. Adam Smith is regarded as the father of modern economics in his work, "*The Wealth of Nations*," published in 1776, he narrated the concept of cost of production and its relationship to the price of goods (in this study the price of goods is the insurance premiums charged by insurance firms). Smith argued that the cost of production was the most important factor in determining the price of goods in a competitive market.

### **3. Methodology**

#### **3.1. Model and variables selection**

This study employs Data Envelopment Analysis (DEA) to estimate the efficiency of the non-life insurance firms in Tanzania and Kenya. DEA is a mathematical programming technique widely used in estimating the efficiency and productivity of firms. DEA has been widely used to measure various social and economic systems (Jung et al.,2023). Thu and Xuan (2023); Cao (2023) added that DEA compares the inputs to output ratio to establish the most efficient firms (in this case insurance firm). DEA can help identify best practices in the allocation of resources among a number of organizations. The main goal of DEA is to assess how effectively Decision Making Units (DMUs) make decisions when there are numerous inputs and outputs. Since the DEA technique compares the relative efficiency of similar units, it is better suited for efficiency evaluation. A data-oriented strategy for assessing the effectiveness of a collection of homogeneous DMUs is called DEA. This method makes sure to specify how current resources can be used efficiently to produce DMU outputs (Xu et al.,2020).

One of the main advantages of the DEA model is that it allows comparison of firms' efficiency, since it benchmarks against the frontier which is established by DEA through joined piecewise linear established based on linear programming (Al-Shammari, 1999; Farrell et al., 1957). Farrell (1957) introduced the concept of the efficiency frontier, and added that the efficiency performance of any firm involved technical and allocative efficiency. He defined technical efficiency as the ability to minimize inputs for the production of the given level

of outputs or maximize production of outputs at given level of inputs. Taking regard of insurance firms in Tanzania and Kenya, this study employed Technical efficiency to comparatively analyze the performance of non-life insurance firms of the two countries. In view of the same, firm's efficiency implies that an insurer produces a given set of outputs (i.e. Premiums and Net Investment) using a particular set of inputs (i.e management expenses and commission paid). An insurer is said to be technical efficient if it is unable to increase/decrease its output level without some proportional increase/decrease in its input level, provided a given state of production technology in the industry. Literature revealed that there are several methods of analyzing efficiency performance of the firm (such as ratio analysis, parametric and Non-parametric technique) however this kind of study opted to use Data Envelopment Analysis (DEA) which is non-parametric approach due to its relevancy in the study. DEA does not require behavioral assumptions (such as normality assumptions), the other reason is that the model is appropriate in measuring efficiency when the prices of inputs and outputs are not known publicly or are not presented in the report (annual reports), since this study extracted secondary data from annual reports of non-life insurance firms in Tanzania and Kenya, and the report do not clearly state the price of the inputs and outputs.

Input variables are resources which are used in the production process in order to be transformed to outputs. Inputs differ from one organization to another depending on the nature of the business. This study adopted two inputs which are *management expenses* and *commission paid*. Management expenses involved commissions, brokerage charges and remuneration to agents while commissioned paid is the amount paid to brokers as percentage of the premium on the insurance policies. The input variables have been used because according to Radhika & Satuluri, (2019) management expenses and commission paid forms large proportion of insurance firms total cost. Furthermore various scholars have used the same variables (Table 1). Outputs are the outcome of the insurance firms operating activities, this study employed premium written and net investment income as the outputs of the non-life insurance firms in the two countries. Table 1 presents inputs and outputs used in the study and the same variables were adopted in the previous studies.

**Table 1: Variables Description and How They Were Used in Previous Similar Studies**

<b>Inputs</b>		<b>Adoption of the variables in previous studies</b>
1	Management expenses	Abidin, Z., and Cabanda, E. (2011). Efficiency of non-life insurance in Indonesia; Ally and Bwana (2019) Performance of insurance firms in Tanzania; Al-Amri, K., Gattoufi, S., and Al-Muharrami, S. (2012). Analyzing the technical efficiency of insurance companies in GCC
2	Commission paid	Ally and Bwana (2019) Performance of insurance firms in Tanzania
<b>Outputs</b>		
1	Premium written	Abidin, Z., and Cabanda, E. (2011). Efficiency of non-life insurance in Indonesia; Ally and Bwana (2019) Performance of insurance firms in Tanzania
2	Net investment income	Fan, C. K., & Cheng, S. W. (2009). An efficiency comparison of direct and indirect channels in Taiwan insurance marketing; Abidin, Z., & Cabanda, E. (2011). Efficiency of non-life insurance in Indonesia Ally and Bwana (2019) Performance of insurance firms in Tanzania; Al-Amri, K., Gattoufi, S., & Al-Muharrami, S. (2012). Analyzing the technical efficiency of insurance companies in GCC Countries

### 3.2. Data sources and Techniques of data analysis

Data were extracted from annual reports of the non-life insurance firms from Tanzania and Kenya. The said report were obtained from the database of the Tanzania Insurance Regulatory Authority (TIRA) and Insurance Regulatory Authority (IRA) for Kenya, the study period covered the year 2014-2017 (four years). Regulatory authority in both countries require insurance firms to prepare and publish their report annually. The study employed 19 and 37 non-life insurance firms from Tanzania and Kenya respectively.

Max DEA5 program was employed to perform comparative efficiency analysis of 19 and 37 non-life insurance in Tanzania and Kenya respectively. During the analysis both the Constant Return to Scale (CRS) and Variables Return to Scale (VRS) model were adopted since the study involved comparative analysis of insurance firms of two different countries. First the study used input oriented model which reflects CRS assumption. The model is widely known as the Charness, Cooper and Rhodes (CCR) - model following the names of profounder authors who advocated the model, Charness, Cooper, and Rhodes (1978). On the other hand, the VR were also adopted. The Data Envelopment Analysis (DEA) model has been widely adopted in measuring efficiency performance. DEA is derived from the formula presented in linear programming as follows:

$$TE_j = \frac{\sum_{r=1}^s U_r Y_{rj}}{\sum_{i=1}^m V_i X_{ij}} \dots\dots\dots 1$$

Equation 1 denote Technical efficiency of firm *j* using *m* inputs to produce *s* outputs, where *U<sub>r</sub>* and *V<sub>i</sub>* explains the weights of the outputs and inputs variables respectively. *Y<sub>rj</sub>* represents the quantity of outputs *r* produced by firm *j* while *X<sub>ij</sub>* represents the amount of inputs *i* consumed by firm *j*. While *s* is number of outputs, *m* is number of inputs and *n* is the number of insurance firms to be evaluated.

Subject to  $TE_j = \frac{\sum_{r=1}^s U_r Y_{rj}}{\sum_{i=1}^m V_i X_{ij}} \leq 1 \dots\dots\dots 2$

$V_i \geq 0$  for  $i = 1, \dots, m$ , and  $U_r \geq 0$  for  $r = 1, \dots, s \dots\dots\dots 3$

According to Charness *et al.* (1978) efficiency is the result of maximum ratio of weighted outputs to weighted inputs subject that similar ratios for every firm (decision making unit) be less or equal to unity (see equation 2). A unit is viewed as scale efficient if its size of operations is optimal to the extent that any modifications on its size will render the unit less efficient. The value for scale efficiency is computed by dividing the aggregate efficiency by the technical efficiency. There are many reasons of technical inefficiency. If a company is operating at an inappropriate size (either too small or too large) it is termed as scale inefficient. While, a company using its inputs and outputs in wrong proportions is termed as mix inefficient. Cummins & Santomero (1999) and Cummins, Weiss & Zi (1999) have discussed the potential sources of inefficiency in detail.

### 4. Findings and Discussion

Findings revealed that non-life insurance in Tanzania were more scale efficient (85.5%) compared to their Kenya counterparts (69.5%), it was also found that most of the insurance firms in Tanzania were operating close to

their optimal size due to small standard deviations of 15.01% compared to 32.4% of Kenya counterparts. The performance in Tanzania could be attributed to improved productivity which was noted by Bwana (2021). In Tanzania, observed technical efficiency score of non-life insurance score varies from 0.0914 to 1 with mean of 0.5416 (which is above the average) while in Kenya the observed technical efficiency varies from 0.0018 to 1 with the mean score of 0.158.

**Table 1: Descriptive statistics of Technical, Pure and Scale efficiency for Tanzania firms**

Variables	Observation	Mean	Std. Dev	Min	Max
Technical efficiency	76	0.5416717	0.2151549	0.091494	1
Pure technical efficiency	76	0.6378095	0.2336977	0.149421	1
Scale efficiency	76	0.855129	0.1501856	0.441039	1

This implies that the degree of the variability from the average scale efficiency was lower among the Tanzania non-life insurance compared to Kenya's firms, this also reflect high inconsistency in the operation among Kenya's firms compared to Tanzania firms (*Table 1 & 2*). The lower variability in Tanzania is confirmed by Bwana (2021) who found that most insurance firms in Tanzania had small standard deviation of 15.01 percent and this was related to optimal size operation. Therefore relative high variability from the average scale efficiency among Kenya's firms (32.4 percent) implies that they are relatively not operating close to their optimal size.

**Table 2: Descriptive statistics of Technical, Pure and Scale efficiency for Kenya's firms**

Variables	Observation	Mean	Std. Dev	Min	Max
Technical efficiency	148	0.1583031	0.2031614	0.001804	1
Pure technical efficiency	148	0.2266013	0.2310576	0.02967	1
Scale efficiency	148	0.6956206	0.3241146	0.013847	1

Findings revealed that in Kenya there were six firms experiencing Constant Return to Scale, (CRS) which means an increase in inputs will cause an equivalent increase in output variable. This suggests that the average over the long term of firm's inputs and outputs is proportionate to each other. In other words, the value of their output increases by the same percentage as the cost of the input variable. For these six firms in Kenya, when management expenses and commission paid are increased they result in the same percentage increase in premium written and net investment income. Furthermore, eight firms manifested Decreasing Return to Scale (DRS) implying that for these firms increase in an input variable will yield a smaller proportional increase in an output variable. Consequently, the ratio of the increase in input to the rise in output will be less. For these eight firms when management expenses and commission paid are increased by a certain percentage they result in a less percentage increase in premium written and net investment income. In general, this is a negative situation since firms are paying more in management costs and commissions than they are improving their productivity as a result, which raises the cost of their inputs. Further, 10 firms experienced Increasing Return to Scale (IRS) which implies that their output variables increase by a larger proportion when an input variable is increased. A bigger proportional rise in output (quantity) than input (cost) increase is required for increasing returns to scale. For most firms, increasing returns to scale is a desirable objective.

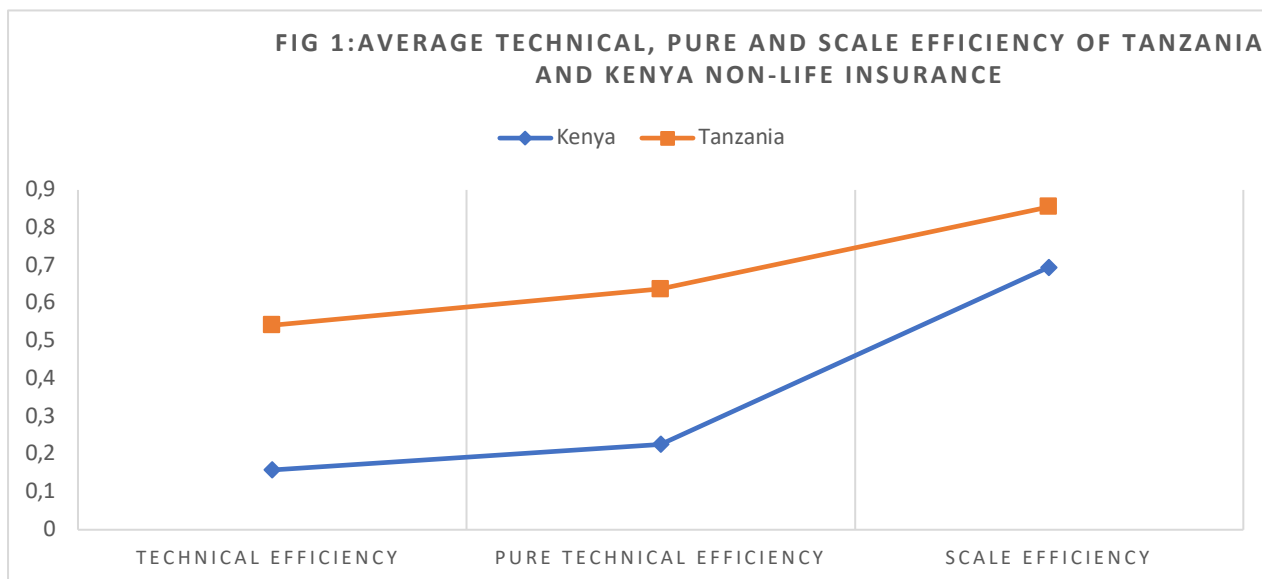


In Tanzania six firms at least in one year were experiencing Constant Return to Scale (CRS), 10 firms manifested Increasing Return to Scale (IRS) and the remaining firms showed mixed results. 31 non-life insurance out of the 37 score above the average over the study period. Mean average of the scale efficiency was 69.5 percent (Table 2). As far as Tanzania is concerned all 19 non- life insurance firms score above the average scale efficiency. Mean average of scale efficiency is 85.5 percent. Findings further revealed that one out of the 37 Kenya’s firms score above the average during the study period and mean average technical efficiency score of all firms was 15.8 percent (Table 2), on the other hand 11 out of 19 Tanzania’s firms score above the average and mean average technical efficiency was 54.16 percent.

**Table 3: Mean Average Technical efficiency, Pure Technical efficiency and Scale efficiency**

	<i>Technical Efficiency</i>	<i>Pure Technical Efficiency</i>	<i>Scale Efficiency</i>
<b>Kenya</b>	0.1583	0.2266	0.6956
<b>Tanzania</b>	0.5416	0.6378	0.8551

Using DEA model the Technical efficiency of the firm can further be decomposed into pure efficiency and scale efficiency so as to examine what largely causes the inefficiency of the firms under scrutiny. Findings indicate that the inefficiency of non-life insurance firms in Tanzania is largely derived by a lack of technical efficiency which reflects issues of innovation in the sector as result reflect a relatively higher average of scale efficiency (85.55 percent) as compared to pure efficiency (63.78 percent). On the other hand, the inefficiency of non-life insurance in Kenya was also largely influenced by a lack of technical efficiency since the result shows a relatively higher average of scale efficiency (69.56 percent) relative to pure technical efficiency of 22.66 percent. As far as the scale of operation is concerned it was found that the majority of non-life insurance firms in Tanzania were operating close to their optimal size compared to Kenya’s counterparts, this is evident by the average scale efficiency of 85.51 percent compared to the average scale efficiency of 69.56 percent. Similar results were obtained by Bwana (2021) who found that optimal size operation contributed to increased efficiency in non-life insurance firms in Tanzania. Furthermore, Gardener and Grace (1993) conducted a study in the US and found that inefficiency in the insurance sector is caused by both internal and external factors. Lack of technical efficiency and scale of operation are also some of the internal factors.



Non-life insurance could be running under Increasing Returns-to-Scale (IRS) which implies that the firms experience economies of scale as it produce more (therefore manifest sub-optimal scale). Alternatively, the non-life insurance could be running under Decreasing Returns-to-Scale (DRS) which implies that the firms experience diseconomies of scale as it produces more (therefore manifest supra-optimal scale). Out of 19 firms in Tanzania, 8 were experiencing Increasing Return to Scale (IRS) while 7 (36.8 percent) were experiencing Decreasing Return to Scale (DRS) and 4 were experiencing Constant Return to Scale (CRS). On the other hand, in Kenya out of 37 firms only 1 firm manifested IRS while 4 experienced CRS and the remaining 32 (86.5 percent) firms were experiencing DRS. This implies that only 21.05% of non-life insurance in the sector were operating at their optimal scale in Tanzania, while only 10.8% of the firms in the sector were operating at optimal scale in Kenya. This also implies that such firms experiencing CRS have the optimum size or most productive scale size, and such insurance firms operate at (the bottom or) a flatter portion of the long-run average cost curve. On the other hand, findings also report that 36.8% of all insurance firms were operating above their optimal size in Tanzania while in Kenya 86.4% of all firms were operating above their optimal size. It was further revealed that 42.11% of all firms in Tanzania have room to expand their scale of operation, since they were operating below their optimal level. While in Kenya only 2.7 % of all firms have a room to expand their scale of activities. Therefore it is generally observed that most firms in the two countries experience DRS which signifies inefficiency in the use of resources (inputs). Similar results was observed by (Cummins and Xie, 2013; Noulas *et al*, 2001; and Cummins and Rubio 2001) in Greece and Spanish insurance sectors that firms were operating at DRS. This implies that when firms increases their production (output) they experience diseconomies of scale.

Generally, technical efficiency can further be decomposed into Pure Technical Efficiency (PTE) and Scale Efficiency (SE). It is important to note that PTE also measure underutilization of resources, especially managerial ability to organize resources in production. On the other hand scale efficiency measure selection of the scale of the firm's activities (operation) given its size. Findings revealed that Tanzania non-life insurance firms were performing well in aspects (TE, PTE and SE) compared to their Kenya counterparts. However, significant variations were noted on the TE and PTE (Figure 1).

Therefore the extent of technical inefficiency of non-life insurance in Kenya show that 77.34 % of 0.8417 technical inefficiency was caused by inappropriate management practices that are being used by the insurance sector while the remaining part was due to insurance firms operating at sub optimal size of operation. On the other hand, the extent of technical inefficiency of non-life insurance in Tanzania show that 36.22 % of 0.4584 of technical inefficiency was caused by inappropriate management practices that are being used by the insurance sector in the country while the remaining part was due to insurance firms operating at sub optimal size of operation. Therefore, in both Tanzania and Kenya findings revealed that inefficiency of non-life insurance in the two countries largely derived by inappropriate management practices which include misallocation of resources in production system that eventually lead to inefficiency in the insurance sector. The trend of performance indicate that in all aspects both in Kenya and Tanzania, there was a slight decline of the TE in the years 2014 to 2017. On the other hand the result for mean scale efficiency indicate that the insurance sector in Tanzania has a room to adjust their scale of activities throughout the period under review. Contrary to Kenya counterparts where majority of the firms in the industry were experiencing decreasing return to scale which calls for reviewing the scale of firms' activities in the sector.

## 5. Conclusion and Recommendations

This study aimed at comparing the performance of non-life insurance in Tanzania and Kenya. It compared Technical and Scale efficiency of non-life insurance in the two countries and further explore the sources of technical inefficiency of non-life insurance in Tanzania and Kenya. Using Data Envelopment Analysis (DEA) to estimate efficiency of the non-life insurance firms in Tanzania and Kenya the study revealed that non-life insurance in Tanzania were more technical and scale efficient compared to their Kenya counterparts. When technical efficiency was further decomposed into pure and scale efficiency to examine causes of inefficiency it was revealed that in both Tanzania and Kenya inefficiency is caused by lack of technical efficiency which reflect issues of innovation in the sector, inappropriate management practices, operating at sub-optimal size of operation and misallocation of resources in the production system.

It is therefore recommended that insurance firms improve their efficiency both technical and scale by allocating their current resources properly, improving management processes, considering various innovations in the industry and take advantage of economies of scale. Production processes of the insurance firms in both Tanzania and Kenya that experienced DRS should be revisited to identify areas of inefficiency and waste, and the management should focus on optimizing those processes. This may involve reorganizing and re-designing the layout of the production line, using new technologies or equipment, and also to streamline production procedures to reduce waste. The study also recommends other measures such as outsourcing some of the activities of the firm to reduce costs and improve efficiency by allowing the firm to remain focused on core competencies while leaving non-core functions to specialized vendors. Improving marketing and distribution channels on how to reach more customers at a relatively low cost and increase the sales revenue could also help the firm to improve efficiency performance. It is generally believed that investing heavily on research and development (R&D) can help to develop new products or improve existing ones, this can help non-life insurance firms in the two countries to be innovative and be able to stay competitive in the market and increase the output.

## 6. Limitation of the Study and Areas for Future Research

The study has some limitations for example, the study involved only two countries which are members of east African community (EAC) leaving other members state (Uganda, Rwanda, Burundi etc). The data were extracted from annual report of insurance firms. Therefore, study's findings may be influenced by the availability and quality of data reported for non-life insurance firms in Tanzania and Kenya. It is obvious that Inaccuracies or gaps in the data could potentially affect the accuracy of efficiency measurements. The study period covered only four years (2014-2017), implying that the study might not capture longer-term trends or structural changes that could influence the efficiency performance of non-life insurance firms. A more extended study period could provide a more comprehensive understanding. The study also used quantitative method and avoid using qualitative data that could be obtained from methods such as interviews with industry (insurance) experts. The study did not consider the impact of broader economic conditions (macroeconomic factors) and trends on the efficiency performance of non-life insurance firms. Factors like inflation rates, interest rates, and economic growth could potentially influence efficiency.

Future studies should consider conducting a more extended longitudinal analysis spanning several years which could provide deeper insights into the trends and determinants of efficiency performance in the non-life insurance sector in the two countries. Expanding the comparative study to include more countries in the region or

globally could offer a broader perspective on the efficiency performance of non-life insurance firms and allow for more robust cross-country comparisons. Complementing quantitative analysis with qualitative methods, such as interviews or surveys with industry experts and stakeholders, could provide a richer understanding of the factors influencing efficiency in the non-life insurance sector. Investigating how technological advancements, such as insurrect and digital platforms, are impacting the efficiency and operations of non-life insurance firms would be valuable in the context of a rapidly evolving industry.

Further, this study did not explore all possible variables. Therefore, similar study can be done and include other variables such as, profitability, size, ownership form and solvency. Also, this study limited its data from the years 2014 to 2017, therefore another study could be conducted using data from 2017 to date.

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**Appendix 1: TECHNICAL EFFICIENCY OF NON-LIFE INSURANCE IN KENYA**

<b>INSURANCE FIRMS</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>AVERAGE</b>
AAR	0.185608	0.137779	0.053825	0.040772	<b>0.104496</b>
AAG	0.107364	0.057348	0.06924	0.054061	<b>0.07200325</b>
ALLINZ	0.045622	1	1	0.227736	<b>0.5683395</b>
AMACO	0.137554	0.137554	0.206793	0.203174	<b>0.17126875</b>
APA insurance	0.032256	0.045622	0.020388	0.021202	<b>0.029867</b>
Britam	0.096377	0.103167	0.38385	0.328171	<b>0.22789125</b>
CIC General	0.042138	0.051826	0.040595	0.059393	<b>0.048488</b>
Corporate	0.11573	1	0.26594	0.28956	<b>0.4178075</b>
Directline	0.001804	0.080953	0.027455	0.044766	<b>0.0387445</b>
Fidelity Shield	0.103957	0.115195	0.091905	0.110785	<b>0.1054605</b>
First Assurance	0.116752	0.069741	0.081781	0.080336	<b>0.0871525</b>
GA Insurance	0.049327	0.255038	0.184437	0.050725	<b>0.13488175</b>
Geminia	0.013103	0.105462	0.064087	0.036942	<b>0.0548985</b>
Heritage	0.182575	0.062846	0.068619	0.101542	<b>0.1038955</b>
ICEA Lion	0.231489	0.505727	0.204419	0.256859	<b>0.2996235</b>
Intrafrica	0.036469	0.019293	0.187014	0.01131	<b>0.0635215</b>
Invesco	0.006952	0.026738	0.045982	0.045673	<b>0.03133625</b>
Jubilee	0.933022	0.426218	0.194314	0.195033	<b>0.43714675</b>
Kenindia	0.161873	0.653387	0.198687	0.22305	<b>0.30924925</b>
Kenya alliance	0.019187	0.135015	0.066512	0.012519	<b>0.05830825</b>
Kenya Orent	0.00242	0.006613	0.006943	0.006857	<b>0.00570825</b>
Madison	0.392935	0.080177	0.139002	0.14706	<b>0.1897935</b>
Mayfair	0.178487	0.088648	0.132372	0.111339	<b>0.1277115</b>
Metropolitan cannon	0.091169	0.196023	1	0.161051	<b>0.36206075</b>
MUA	0.051826	0.205181	0.358408	0.24383	<b>0.21481125</b>
Occidental	0.181682	0.183006	0.072409	0.148845	<b>0.1464855</b>
Pacis	0.019726	0.11744	0.003703	0.099172	<b>0.06001025</b>

Pioneer	0.059614	0.172838	0.198003	1	<b>0.35761375</b>
Resolution	0.11056	0.008763	0.205407	0.072337	<b>0.09926675</b>
Saham	0.051628	0.121431	0.395115	0.018563	<b>0.14668425</b>
Sanlam	0.167778	0.151163	0.096221	0.385154	<b>0.200079</b>
Takaful	0.255038	0.01052	0.231379	0.355474	<b>0.21310275</b>
Tausi	0.139872	0.017701	0.197088	0.079695	<b>0.108589</b>
The Mornach	0.004041	0.15881	0.007614	0.008241	<b>0.0446765</b>
Trident	0.127376	0.110241	0.216042	0.01144	<b>0.11627475</b>
UAP Insurance	0.113585	0.059614	0.029628	0.026187	<b>0.0572535</b>
Xplico	0.011136	0.00493	0.049689	0.105098	<b>0.04271325</b>
<b>MEAN TECHNICAL EFFICIENCY</b>	<b>0.123730595</b>	<b>0.1805948</b>	<b>0.183645027</b>	<b>0.145241946</b>	<b>0.15830309</b>

## Appendix 2: SCALE EFFICIENCY OF NON-LIFE INSURANCE IN KENYA

<b>INSURANCE</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>AVERAGE</b>
AAR	0.914944	0.959684	0.979801	0.974675	<b>0.95728</b>
AAG	0.953481	0.994896	0.679111	0.995713	<b>0.9058</b>
ALLIANZ	0.981671	1	1	0.646783	<b>0.90711</b>
AMACO	0.959818	0.959818	0.981385	0.975538	<b>0.96914</b>
APA insurance	0.800175	0.981671	0.682182	0.700075	<b>0.79103</b>
Britam	0.942746	0.866713	0.663385	0.552219	<b>0.75627</b>
CIC General	0.948881	0.911066	0.920047	0.963599	<b>0.9359</b>
Corporate	0.383046	1	0.711532	0.644873	<b>0.68486</b>
Directline	0.037528	0.929713	0.713255	0.99279	<b>0.66832</b>
Fidelity Shield	0.759251	0.987504	0.996145	0.958054	<b>0.92524</b>
First Assurance	0.897875	0.844037	0.962808	0.93817	<b>0.91072</b>
GA Insurance	0.286184	0.806415	0.952659	0.285179	<b>0.58261</b>
Geminia	0.069428	0.709139	0.842359	0.548492	<b>0.54235</b>
Heritage	0.722674	0.680584	0.705026	0.841655	<b>0.73748</b>
ICEA Lion	0.809966	0.638327	0.804801	0.706627	<b>0.73993</b>
Intra-africa	0.158104	0.05481	0.997608	0.073788	<b>0.32108</b>
Invesco	0.144322	0.59505	0.997397	0.912211	<b>0.66225</b>
Jubilee	0.933022	0.801121	0.940109	0.893501	<b>0.89194</b>
Kenindia	0.944759	0.653387	0.853182	0.869687	<b>0.83025</b>
Kenya alliance	0.134729	0.919558	0.999088	0.184717	<b>0.55952</b>
Kenya Orient	0.026719	0.07615	0.062566	0.058574	<b>0.056</b>
Madison	0.886823	0.921901	0.851855	0.877963	<b>0.88464</b>
Mayfair	0.406633	0.414556	0.836595	0.947519	<b>0.65133</b>

Metropolitan cannon	0.999517	0.774123	1	0.161051	<b>0.73367</b>
MUA	0.911066	0.983372	0.714564	0.618369	<b>0.80684</b>
Occidental	0.993282	0.992208	0.574118	0.96927	<b>0.88222</b>
Pacis	0.161576	0.928273	0.036346	0.975693	<b>0.52547</b>
Pioneer	0.913521	0.999933	0.861106	1	<b>0.94364</b>
Resolution	0.7951	0.15441	0.670096	0.972245	<b>0.64796</b>
Saham	0.100066	0.353582	0.796496	0.119326	<b>0.34237</b>
Sanlam	0.951527	0.971792	0.619341	0.576237	<b>0.77972</b>
Takaful	0.806415	0.065973	0.797311	0.83645	<b>0.62654</b>
Tausi	0.699765	0.075963	0.97954	0.626119	<b>0.59535</b>
The Mornach	0.013847	0.866297	0.043494	0.052803	<b>0.24411</b>
Trident	0.355615	0.414205	0.744272	0.058769	<b>0.39322</b>
UAP Insurance	0.925779	0.913521	0.988693	0.882611	<b>0.92765</b>
Xplico	0.145184	0.077654	0.582264	0.867529	<b>0.41816</b>
MEAN SCALE EFFICIENCY	<b>0.61824</b>	<b>0.7102</b>	<b>0.77137</b>	<b>0.68267</b>	<b>0.69562</b>

## Appendix 3: TECHNICAL EFFICIENCY OF NON-LIFE INSURANCE IN TANZANIA

<i>INSURANCE FIRMS</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>AVERAGE</i>
ALLIANCE	1	0.828546	0.830882	0.781463	<b>0.86022</b>
BRITAM	0.324268	0.324268	0.341432	0.397291	<b>0.34681</b>
BUMACO	0.527464	0.598327	0.518775	0.579931	<b>0.55612</b>
FIRST	1	0.754544	0.292121	0.091494	<b>0.53454</b>
ICE LION	0.403352	0.580006	0.610278	0.456297	<b>0.51248</b>
IGT	0.700649	0.743023	0.591966	0.501593	<b>0.63431</b>
MAXINSURE	0.299747	0.5636	0.554926	0.443025	<b>0.46532</b>
MAYFAIR	0.45735	0.479954	0.482007	0.514181	<b>0.48337</b>
MGEN	0.496887	0.404052	0.344335	0.272629	<b>0.37948</b>
MILEMBE	0.507474	0.308206	0.209864	0.29406	<b>0.3299</b>
MO	0.645503	0.46747	0.497502	0.350367	<b>0.49021</b>
NIC	0.448741	0.917296	0.272963	1	<b>0.65975</b>
PHOENIX	1	1	0.639053	0.414263	<b>0.76333</b>
RELIANCE	0.71514	0.576835	0.519048	0.367071	<b>0.54452</b>
SANLAM GENERAL	1	0.355071	0.365774	0.275848	<b>0.49917</b>
STAR GENERAL	0.557941	0.72487	0.567938	0.186294	<b>0.50926</b>
TANZINDIA	1	0.767968	0.661416	0.579638	<b>0.75226</b>
UAP	0.491024	0.481104	0.455418	0.445533	<b>0.46827</b>
ZIC	0.495268	0.546332	0.488539	0.479555	<b>0.50242</b>
<b>MEAN TECHNICAL EFFICIENCY</b>	<b>0.635305684</b>	<b>0.601130105</b>	<b>0.486538789</b>	<b>0.443712263</b>	<b>0.54167</b>



## Appendix 4: SCALE EFFICIENCY OF NON-LIFE INSURANCE IN TANZANIA

<i>FIRMS</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>AVERAGE</i>
ALLIANCE	1	0.840139	0.830882	0.781463	<b>0.86312</b>
BRITAM	0.976648	0.976648	0.966106	0.988094	<b>0.97687</b>
BUMACO	0.824836	0.896442	0.939946	0.97633	<b>0.90939</b>
FIRST	1	0.996933	0.840336	0.612322	<b>0.8624</b>
ICE LION	0.768453	0.87045	0.610278	0.456297	<b>0.67637</b>
IGT	0.925765	0.903466	0.938607	0.956922	<b>0.93119</b>
MAXINSURE	0.816278	0.894193	0.937097	0.901557	<b>0.88728</b>
MAYFAIR	0.74593	0.738052	0.736652	0.86523	<b>0.77147</b>
MGEN	0.872962	0.882255	0.872941	0.866302	<b>0.87362</b>
MILEMBE	0.507474	0.532574	0.504225	0.557559	<b>0.52546</b>
MO	0.78176	0.624483	0.737758	0.773029	<b>0.72926</b>
NIC	0.986842	0.917296	0.961331	1	<b>0.96637</b>
PHOENIX	1	1	0.949442	0.945679	<b>0.97378</b>
RELIANCE	0.93714	0.977769	0.979953	0.955707	<b>0.96264</b>
SANLAM GENERAL	1	0.865747	0.902426	0.909881	<b>0.91951</b>
STAR GENERAL	0.557941	0.72487	0.631193	0.441039	<b>0.58876</b>
TANZINDIA	1	0.955807	0.991103	0.75719	<b>0.92603</b>
UAP	0.98395	0.893072	0.953441	0.992169	<b>0.95566</b>
ZIC	0.978752	0.921635	0.994151	0.898602	<b>0.94829</b>
MEAN SCALE EFFICIENCY	<b>0.877091105</b>	<b>0.863780579</b>	<b>0.856729895</b>	<b>0.82291</b>	<b>0.85513</b>