

DBA AFRICA MANAGEMENT REVIEW

VOLUME 12 NO 3
2022

**FIRM SIZE MODERATION ON EARNINGS VOLATILITY AND
INCOME RETENTION OF GENERAL INSURERS IN EAST AFRICA**

Phocas Nyandwi
Amos Njuguna
George Achoki

A Quarterly publication of the Department of Business Administration,
Faculty of Business and Management Sciences
University of Nairobi

ISSN NO: 2224-2023

DBA Africa Management Review

Received Date
19/04/2022
Reviewed
06/06/2022
Accepted Date
19/07/2022

FIRM SIZE MODERATION ON EARNINGS VOLATILITY AND INCOME RETENTION OF GENERAL INSURERS IN EAST AFRICA

Phocas Nyandwi¹, Amos Njuguna², George Achoki³

Abstract

To hedge against the prospect of financial distress and stabilize results, insurance firms with volatile earnings have incentive to purchase more reinsurance, thereby reducing their income retention. With the benefit of diversification, large firms may not need as much reinsurance as small firms. This study aimed to determine the moderating effect of firm size on the relationship between earnings volatility and income retention of general insurers in East Africa. The study targeted 87 general insurance companies in existence throughout the period of study from 2015 to 2019 across five countries in East Africa comprising of Kenya, Uganda, Tanzania, Rwanda and Burundi. The study adopted explanatory sequential mixed methods research design. For secondary data, a census was conducted on the total population of 87 general insurance companies in existence during the period of study. Data were obtained from insurance regulatory reports, company annual reports and through data collection sheets where reports were not available. The primary data phase consisted of in-depth interviews carried out on a stratified sample of 25 key informants across the five countries. Both descriptive and inferential analysis methods were employed in the analysis. The study found a significant negative relationship between earnings volatility and income retention. On the hypothesis testing, the study found that firm size exerts a negative significant effect on the relationship between earnings volatility and income retention, hence rejecting the null hypothesis. Therefore, general insurers should strive to reduce volatility through sound underwriting practices to minimize the cost of reinsurance and maximize income retention.

Keywords: Earnings Volatility, Firm Size, Income Retention

¹ United States International University – Africa - phocany@yahoo.fr

² United States International University – Africa

³ United States International University – Africa

Introduction

Income retention is important for insurance firms as it also determines how much profits can be retained from their core underwriting operations (Lei, 2019). Income retention is the proportion of premium that remains in the insurance firm's books after deduction of cessions made for reinsurance (Bahri, Saragih & Nugroho, 2017). In order to be able to cover adequately their liabilities, insurance firms need to possess capital that is commensurate to the level of risks stemming for their operations (Mao, Carson & Ostaszewski, 2015). Capital is the shock absorber for all risks including underwriting risk, credit risk, market risk and operational risk and this provides the justification why most regulations worldwide are moving to risk based capital frameworks.

However, holding capital is expensive and as part of risk management mechanisms to offset partly contingent liabilities arising out of the risks assumed, insurance companies are allowed by regulations to use reinsurance which provides them with important diversification benefits (Porth, Tan & Weng, 2013). According to Gonzalez and Anderson (2018), reinsurance supplies insurance firms with vital financial resources for growth, expansion and regulatory compliance by increasing underwriting capacity and also allows international capital to participate in the enhancement of the local capacity especially in insurance markets which are undercapitalized. Clemente (2018) documented that insurance firms can use different types of reinsurance arrangements to reduce the risk based capital requirements.

Similar to insurance for non-insurance firms, reinsurance is however purchased at a cost which needs to be weighed against the benefits of risk management. Several studies

have documented that high reinsurance usage is harmful to the profitability of insurance firms due to high cost. According to Scordis and Steinorth (2012), as the amount of reinsurance used increases, the insurance company reduces by the same margin the income retained and therefore has to forego part of its expected profit. Lei (2019) found that reinsurance dependence negatively affects the risk-adjusted return on assets and the risk-adjusted return on equity. Zhou, Wang, Zhang and Wang (2015) explain the negative relationship between reinsurance usage and profit by the fact that reinsurance firms price adequately their risk and load for their expenses and profit and therefore the reinsurance premium paid is usually higher than insurance claims recoveries received from reinsurers.

In addition to reduced profit, low income retention is associated with other downsides, including credit risk and moral hazard. According to Lo (2016), as there is no contractual relationship between the policyholder and reinsurers, insurance firms are fully liable in case reinsurers do not fulfil their obligations. Wen, Chen and Wu (2015) also pointed out that low retention leads to moral hazard which worsens the profitability as insurance firms have less incentive for prudent underwriting and claims management when their stake in the risk is low.

The issue of income retention has attracted the attention of regulatory authorities in Africa in recent years, driven mainly by the perspective of premium income flight abroad in foreign currency. The Circular No 005/CIMA/PCMA/CE/2016 in the West Africa Francophone CIMA Zone (CIMA, 2016) both set minimum retentions to minimize the effects of excessive use of reinsurance. It stipulates that all policies

related to accident classes of insurance must be reinsured within the CIMA zone while only 50% of the risks for property insurance classes can be reinsured outside the zone. In East Africa, similar concerns transpired as well through various recent local retention regulatory policies. The Circular Letter No 055/2017 and its subsequent amendment in 2018 by the Tanzania Insurance Regulatory Authority (TIRA, 2017; TIRA, 2018) set a minimum of 5% of shareholders' funds as minimum retention per risk with other stringent conditions for externalization of risk outside the country. The 2017 Circular IRA/CIR/11/17/363 by the Insurance Regulatory Authority of Uganda (IRAU, 2017) provided general guidelines advising that all risks should be shared by the local insurance and reinsurance players before being ceded outside the country.

Theories as well as empirical research have attempted to determine what factors are associated with low income retention, with inconclusive results. The expected utility theory (Neumann & Morgenstern, 1953) predicts that profitability and volatility would be associated with reinsurance usage which in turn determines income retention. For instance, Altuntas, Garven and Rauch (2018) found a negative relationship between earnings volatility. However, Kader, Adams and Anderson (2010) could not find a significant relationship between the two variables. The financial distress hypothesis of risk management (Mayers & Smith, 1990) also conjectures that large firms are less exposed to bankruptcy and would retain more income. In this respect, Curak, Utrobicic and Kovac (2014) found a positive association between firm size and income retention, but Burca and Batrinca (2014) found a negative relationship between firm size and income retention. There is also a contextual gap as most studies have been

conducted in developed countries with a context that is different from East Africa.

Problem Statement

Despite its importance in risk and capital management of insurance companies as their main insurance mechanism, reinsurance has been identified as detrimental to the profitability of insurance companies (Lei, 2019). According to Abass and Obalola (2018), reinsurance usage has a negative impact of profitability of insurance companies in Nigeria due to significant cost incurred and low income retention. Wasike (2017) also found that low income retention is associated with low profitability of insurance firms in Kenya. Other downsides of low income retention include counterparty risk in case reinsurers are unable or unwilling to their share of insurance claims (Lo, 2016) and moral hazard (Wen, Chen & Wu, 2015) owing to the fact with low retention the insurance firm has less incentive for sound underwriting and claims management.

The cost of reinsurance for Kenyan general insurers averaged 28.37% with a retention ratio of 71.63% for the period of study from 2015 to 2019 (IRA, 2020). As the third largest African insurance market, this retention level is significantly low compared to peer African markets such as Morocco at 92.33% (ACAPS, 2021) or South Africa at 88.2% (OECD, 2022) and to the average of 84.3% for OECD countries (OECD, 2022). Statistics from other countries in East Africa do not reflect a better picture. According to country respective statistics from Insurance Regulatory Authority of Uganda (IRAU, 2020), Tanzania Insurance Regulatory Authority (TIRA, 2017; TIRA, 2019) and Insurance Regulation and Control Agency of Burundi (ARCA, 2020), the average income retention for the same period from 2015 to 2019 was 55.25% for Uganda, 49.92% for

Tanzania and 65.10% for Burundi. At country level, concerns on low income retention have transpired in recent years through various regulatory circulars. For instance, the Tanzania Insurance Regulatory Authority (TIRA, 2017; TIRA, 2018) and the Insurance Regulatory Authority of Uganda (IRAU, 2017) issued circulars that seek to maximize income retention at country level.

It is important to understand factors that influence income retention in order find sustainable solutions for low income retention at firm level and country level. According to the expected utility theory (Neumann & Morgenstern, 1953), insurance firms with low profitability and higher variance of results are expected to purchase more reinsurance to improve and stabilize the results. The financial distress hypothesis of risk management (Mayers & Smith, 1990), on the hand, conjectures that large firms possess internal diversification benefits which would enable them to absorb risk or retain more risk. Some findings from some empirical studies have supported these theoretical predictions while others were not in line with theory. For instance, Mankai and Belgacem (2016) found that earnings volatility is negatively associated with income retention in U.S. A study by Altuntas, Garven and Rauch (2018) also arrived at the same conclusion in the global insurance industry. However, Kader, Adams and Anderson (2010) could not find a significant relationship between the two variables in Sweden. In respect of firm size, studies by Ho (2016) and Curak, Utrobicic and Kovac (2014) find a positive association between firm size and income retention. However, Burca and Batrinca (2014) found a negative relationship between firm size and income retention.

In addition to the contradictory findings, most of studies have been conducted in a

context that is different from East Africa. There is indeed a dearth of empirical studies in Africa in general and in East Africa in particular. Different methodologies and measurements have also been used, making difficult to compare results. For instance as measures of earnings volatility, some studies use standard deviation of the return on assets (Ho, Lai & Lee, 2013), others the standard deviation of the claims ratio and others the natural logarithm of coefficient of variation of earnings before interest and taxes (Kader, Adams & Anderson, 2010). This study therefore sought to address the gaps and investigate the moderation effect of firm size on income retention of general insurers in East Africa.

Literature Review

Theoretical Review

From a theoretical perspective, the expected utility theory provides the framework to explain the relationship between volatility and income retention of insurance firms. The theory is credited to Neumann and Morgenstern (1953) and is concerned with choices under risk and uncertainty. The theory has been used extensively in corporate risk management to explain risk management decisions under risk and uncertainty (Cupic, 2015). By reducing the volatility of results, corporate risk management enables firms to move further from financial distress and increase their value as lowering the risk increases the expected utility. It is therefore expected that insurance companies with more volatile portfolios will be inclined to purchase more reinsurance and hence have lower income retention (Kader, Adams & Anderson, 2010).

With regard to the moderating effect of firm size, the size of the firm is an indicator of diversification and scale and the larger the firm the easier it can reduce variability of

earnings (Ismail, 2013). From the financial distress hypothesis of risk management (Mayers & Smith, 1990), size is therefore expected to reduce the amount of reinsurance a firm would need to reduce volatility. On the other hand, the transaction cost theory conjectures that large firms can use the scale to negotiate cost effective reinsurance arrangements, providing incentive to purchase more reinsurance to reduce volatility.

Empirical Review

Altuntas, Garven and Rauch (2018) conducted a study on demand for reinsurance in the global insurance market. The study involved many countries picked from Best's report from different countries of the world. The panel data collected was from 2000 to 2012, being a period of 13 years. The volatility of results as measured by the standard deviation of the loss ratio was assessed against the demand for reinsurance. The findings from the panel data regression results showed a positive significant relationship between loss volatility and reinsurance use. In order to reduce earnings volatility, less profitable companies use more reinsurance to smoothen results. The findings are in line with the expected utility theory. However, although this was a global study, no insurance companies from East Africa or Africa were included in the sample hence the findings may not reflect the context of the current study.

Kader, Adams and Anderson (2010) conducted a study on reinsurance usage by insurance companies in Sweden. The study used 641 firm-year observations for a period of 21 years from 1919 to 1939. Earnings volatility was measured by the natural logarithm of the coefficient of variation of annual earnings up to the preceding year. The findings from the panel data regression indicate that earnings volatility was a

significant determinant of reinsurance use during the period of 1919 to 1928, but not significant during the period of 1929-1939. The findings highlight the fact that the relationship may be influenced by context.

A few studies also found either a contradicting relationship or no significant association. For instance, Shiu (2011) carried out a study in the United Kingdom non-life insurance industry and did not find a significant relationship between earnings volatility as measured by the natural logarithm of the coefficient of variation of earnings before interest and taxes and income retention. In addition to the geographic, economic and temporal context, the findings could be influenced by different measurements applied. Some studies use standard deviation, others the coefficient of variation or even simply year-to-year variations.

Curak, Utrobicic and Kovac (2014) conducted a study on company-specific features affecting reinsurance use. The study was conducted in Croatia for a period of 6 years from 2006 to 2011 and 19 insurance companies participated in the study using various company factors including firm size, leverage, profitability measured by return on investment and market regulation. The findings indicate a significant negative association between firm size and reinsurance use, suggesting that large firms use less reinsurance and have more retention instead. The findings support the financial distress hypothesis of risk management. The context of the study is however different from East Africa.

Mankai and Belgacem (2016) conducted a study which looked at the relationship among capital, risk and reinsurance usage in the U.S. Property-Liability insurance industry. The study related to the period from 1999 to 2008 and the sample was limited to

solvent insurers with no regulatory action in process, resulting in 11,929 firm-year observations. Firm size was measured by the logarithm of total assets. The study found a positive significant relationship between firm size and income retention. Apart from the fact that U.S. is a more developed country than East African countries, the exclusion of non-solvent reinsurers could influence the results.

While the above findings are in line with those of most other related studies such as Ho (2016) in China and Yanase and Limpaphayom (2017) in Japan, some studies found either a negative relationship or no relationship between firm size and income retention. For instance, Bahri, Saragih and Nugroho (2017) were unable to find a significant relationship between the size of the firm and retention of premium income. On the other hand, Burca and Batrinca (2014) found a negative relationship in the Romanian insurance market between firm size and income retention. Apart from the context, it is apparent that there is a theoretical gap as to whether the financial distress hypothesis of risk management explains fully the relationship between firm size and income retention.

Research Methodology

The study utilized explanatory sequential mixed methods research design premised on positivism research philosophy. Explanatory sequential mixed methods research design consists of collecting and analysing secondary data first and subsequently collecting primary data to get deeper insight on the results from secondary data. For secondary data, a census was conducted on the total population of 87 general insurance companies in existence during the period of study from 2015 to 2019 across Kenya, Uganda, Tanzania, Rwanda and Burundi. Data were obtained from insurance

regulatory reports, company annual reports and through data collection sheets where reports were not available. The primary data phase consisted of in-depth interviews carried out on a stratified sample of 25 key informants across the 5 countries. The insight from key informant interviews is presented in the discussion section. Descriptive statistics were used to summarize statistics and make trend analysis, while inferential statistics were used to test hypotheses and make inferences. Prior to panel data regression analysis, diagnosis tests, namely linearity, normality, multicollinearity, homoscedasticity and stationarity were conducted to ensure that data are fit for the envisaged model. The respective tests to this effect were Pearson correlation test, Jarque-Bera test in addition to skewness and kurtosis assessment, VIF and Tolerance values, Modified Wald Test and Fisher type Augmented Dickey Fuller (ADF) test. Hausman test and Woodridge post estimation tests were also conducted to determine which model between random and fixed model is fit and to assess the existence of serial correlation.

Research Findings

Descriptive Results

Against a target population of 87 general insurance companies across the 5 countries of East Africa, secondary data were obtained from 79 firms, representing 395 firm-year observations for each variable. This also represents a 90.80% response rate. For primary data, the response rate was 80%, being 20 out of the target 25 key informants across the 5 countries. The information was analysed thematically and used to provide deeper insight to the findings from secondary data analysis in the discussion section. The summary for secondary data is presented in table 1 below.

Table 1. Secondary data description

Variable	Observation Description
Study Period	2015 to 2019 (5 Years)
Panel Variable	Strongly balanced
Total firms targeted	87
Number of firms with complete data	79
Number of observations	395
Percentage data collected to target	90.80%

Source: Data processed

As per the summary in table 1 above, the panel data are strongly balanced with zero omissions, which is good for analysis. Table

2 shows the summary aggregate descriptive statistics for the three variables of interest during the study period.

Table 2 Summary Statistics of General Insurers in East Africa

Variable	Income retention	Earnings Volatility	Size
Number of observations	395	395	395
Mean	0.661	0.011	6.261
Standard deviation	0.188	1.169	0.483
Min	0.170	-3.020	4.500
Max	1.000	4.220	7.230
Mode	0.870	-0.440	6.710
Median	0.680	-0.060	6.300

Source: Data processed

As per the results in table 2 above, data are symmetric for the three variables of interest since the mean and the median are very close. Distributions are slightly negatively skewed for income retention and size since

the median is greater than the mean. For earnings volatility, the distribution is slightly positively skewed. Earnings volatility also has more spread as the standard deviation is greater than the mean.

Table 3 Retention Ratio Trend from 2015 to 2019

Retention Ratio	2015	2016	2017	2018	2019	Overall
Kenya	0.73	0.73	0.70	0.71	0.71	0.72
Tanzania	0.50	0.45	0.50	0.53	0.53	0.50

Uganda	0.54	0.60	0.54	0.54	0.55	0.55
Rwanda	0.76	0.79	0.80	0.80	0.81	0.79
Burundi	0.61	0.62	0.68	0.67	0.67	0.65

Source: Data processed

As shown in table 3, retention ratios show different trends across the countries of East Africa. Rwanda had the highest retention ratio with an average of 0.79, followed by Kenya at 0.72. Tanzania has the lowest average retention ratio at 0.50. One-way ANOVA test was conducted to assess the significance of the differences in means of retention ratios among countries. With the value of F-statistic of 24.18 and a p-value of 0.000, the results provided evidence that there are differences in means across East African countries. A Tukey's post hoc test

was performed to investigate where the differences come from. The results as reported in appendix 1 show that there are significant differences in means of retention ratios between Uganda and Kenya, Tanzania and Kenya, Tanzania and Uganda, Rwanda and Uganda, Rwanda and Tanzania, and Burundi and Tanzania. Kenya and Rwanda have significantly higher retention ratios than Uganda and Tanzania while Burundi and Uganda also have significantly higher retention ratios than Tanzania.

Table 4 Earnings Volatility Trend from 2015 to 2019

Volatility of Earnings	2015	2016	2017	2018	2019	Overall
Kenya	-0.86	-0.63	-0.36	-0.17	-0.14	-0.43
Tanzania	-0.41	-0.32	-0.24	-0.05	0.07	0.19
Uganda	-0.41	-0.07	0.27	0.68	0.81	0.26
Rwanda	0.11	-0.18	-0.03	-0.14	0.08	-0.03
Burundi	-0.32	-0.80	-0.35	-0.01	0.11	-0.27

Source: Data processed

According to table 4 above, Uganda has on average the highest volatility while Kenya has the lowest. One-way ANOVA test was conducted to assess the significance of the differences in means of earnings volatility among countries. The F-statistic value of 5.27 and its p-value of 0.000 indicate that there are differences in means across East African countries. A Tukey's post hoc test was carried out to investigate where the differences come from. The

results in appendix 2 show that mean values in volatility of earnings for Kenya and Uganda are statistically different with a p-value of 0.000. The mean values in volatility of earnings between Tanzania and Uganda are also significantly different with a p-value of 0.031. Earnings for Ugandan insurance companies are significantly more volatile than those of companies in Kenya and Tanzania.

Table 5 Firm Size Trend from 2015 to 2019

Log of Assets	2015	2016	2017	2018	2019	Overall
Kenya	6.53	6.59	6.62	6.63	6.65	6.60
Tanzania	6.05	6.09	6.11	6.12	6.15	6.10
Uganda	5.90	5.92	6.01	6.02	6.04	5.98
Rwanda	5.97	5.96	6.02	6.08	6.22	6.05

Burundi	5.93	5.67	5.82	5.95	5.98	5.87
---------	------	------	------	------	------	------

Source: Data processed

Results in table 5 that on average general insurers in Kenya are bigger than those of other countries in East Africa while general insurers in Burundi are on average the smallest in size. One-way ANOVA test was carried out to determine the significance of the differences in means of firm size among countries. The F-statistic value of 62.50 and its p-value of 0.000 indicate that there are differences in means across East African countries. A Tukey’s post hoc test was carried out to investigate where the differences come from. Results as shown in appendix 3 show that the mean size of assets for insurance companies in Kenya is significantly bigger than that of

companies from other countries in East Africa. The difference in means of logarithm of assets between Burundi and Tanzania is also statistically significant.

Diagnosis Tests

Linearity Test

Pearson correlation was used to assess the linear relationship between independent and dependent variables. Earnings volatility and firm size were correlated against retention ratio. The results are as reported in table 6 below.

Table 6 Correlation Analysis Matrix

Variables	Retention ratio	Earnings Volatility	Firm Size
Retention ratio	1.000		
Earnings Volatility	-0.2421	1.000	
Firm size	-0.0321	-0.1595	1.000

Source: Data processed

According to table 6 above, earnings volatility has a negative significant linear relationship with retention ratio. Firm size has a linear negative relationship with retention ratio although the correlation is weak. Therefore, the linearity assumption holds.

Normality test was conducted to establish whether the data followed the Gaussian distribution. The study employed skewness, kurtosis and Jarque bera tests to establish normality of the variables and the results are presented in table 7. Skewness measures the asymmetry of the distribution while kurtosis measure the flatness or peakedness of the distribution.

Normality Test

Table 7 Normality Test

Variable	Skewness	Kurtosis	Jarque Bera Test	
			Chi2	P-value
Retention ratio	-0.09214	-0.4206	3.47	0.1764
Earnings volatility	0.2581	-0.2222	5.20	0.0742

Size -0.22842 -0.3736 5.73 0.0569

Source: Data processed

From the results in table 7 above, skewness values range between -0.22842 and 0.2581 while kurtosis values range between -0.4206 and -0.2222, suggesting that the distribution is normal for the 3 variables. This is further confirmed by the results of Jarque Bera test with the p-values greater than 0.05 which leads to the conclusion that we cannot reject

the null hypothesis that the distributions are normal.

Multi-collinearity Test

The study checked for multi-collinearity using variance inflation factors (VIF) and tolerance value. The results are presented in table 8 below.

Table 8 Multi-collinearity Tests

Variable	VIF	Tolerance (1/VIF)
Earnings volatility	1.03	0.97342
Firm Size	1.03	0.97430
Size*Volatility	1.00	0.99836
Mean VIF	1.02	

Source: Data processed

A VIF value of less than 5 indicates absence of multi-collinearity while a VIF value greater than 5 indicates the presence of multi-collinearity (Shrestha, 2020). Table 8 shows VIF values of less than 5 implying that there is no serial multi-collinearity, hence the assumption of low or zero multi-collinearity was not violated.

Other Diagnosis Tests

Other diagnosis tests were conducted to confirm that assumptions for linear regression are not violated. These were homoscedasticity test, stationarity test and the test for serial correlation. The results are presented in table 9.

Table 9 Other Diagnosis Tests

Diagnosis Test	Variable/Model	Test Type	Statistic	P-value
Homoscedasticity	Earnings volatility	Mod. Wald test	Chi2 = 579.08	0.000
	Earnings volatility & Size	Mod. Wald test	Chi2 = 583.94	0.000
Stationarity	Income retention	ADF test	Inverse Chi2 = 590.605	0.000
	Earnings volatility	ADF test	Inverse Chi2 = 767.227	0.000
	Size	ADF test	Inverse Chi2 = 711.125	0.002
Autocorrelation	Earnings volatility	Woodridge test	F-stat = 2.336	0.1117
	Earnings volatility & Size	Woodridge test	F-stat = 2.251	0.1375

Source: Data processed

The null hypothesis of Fisher type Augmented Dickey Fuller test for stationarity avers that all panels contain a unit root, hence a p-value of less than 0.05 implies that the variable has no unit roots or is stationary. As per the results in table 9 above, the p-values for ADF test are all below 0.05 and therefore there is no issue of stationarity. Additionally, no serial correlation was found with p-values for both models above 0.05 in view of the fact that the null hypothesis of the Woodridge test for autocorrelation is that there is no serial correlation. The null hypothesis of the Modified Wald test for homoscedasticity test is that the model exhibit homogeneity of variance. Since the test results for both

models provide p-values below 0.05, there is evidence to reject the null hypothesis and conclude that both models are heteroscedastic. The study adopted robust standard errors as appropriate for heteroscedastic models.

Hausman Specification Test for the Model before Moderation

Hausman test was used to decide the model to be adopted for the regression model prior to moderation. The null hypothesis of Hausman test avers that if p-value is significant, fixed effects model is appropriate. If not, the random effects model is selected.

Table 10 Hausman Specification Test

	Fixed	Random	Difference	sqrt(diag(V b-V_B))	Chi2	P-value
Earnings volatility	-0.02061	-0.02226	0.00165	0.00127	1.70	0.1924

Source: Data processed

Given the Hausman test p-value of 0.1924 which is greater than 0.05, the random effects model was used for further

interpretations, otherwise the fixed effects model would have been selected.

Results of Earnings Volatility and Income retention

Regression Results on Earnings Volatility and Income Retention (Before Moderation)

The study conducted panel regression using random effects model as specified by the Hausman test to establish the influence of earnings volatility on retention ratio of general insurance firms in East Africa. The

analysis was done at various levels, namely at the East Africa level and per country. Earnings volatility was measured by the natural logarithm of the coefficient of variation of earnings before interests and taxes up to the preceding year while income retention was measured by the ratio of net written premium to gross written premium. The model and the results are as shown below.

$$Y_{it} = \beta_0 + \beta_1 X_{lit} + \varepsilon_{it} \dots\dots\dots (1)$$

Table 11 Effect of Earnings Volatility on Income Retention

Number of obs =	395	Wald chi2(1)	8.25
Number of groups =	79	Prob > chi2	0.004

Obs Per Group: Min=		5	R ² between	0.0668	
Max =		5	R ² overall	0.0586	
Retention	Coef.	Robust Std. Err.	Z	P> z	[95% Conf. Interval]
Volatility	-0.02226	0.00775	-2.87	0.004	-0.0375 -0.0071
_cons	0.6608	0.0196	33.72	0.000	0.6224 0.6992

Source: Data processed

Table 11 above shows the panel regression results when estimating the effect of earnings volatility on retention ratio of insurance firms in East Africa. The random effects model is significant as shown by the p-value of Wald chi2 of 0.004. This implies that

earnings volatility is a significant predictor of retention ratio of insurance firms in East Africa. The R² value of 0.0586 shows that the independent variable accounts for 5.86% variation in dependent variable. The optimal regression model is expressed as follows:

$$Y_{it} = 0.6608 - 0.02226 \text{ Earnings Volatility} + \varepsilon_{it}$$

Regression Results per Country

Table 12 Effect of Earnings Volatility on Retention Ratio (Per Country)

Item	Kenya	Uganda	Tanzania	Rwanda	Burundi
Earnings volatility					
Coefficient	-0.06518	0.00105	-0.01466	-0.03476	-0.01451
Z statistic	-4.52	0.012	-1.19	-0.83	-0.83
P> z	0.000	0.903	0.235	0.409	0.408
Observations	165	85	80	35	30
R-squared	0.5357	0.0488	0.0132	0.2226	0.1568
Number of Firms	33	17	16	7	6

Source: Data processed

Table 12 shows the effect of earnings volatility on retention ratio of insurance firms in East Africa per country. According to results, earnings volatility has a negative and significant effect (p-value = 0.000 < 0.05) on retention ratio for general

insurance firms in Kenya. For Tanzania, Rwanda and Burundi general insurance firms, earnings volatility has a negative but insignificant effect on retention ratio. For Uganda, the relationship is positive but insignificant.

Results of Firm Size Moderation Effect on Earnings Volatility and Income retention

Hausman Test for Moderation Model Specification

Hausman test was used to decide the model to be adopted for the regression with

moderation. The results are presented in table 13 below.

Table 13 Hausman Specification Test for the Model with Moderation

	Fixed	Random	Difference	sqrt(diag(V b-V_B))	Chi2	P-value
Earnings volatility	0.23131	0.24205	-0.01074	0.02581	0.83	0.8434
Size	-0.02184	-0.02194	0.0001	0.02059		
Size*Volatility	-0.04118	-0.04312	0.00194	0.00432		

Source: Data processed

Given the Hausman p-value of 0.8434 which is greater than 0.05, the random effects model was used for further interpretations.

Regression Results of Firm Size Moderation on Earnings Volatility and Income retention

The study conducted panel regression using random effects model as specified by the Hausman test to assess the moderating effect of firm size on the relationship between earnings volatility and retention ratio of general insurance firms in East Africa. Firm size, as moderating variable represented by Z in the model, was measured by the logarithm of total assets. The model and the results are as shown below.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \beta_3 X_{it} * Z_{it} + \varepsilon_{it} \dots\dots\dots(2)$$

Table 5.14 Moderating effect of Firm Size for Earnings Volatility

Number of obs	=	395	Wald chi2(3)	12.60
Number of groups	=	79	Prob > chi2	0.006
Obs Per Group: Min	=	5	R ² between	0.0875
Max	=	5	R ² overall	0.0853

Retention	Coef.	Robust Std. Err.	Z	P> z	[95% Conf. Interval]	
Volatility	0.24205	0.11126	2.18	0.030	0.024	0.4601
Size	-0.02194	0.03011	-0.73	0.466	-0.0809	0.0371
Size*Volatility	-0.04312	0.01869	-2.31	0.021	-0.0798	-0.0065
_cons	0.79438	0.18988	4.18	0.000	0.4222	1.1665

Source: Data processed

Table 5.14 shows the panel regression results when estimating the effect of moderating effect of insurance firm size on the relationship between earnings volatility and income retention. The random effects model is significant as shown by the p-value of Wald chi2 of 0.006. The R² value for the moderated equation is 0.0853, suggesting that the variables explain 8.53% of the variation in income retention. With moderation, earnings volatility shows a positive significant relationship with retention ratio ($\beta_1 = 0.24205$, p-value = 0.030). Size has a negative but insignificant relationship with income retention ratio ($\beta_2 = -0.02194$, p-value = 0.466). However, for significance of the moderation effect, the

interaction term X*Z or Size*Volatility has to be significant. The interaction term has a negative significant effect on retention ratio ($\beta_3 = -0.04312$, p-value = 0.021). To test whether the incremental change of the R² after moderation is significant compared to the R² before moderation, an F statistics test was carried out as per the following formula:

$$F = [(R_2^2 - R_1^2)/(k_2 - k_1)] / [(1 - R_2^2)/(N - k_2 - 1)]$$

Where R₂² and k₂ represent respectively the R-squared and the number of predictors of the moderated model, and R₁² and k₁ the R-squared and the number of predictors of the model before moderation.

Table 5.15 F-statistic Test on Incremental Change of R² after Moderation

F statistic	P-value	Decision
5.71	0.0036	Significant

From the results of table 5.15 above, the value of F statistic is 5.71 which corresponds to a p-value of 0.0036.

Accordingly, since the p-value is less than 0.05, the overall moderated model as assessed by the incremental change in R² is

significant. The optimal regression model is expressed as follows:

$$Y_{it} = 0.79438 + 0.24205 \text{ Earnings Volatility} - 0.02194 \text{ Size} - 0.04312 \text{ Size*Volatility} + \varepsilon_{it}$$

Hypothesis Testing

The research null hypothesis was that firm size has no significant moderation effect on the relationship between earnings volatility and income retention of general insurers in East Africa. The interaction term showed a negative significant relationship with retention ratio (p-value = 0.021) and the F-statistic test carried out on the change in R² before and after moderation showed a p-value of 0.0036. The study results therefore provide enough evidence to reject the null hypothesis and conclude that firm size has a significant moderation effect on the relationship between earnings volatility and income retention.

Discussion

With the use of random effects panel data regression model, the findings showed that earnings volatility has a negative significant influence on income retention of general insurers in East Africa. The study also established that firm size has a negative and significant moderating effect on the relationship between earnings volatility and income retention of general insurers in East Africa. The findings are consistent with the expected utility theory in respect of the relationship between earnings volatility and income retention. In respect of the moderating effect of firm size, the findings rather support the transaction cost theory perspective than the financial distress hypothesis of risk management.

The findings were inconsistent with most studies such as Altuntas, Garven and Rauch (2018) in the global insurance market and Workie (2018) in Ethiopia. However, the findings are consistent with

the study by Burca and Batrinca (2014) in the Romanian insurance market. The findings are in line with the transaction cost perspective argument that large firms can take advantage of scale economies to negotiate more favorable reinsurance terms and this provides to purchase more reinsurance and have a lower retention. According to insurance industry experts interviewed during the primary study, the reason why most insurance companies do not purchase more reinsurance to mitigate volatility is because reinsurers charge a high cost to take into account their increased risk and this offsets the expected benefit. If large firms are able to reduce the cost then there is incentive to mitigate volatility through reinsurance.

Conclusion

The study findings and discussion reveal that earnings volatility has a negative effect on income retention and firm size has a significant moderating effect on the relationship between earnings volatility and income retention. As volatility reaches higher levels, larger insurance firms use more reinsurance to mitigate the risk at the expense of lower income retention. This affects negatively their profit and exposes them to higher credit risk. To save cost and increase income retention, regulatory authorities in East Africa should encourage general insurance firms to explore more internal solutions to manage the volatility in terms of risk selection and adequate pricing so that only the residual risk is transferred. Managers of large firms should aim profitable growth through excellent underwriting practices instead of reinsurance which reduces their income retention.

References

- Abass, O.A., & Obalola, M.A. (2018). Reinsurance Utilization and Performance of Non-Life Business in the Nigerian Insurance Industry: A Mixed Method Approach. *The Journal of Risk*

- Management and Insurance*, 22(2), 29-46.
- Altuntas, M., Garven, J., & Rauch, J. (2018). On the Corporate Demand for Risk Management: Evidence from the Global Market. *Risk Management and Insurance Review*, 21(2), 211-242.
- Bahri, S., Saragih, F. D., & Nugroho, B. Y. (2017). The Insurance Factors and the Determination of Retention to Improve Performance of Insurance Companies Indonesian Insurance Industry. *International Journal of Applied Business & Economic Research*, 15(7), 317-336.
- Burca, A. M., & Batrinca, G. (2014). The determinants of financial performance in the Romanian insurance market. *International Journal of Academic Research in Accounting, Finance and management Sciences*, 4 (1), 299-308.
- Clemente, G. P. (2018). The Effect of Non-Proportional Reinsurance: A Revision of Solvency II Standard Formula. *Open Access Journal*, 6(2), 1-13.
- Conference Interafricaine des Marchés d'Assurances (2016). *Circular 005/CIMA/PCMA/CE/2016 Amending and Complementing Article 308 of the Insurance Act in Respect of Reinsurance Sessions Abroad*. April 2016.
- Cupic, M. (2015). Risk Management and Corporate Value. *Economic Horizons*, 17(3), 215-228.
- Curak, M., Utrobicic, M., & Kovac, D. (2014). Firm specific characteristics and Reinsurance: Evidence from Croatian insurance companies. *Ekonom. Misao Praksa*, 23(1), 29-42.
- Gatamel, M., & DeForges, S. L. (2013). Understanding and Monitoring Reinsurance Counterparty Risk. *Bulletin Français d'Actuariat*, 13(26), 121-138.
- Gonzalez, P.G., & Anderson, L. (2018). Managing Financial Constraints: Undercapitalization and Underwriting Capacity in Spanish Fire Insurance. *The Economic History Review*, 71(2), 567-592.
- Ho, C., Lai, G. C., & Lee, J. (2013). Organizational Structure, Board Composition and Risk Taking in U.S. Property Casualty Insurance Industry. *The Journal of Risk and Insurance*, 80(1), 169-203.
- Insurance Regulation and Control Agency of Burundi (2020). *Annual Report 2019*. August 2020.
- Insurance Regulation and Social Protection Authority of Morocco (2021). *Industry Annual Report 2020*. May 2021.
- Insurance Regulatory Authority Kenya (2020). *Industry Annual Report 2019*.
- Insurance Regulatory Authority of Uganda (2020). *2019 Annual Insurance Market Report*.
- Insurance Regulatory Authority of Uganda (2017). Circular IRA/CIR/11/17/363 in Respect of *Guidelines on Localization of Reinsurance Business*. December 2017.
- Ismail, M. (2013). Determinants of Financial Performance: The Case of General Takaful and Insurance Companies in Malaysia. *International Review of Business Research Papers*, 9(6), 111-130.
- Kader, H. A., Adams, M., & Anderson, L.F. (2010). The Determinants of Reinsurance in Swedish Property Fire Insurance Market During Interwar Years 1919-1939. *Business History*, 52(2), 268-284.
- Lei, Y. (2019). Reinsurance and Insurers' Risk-Return Profile. *Journal of Insurance Issues*, 42(1), 1-29.
- Lo, A. (2016). How does Reinsurance Create Value to an Insurer? A Cost-Benefit Analysis Incorporating Default Risk. *Journal of Risk and Financial Management*, 4(48), 1-16.
- Mankai, S., & Belgacem, A. (2016). Interactions between risk taking, capital and reinsurance for Property-Liability insurance firms. *Journal of Risk and Insurance*, 83(4), 1007-1043.
- Mao, H., Carson, J., & Ostaszewski, K. (2015). Integrated Determination of Insurer Capital, Investment and Reinsurance Strategy. *Journal of Insurance Regulation*, 34(6), 1-29.
- Mayers, D., & Smith, C.W.J. (1990). On Corporate Demand for Insurance: Evidence from the Reinsurance market. *The Journal of Business*, 63(1), 19-40.
- Neumann, V., & Morgenstern, O. (2012). *Theory of Games and Economic Behavior*. Princeton, Princeton University Press. Organization for Economic

- Cooperation and Development (2022). *OECD insurance statistics 2021*. OECD Publishing, Paris.
- Porth, L., Tan, K.S., & Weng, C. (2013). Optimal Reinsurance Analysis from a Crop Insurer's Perspective. *Agriculture Insurance Review*, 73(2), 310-328.
- Scordis, N. A., & Steinorth, P. (2012). Value from hedging risk with reinsurance. *Journal of Insurance Issues*, 35 (2), 210-231.
- Shiu, Y-M. (2011). Reinsurance and capital structure: Evidence from the United Kingdom Non-Life insurance industry. *The Journal of Risk and Insurance*, 78(2), 475-494.
- Tanzania Insurance Regulatory Authority (2018). *Annual Insurance Market Performance Report for the Year Ended 31st December 2017*. October 2018.
- Tanzania Insurance Regulatory Authority (2017). *Circular No 055/2017: Conditions for Dealing with Foreign Reinsurers and Reinsurance Brokers*. December 2017.
- Tanzania Insurance Regulatory Authority (2018). *Conditions for Dealing with Foreign Reinsurers and Reinsurance Brokers on Reinsurance Matters*. December 2018.
- Tanzania Insurance Regulatory Authority (2020). *Tanzania Insurance Quarterly Performance for the Twelve Months' Period from 01st January to 31st December 2019*. March 2020.
- Wasike, A.N. (2017). Determinants of Profitability in the Insurance Sector: A Case of Composite Insurance Companies. *Journal of Humanities and Social Sciences*, 21(10), 10-24.
- Wen, J., Chen, K.C., & Wu, L. (2015). Empirical Study of Adverse Selection and Moral Hazard in the Property and Liability Reinsurance Market. *Journal of Finance and Accountancy*, 19 (1), 1-22.
- Yanase, N., & Limpaphayom, P. (2017). Organization Structure and Demand for Reinsurance: The Case of Japanese Keiretsu. *The Journal of Risk and Insurance*, 84(2), 599-629.
- Zhou, X., Wang, Y., Zhang, H., & Wang, K. (2015). Empirical Study on Optimal Reinsurance for Crop Insurance in China from an Insurer's Perspective. *Journal of Integrative Agriculture*, 14(10), 2121-2133.

Appendices

Appendix 1: Tukey's Test for Pairwise Differences in Means – Income Retention

Country A vs B (A-B)	Mean diff.	Std. Error	t	P> t
Uganda vs Kenya	-.0893904	.0225764	-3.96	0.001
Tanzania vs Kenya	-.1993977	.0230373	-8.66	0.000
Rwanda vs Kenya	.0492987	.0314684	1.57	0.520
Burundi vs Kenya	.0073939	.0335622	0.22	0.999
Tanzania vs Uganda	-.1100074	.0263404	-4.18	0.000
Rwanda vs Uganda	.1386891	.0339612	4.08	0.001
Burundi vs Uganda	.0967843	.0359099	2.70	0.056
Rwanda vs Tanzania	.2486964	.0342693	7.26	0.000
Burundi vs Tanzania	.2067917	.0362015	5.71	0.000
Burundi vs Rwanda	-.0419048	.0420724	-1.00	0.857

Appendix 2: Tukey's Test for Pairwise Differences in Means – Earnings Volatility

Country A vs B (A-B)	Mean diff.	Std. Error	t	P> t
Uganda vs Kenya	.7445241	.166652	4.47	0.000
Tanzania vs Kenya	.1786932	.1700544	1.05	0.831
Rwanda vs Kenya	.4218182	.2322902	1.82	0.366
Burundi vs Kenya	.1521515	.2477459	0.61	0.973
Tanzania vs Uganda	-.5658309	.1944372	-2.91	0.031
Rwanda vs Uganda	-.3227059	.2506911	-1.29	0.699
Burundi vs Uganda	-.5923725	.2650762	-2.23	0.169
Rwanda vs Tanzania	.243125	.2529658	0.96	0.872
Burundi vs Tanzania	-.0265417	.2672284	-0.10	1.000
Burundi vs Rwanda	-.2696667	.310566	-0.87	0.908

Appendix 3: Tukey's Test for Pairwise Differences in Means – Firm Size

Country A vs B (A-B)	Mean diff.	Std. Error	t	P> t
Uganda vs Kenya	-.6422389	.0508717	-12.62	0.000
Tanzania vs Kenya	-.5034962	.0519104	-9.70	0.000
Rwanda vs Kenya	-.5572641	.0709083	-7.86	0.000
Burundi vs Kenya	-.7757879	.0756263	-10.26	0.000

Tanzania vs Uganda	.1387426	.0593534	2.34	0.135
Rwanda vs Uganda	.0849748	.0765253	1.11	0.801
Burundi vs Uganda	-.133549	.0809164	-1.65	0.466
Rwanda vs Tanzania	-.0537679	.0772196	-0.70	0.957
Burundi vs Tanzania	-.2722917	.0815734	-3.34	0.008
Burundi vs Rwanda	-.2185238	.0948025	-2.31	0.145
