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Firm Characteristics and Revenue Efficiency of Selected Insurance Companies in Kenya

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Abstract: *Revenue efficiency is recognized as a major ingredient in sustainable growth in insurance business. The growing complexity in the insurance business characterized by the constant change in the operating environment has increased the significance of the effect of revenue efficiency in resource utilization in the sector. The continuous decline in revenue efficiency in the Kenyan insurance sector has made it hard for the insurers to gain business volume which is important for collective pooling of insurance risk under the law of large numbers yet operations in the insurance sector is anchored on it. Hence, this paper sought to determine the effect of firm characteristics on revenue efficiency of insurance companies in Kenya. The specific objectives were to establish the effect of firm size, capital adequacy, risk, asset quality and claims experience on revenue efficiency of insurance companies in Kenya. The study adopted a causal research design and a positivism research philosophy. Twenty-seven insurance companies that have consistently been in operation during the study period, 2008-2017 and registered by the Insurance Regulatory Authority were studied. Dynamic Panel data was collected from audited financial statements as submitted to the Insurance Regulatory Authority. The obtained data was analyzed using descriptive statistics and inferential statistics. The study findings indicated that asset quality had a statistically significant effect on revenue efficiency (P=0.028); firm size had astatistically significant effect on revenue efficiency (P=0.002); capital adequacy had astatistically significant effect on revenue efficiency of insurance companies in Kenya (P=0.037). Furthermore, claims experience and risk had no significant effect on revenue efficiency (P=0.481, P= 0.610) respectively. The study recommends that policy makers should enact strong credit policies which will act to reduce the amounts of debtors thus decreasing threats on the solvency position of the firm and liquidity problems. Moreover, insurance firms should be encouraged to form strategic business units through spin-offs to encourage specialization for the different units. The Insurance regulatory authority should adopt a risk-based approach and emphasize on implementation of the solvency II framework.*

Keywords:*Asset Quality, Capital Adequacy, Claims Experience, Data Envelopment Analysis, Firm Size, Revenue Efficiency, Risk*

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I. Introduction

Traditional theory postulates that all companies strive to minimize inputs and to maximize their outputs and that companies that fail to achieve these objectives do not survive, (Cummins & Weiss, 2001). The main objective of every profit orientated organization is profit maximization through maintenance of great standards of efficiency in cost and revenue, this has made the study of cost and revenue efficiency imperative in finance, (Philips *et al.*, 2010). Thegrowing complexity in the insurance business and the constant change in the operating environment have enhanced the importance of the effect of cost and revenue efficiency in resource utilization in the sector, (Roy & Das, 2012).

The insurance sector has been experiencing a decline in revenue efficiency occasioned by a slowdown in premium collection in both the advanced and developing economies, with the Kenyan industry experiencing a decline of 1.0% in revenue efficiency from the year 2013 to 2014, a decline of 3.0% from 2014 to 2015, and a further decline of 2.0% from 2015 to 2016; and a 1.0% revenue efficiency decline from 2016 to 2017 (IRA, Annual Report, 2014 & 2017). The declining cost and revenue efficiency remain a major problem in promoting sustained growth in the Kenyan insurance industry, (Wasseja& Mwenda, 2015). In this regard insurers are unable to gain business volume which is significant for collective pooling of insurance risk under the law of large numbers yet the insurance sector operations are anchored on it, (Greene, 2004).

The Kenyan insurance industry has lately been experiencing a declining rate of growth in revenue as compared to the global revenue trends. The General insurance business in Kenya grew by 11.4% which is an equivalent of 3.4% while the global growth stood at 3.6%, and the Life business in Kenya grew by 9.7% representing 1.7% while the global growth was at 4%, (IRA, Annual Report, 2017).

Insurance industry is part of the financial service providers including but not limited to commercial Banks, Savings and Credit Societies, Building Societies among others contributing about 11% of GDP, with the insurance industry contributing 3% of the GDP, (Cytonn Report, 2017). The insurance industry in Kenya is facing turbulence which seems to be affecting its revenue efficiency and productivity with an Insurance penetration of 2.7%, and 52 insurance firms serving 46 million people as at December, 2017, while the average global penetration was at 6.1%; and Africa at 3.5%.

Trends in the Kenyan insurance sector revenue throughout the study period are as shown in figure 1 below:

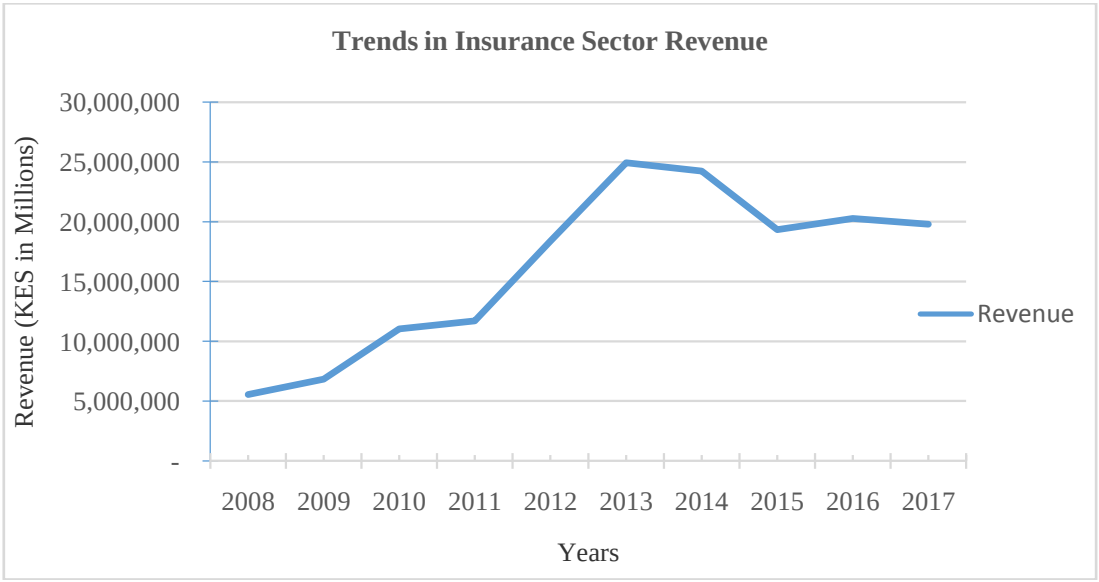

Figure: 1 Trends in Insurance Sector Revenue

Source: IRA Annual Reports, (2008-2017)

From Figure 1, although there is an increase in the industry revenue, it is marginal and starts declining from the year 2013 through to 2017. The industry's Revenue is seen to decline by 2.7% from 2013 to 2014 and further with even a bigger margin of 20.25% from 2014 to 2015. Although there is a slight increase in 2016, the industry's revenue declines further by 2.32% in the year 2017.

II. Material and Methods

The study was underpinned on the positivisim philosophy and adopted the causal research design. The target population was the 27 insurance companies that have consistently been in operation during the study period, 2008-2017 and registered by the Insurance Regulatory Authority. A census of all the 27 insurance companies was taken. Using a data collection sheet, secondary data was collected from audited financial statements as submitted to the Insurance Regulatory Authority. The dynamic panel secondary data was quantitative in nature and was analyzed using descriptive statistics and inferential statistics. Descriptive statistics included mean, mode, median and standard deviations. Inferential statistics included correlation analysis and multivariate analysis using the two stage Data Envelopment Analysis by obtaining efficiency scores in the first stage followed by Dynamic panel regression model in stage two.

Stage one: Determination of Revenue Efficiency

Two models have been developed in the DEA methodology; Constant Returns to Scale, (Charnes, Cooper & Rhodes, 1978) and Variable Returns to Scale, (Banker, Charnes, & Cooper, 1984). The Constant Returns to Scale (CRS) model assumes that there is no significant relationship between the scale of operations and efficiency therefore it gives the overall technical efficiency (OTE). That assumption is viable when all the DMUs operate at an optimal scale otherwise the computed measures of technical efficiency will be contaminated with scale efficiencies, (Sufian, 2007).The Variable Returns to Scale Model measures pure technical efficiency (PTE), which is the measurement of technical efficiency, free from the scale efficiency effects, (Seiford, 1996).

The study adopted the DEA models presented by (Cook &Seiford, 2009, Cooper *et al.,* 2006). Assuming n insurance firms (i=1,….,n), based on a vector of *y* outputs with *s* elements (y_1, y_2……y_s) and a vector of *x* inputs with *m* elements (x_1, x_2……x_m), the problem is specified as a mathematical problem below to necessitate the choice of an optimal weight;

$$Max_{u,\ v}\theta\ =\ \frac{\sum_{r=1}^{s} u_r y_{rn}}{\sum_{i=1}^{m} v_i x_{in}} \text{ Subject to; } \frac{\sum_{r=1}^{s} u_r y_r}{\sum_{i=1}^{m} v_i x_{ij}}\ \leq\ 1 \forall\ j = 1\ldots, n$$

$u_1 \ldots u_s \geq 0$

$v_1\ \ldots v_m \geq 0$

Where; u – Vector of weights on the outputs (Total Revenue)

v – Vector of weights on the inputs (Total Assets)

The objective of the DEA program is to determine the u and v that maximizes θ subject to program constraints, (Cooper *et al.,* 2006). The weight vectors u and v that maximize the ratio of the weighted average outputs to the weighted average inputs for the first insurance firm are determined first, (Athanassopoulos& Shale, 1997). The first condition constrains the maximum efficiency (θ), so the program initially selects weights u and v which produce an efficiency of one, (Avkiran, 1999). This first potential vector of weights for the first insurance firm is applied to all other insurance firms in the study. As with the first insurance firm, the efficiency for the remaining 26 insurance firms is also constrained to be one or less. If these weights yield a calculated efficiency greater than one for any insurance firm, u and v weightsare rejected and the program selects another set of weights and starts the process again, (Cook &Seiford, 2009). The program repeatedly tests different weighting schemes against the other insurance firms until a set of weights that maximizes θ for the first insurance firm is selected while not yielding a calculated efficiency greater than one for any other insurance firm. This insurance-specific set of weights u and v are used to calculate the efficiency score for the first insurance firm. The DEA program then repeats the same procedure with the second, third and all the remaining twenty-three firms until all the DMU-specific weights and corresponding efficiency scores for each of the n insurance firms have been calculated (Cooper *et al.,* 2006). The efficiency scores range from zero to one where observations with a value of one are on the efficient frontier.

Stage two: Dynamic Panel Regression Model

Stage Two involved the determination of the potential effect of firm size, capital adequacy, risk, asset quality, claim experience and competition as a moderating variable on the revenue efficiency score obtained in stage one using the Ordinary Least Squares as follows:

A panel regression model is based on panel data; these are observations on the same individual unit over several time periods. The relationship between the dependent variable Y and the independent variables Xs is given by:

$Y_t = Y_{t-1} + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots\ldots\ldots\ldots \beta_n X_{nt} + \varepsilon$…… (2)

In this study, the Xs are replaced by Firm size, Capital Adequacy, asset quality, Risk, Claims Experience and Competition as a moderating variable. The study sought to determine the effect of firm characteristics on revenue Efficiency of insurance companies in Kenya.

The basic model provides a direct relationship between the independent variables and revenue efficiency as below;

$$RE_{it} = RE_{it-1} + \beta_1 FS_{it} + \beta_2 CA_{it} + \beta_3 R_{it} + \beta_4 AQ_{it} + \beta_5 CE_{it} + \varepsilon \ldots\ldots\ldots\ldots\ldots (3)$$

The Model with Moderation is as below;

$$RE_{it} = RE_{it-1} + \beta_1 FS_{it} + \beta_2 CA_{it} + \beta_3 R_{it} + \beta_4 AQ_{it} + \beta_5 CE_{it} + \beta_5 H_{it} + \beta_6 FS * H_{it} + \beta_7 CA * H_{it} + \beta_8 R * H_{it} + \beta_9 AQ_{it} * H + \beta_{10} CE * H_{it} + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

Where:

CA	Capital Adequacy	RE_{it-1}	One-year lagged Revenue Efficiency of firm i
AQ	Asset Quality	FS	Firm Size
CE	Claims Experience	$\beta_{i\ldots}\beta_n$	Regression Coefficients
H	Competition	ε	The residual error of the regression
R	Risk	I	Number of insurance companies
RE_{it}	The Revenue Efficiency Measure	T	Time Period

The Herfindahl-Hirshman Index (HHI) of Competition will be determined by the following;

$H = \sum_{i=1}^{n} MS_i^2$ **Where**: n = Number of insurance firms in the industry.

MS = Market Share of company *i:*

The market share can be measured on the basis of either total assets or premium revenue or premium income plus investment income, and the value of HHI tends to zero for an industry with a very large number of small firms and a higher value of about 10,000 for a monopolistic industry, (Murat *et al.*, 2002). This study intends to use total assets as a measure of market share.

Diagnostics tests carried out for the regression were; test of normality, stationarity test, autocorrelation test and heteroscedasticity test.

III. Results

The objective of this study was to determine the influence of firm characteristics on revenue efficiency of insurance fcompanies in Kenya.

Descriptive Statistics

Table 1 below shows the summary of the variables included in the model with their minimum, maximum, mean, standard deviation, skewness, kurtosis and the jarquebera test of normality.

Table 1: Summary of Descriptive Statistics

	Revenue Efficiency	Capital Adequacy	Firm Size	Asset Quality	Claims Experience	Risk	Competition
Minimum	0.096	0.000	12.740	0.10	-0.040	0.010	1515
Maximum	1.00	0.900	19.260	0.87	86.70	1.880	2094
Mean	0.944	0.084	15.075	0.333	0.619	0.568	1740
SD	0.076	0.811	1.194	0.155	5.526	0.191	153
Skewness	0.000	0.000	0.000	0.168	0.000	0.000	0.000
Kurtosis	0.000	0.000	0.639	0.229	0.000	0.000	0.84
JarqueBera	101.25	101.25	62.7111	87.652	101.25	101.25	52.488
Probability	0.000	0.000	0.0006	0.1857	0.000	0.000	0.000
Observations	270	270	270	270	270	270	270

Source, Research Data, 2019

From table 1, the results showed that Capital Adequacy had a mean of 0.084; Firm Size a mean of 15.075, Asset Quality had a mean of 0.333 while Claims Experience, Risk and Competition had a mean of 0.619, 0.5681 and 1740 respectively. Analysis of skewness shows that with the exception of asset quality, which was skewed to the right, all the variables had zero skewness implying they are symmetric around their means. Competition and firm size were the most highly peaked compared to other variables, Kurtosis values reveal that all the variables follow a Platykurtic distribution.

Jarque-Bera test determines if the series is symmetric around its mean, it measures the difference of the skewness and kurtosis of the series. The null hypothesis for this test is that the variables are normally distributed and would lead to a bell curved distribution. Jarque-Bera test for normality shows that Capital Adequacy *(P = 0.000),* Firm Size *(P = 0.00),* Claims Experience *(P = 0.0006),* Risk *(P = 0.000),* and Competition *(P = 0.000)* are not normally distributed since their p-value were smaller than 0.05 at 95% confidence level, the residuals are not normally distributed which would lead to model bias (Jarque and Bera, 1980). Asset Quality *(P = 0.1857)* was found to be normally distributed. Brooks, (2008) recommends sticking to OLS in case of non-normality since for sufficiently large samples violation of normality is inconsequential.

Correlation Analysis

The descriptive analysis and the time series trends above pointed out the feasible problems likely to be faced in the inferential analysis but there was need to carry out statistics with a more intuitive quantitative analysis. The correlation matrix helped in determining which independent variables best explained the movement in the dependent variable and the strength and nature of association. The study used the Pearson correlation at 5% significant level to determine the relationship between variables as shown in table 5.2.

Table 2: Pearson Correlation Matrix

	revenu~y	capita~y	firmsize	assetq~y	claims~e	risk	compet~n
revenueeff~y	1.0000						
capitalade~y	0.1663*	1.0000					
	0.0062						
firmsize	-0.3037*	-0.0575*	1.0000				
	0.0000	0.3466					
assetquality	-0.0498*	0.1458*	-0.4603*	1.0000			
	0.4152	0.0165	0.0000				
claimsexpe~e	0.0605*	-0.0233	-0.1372*	-0.0010	1.0000		
	0.3220	0.7030	0.0241	0.9868			
risk	-0.1521*	-0.0261	0.2679*	-0.1644*	-0.2146*	1.0000	
	0.0123	0.6694	0.0000	0.0068	0.0004		
competition	0.0147	0.0149	0.3289*	0.0872*	-0.0764*	0.0899*	1.0000
	0.8098	0.8070	0.0000	0.1530	0.2108	0.1406	

Source: Research data, 2019

Table 2,revealsthe existence of a negative non-significant relationship between Revenue Efficiency and Asset Quality *(rho= -0.0498, P = 0.4152).* A positive non-significant relationship between Revenue Efficiency and Claims Experience *(rho = 0.0605, P = 0.3220);* Competition *(rho= 0.0147, P = 0.8098).* A positive significant relationship was established with Capital Adequacy *(rho = 0.1663 P = 0.0062)* while a negative significant relationship was established with Firm Size *(rho = -0.3037, P = 0.00);* and Risk *(rho= -0.1521, P = 0.0123).*

Dynamic Panel Regression Analysis

The first empirical analysis sought to establish the effect of firm characteristics on revenue efficiency. In research it represents direct relationships between dependent variable and the independent variables. The results are presented in two stages. First stage was determining revenue efficiency scores using DEA. Stage Two involved the determination of the potential effect of firm size, capital adequacy, risk, asset quality, claim experience and competition as a moderating variable on the revenue efficiency scores obtained in stage one using the Ordinary Least Squares. The study used the Dynamic Panel Data Model proposed by Arellano-Bover (1995) and Blundell-Bond, (1998). The Arellano-Bover/Blundell-Bond Generalized Methods of Moments estimator enables us to control for potential biases without relying on strictly exogenous instrumental variables, (Chung, *et al.,* 2018). The results are as shown below:

Table 3: Dynamic Panel Regression Analysis

revenueeffi~y	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
revenueeffi~y L1.	-.0514045	.0604531	-0.85	0.395	-.1698904	.0670814
capitaladeq~y	.1466093	.0703283	2.08	0.037	.0087684	.2844501
firmsize	-.0250228	.0080985	-3.09	0.002	-.0408956	-.0091499
assetquality	-.1614322	.0735277	-2.20	0.028	-.3055437	-.0173206
claimsexper~e	.0025791	.0036608	0.70	0.481	-.004596	.0097542
risk	-.0176855	.0347077	-0.51	0.610	-.0857113	.0503403
_cons	1.421316	.1432542	9.92	0.000	1.140543	1.70209

Source: Research data, 2019, At 5% significant level

The following regression model was extracted from the results in Table 5.3:

$$RE_{it} = -0.025FS_{it} + 0.147CA_{it} - 0.161AQ_{it} + 1.421$$

Where:

FS - Firm Size
CA - Capital adequacy
AQ - Asset Quality
RE_{it} - The revenue efficiency measure

From table 3 above, revenue efficiency at time (t-1) (*P = 0.395*) at 0.05 significant level implies previous revenue efficiency had no significant effect on the current revenue efficiency of insurance companies in Kenya. The results further indicate that firm size had a negative statistically significant effect on revenue efficiency of insurance firms in Kenya (β = -0.0250228, *P* = 0.002). This implies that an increase in firm size reduces the capacity of an insurance firm to realize revenue efficiency.

The study results (table 3) indicate that Capital Adequacy had a positive statistically significant effect on revenue efficiency (β = 0.1466093, *P* = 0.037) at 0.05 significant level. An indication that the more an insurance company improves on its capital adequacy in relation to the minimum required capital, the more revenue efficient it becomes.

The study findings show that Asset Quality has a negative statistically significant effect on revenue efficiency (β = -0.164322, *P* = 0.028) at 0.05 significant level. This implies that an increase in asset quality reduces the capacity of an insurance firm to realize revenue efficiency.

The findings of the study indicate that Claims Experience has no statistically significant effect on revenue efficiency (β = 0.0025791, *P* = 0.481) at 0.05 significant level. This means that a change in claims experience has no effect on insurance firm's revenue efficiency.

The study further indicates that risk had no statistically significant effect on revenue efficiency (β = -.0176855, *P* = 0.610) at 0.05 significant level. Meaning an increase in underwriting risk does not necessarily reduce the capacity of an insurance firm to realize revenue efficiency.

The Dynamic Regression results of the Moderating Effect of Competition

The study investigated whether competition moderated the relationship between firmcharacteristics and revenue efficiency. The yearly HHI Competition indices were computed and the results reflected a range between 1500 and 2500. This result was an indicator that market concentration of the selected insurance firms in Kenya was moderate. The results of the moderated regression revealed that the relationship between capital adequacy and revenue efficiency; risk and revenue efficiency are moderated by competition while firm size, asset quality, and claims experience are not moderated by competition.

IV. Discussion

The study results show that firm size has a negative statistically significant effect on revenue efficiency of insurance companies in Kenya. This finding supports the finding by (Almajali*et al*., (2012); Zanghieri, (2008); Fenn *et al.*, (2008);Yuqi Li, (2007), that proposed that size had a negative effect on efficiency, that is larger firms suffer from diseconomies of scale resulting from bureaucracy and the complexity of their operations causing efficiency to reduce and contradicts the findings by (Cummins & Rubio-Misas, 2006), that suggested a positive relationship between size and revenue efficiency occasioned by the scale advantages large insurers enjoy as the mean cost per unit of output decreases as the volume of actual output increases. Moreover, the study findings reveal that Capital Adequacy has a positive statistically significant effect on revenue efficiency. This finding supports the findings by Malik, (2011), who suggested that capital adequacy promoted the efficiency and stability of a financial system and Sentero, (2012), using DEA, suggested that there was a significant relationship between capital adequacy and efficiency.

The study findings further reveal that Asset Quality had a negative statistically significant effect on revenue efficiency. This finding is in tandem with Kumar &Ghimire, (2013), findings which suggested that debtors have a negative relationship with the financial performance of insurance firms. Higher amounts of debtors imply a weak credit policy that threatens the solvency position of the firm resulting to liquidity problems.Furthermore, the findings of the study indicate that Claims Experience has no statistically significant effect on revenue efficiency. This is contrary to the findings byKiarie, (2004) and Mbakisi, Batsirai& Tendai, (2017), who mooted that improper claims management by the insurer and bad customer claims experience may lead to possible insolvency and winding up of insurance companies due to decreased efficiency.The results further indicate that risk had no statistically significant effect on revenue efficiency. This finding is contrary to the finding by Deyganto& Alemu, (2019) and Gebremariyam, (2014) who demonstrated that excessive risk-taking impacts negatively on the revenue efficiency of insurance firms.

Traditionally, most studies have focused on profit, market share and Economic Value Addition on financial performance using simple ratio-based analysis. However, ratios are one dimensional and ignore any interaction between key variables; that is the effect of input factors (capital) is not connected to the output (revenue), (Cummins & Weiss, 2008). While the frontier approaches are superior as they utilize programming and statistical techniques which minimize the effects of differences in input and output prices and other external factors that affect a firm. The insurance industry in Kenya being oligopolistic in nature informed the study to include competition as a moderating variable in orderto explain how competition in such a market influenced the relationship between firm characteristics and revenue efficiency.

Basing on the findings of this study, three areas are suggested for further research. Researchers may use different frameworks on the same data set, different assumptions and different research methods. Future researchers should attempt to improve on the decision making techniques used in this study by expanding the model through addition of more firm characteristics and improving the model performance by the use of parametric frontier efficiency methods such as the stochastic frontier approach, thick frontier approach and distribution free approach instead of the nonparametric DEA. Furthermore, research in this area can be improved by looking at different time periods- before the risk-based supervision was established by the IRA.

V. Conclusion

From the findings above, the study concluded that revenue efficiency of insurance companies in Kenya is effectively determined or explained by the companies' capital adequacy, firm size, and asset quality while claims experience and risk are not key factors in explaining revenue efficiency of insurance companies.The findings of the study have some crucial policy implications; The capital maintained by an insurance company in relation to the minimum required capital set by the IRA at a particular time is an important factor to the revenue efficiency of the company. The study recommends that the IRA through a holistic analysis of an insurer's risk position and capital held at all times should be able to link the company's capital adequacy to the amount of risk the company underwrites, therefore adopting risk-based approach and emphasizeon implementation of solvency II framework.

The result showed a negative effect of firm size on revenue efficiency, an indicator of diseconomies of scale andinsurance companies holding a lot of assets yet generating less revenue. The study therefore, recommends that insurance companies should be encouraged to form strategic business units through spin-offs, which will encourage specialization for the different units, and also reduce too-big-to fail phenomenon. Asset quality had a negative relationship with revenue efficiency. In this regard,the insurance companies should come up with robust measures to ensure remittance of policy premiums especially from insurance agents and brokers to reduce high amounts of debtors. The IRA should put in place strong credit policies through changes in the insurance Act CAP 487, to make it mandatory for insurance agents and brokers to remit policy premiums to insurance firms within a specified time period, failure to which should be punishable by law. This will act to reduce the amount of debtors thus decreasing the threats to the solvency position of the firm and liquidity problems.

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