The Effect of Product Pricing on the Growth of Micro Insurance by Insurance under Writers in Kenya

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Abstract

This research study sets out to examine whether the growth of micro insurance in Kenya is affected by how insurance underwriters price their products. The research objective was to establish how product pricing affects the growth of micro insurance by insurance underwriters in Kenya. The research adopted an experimental research design and was based on multiple linear regression analysis of secondary data. The dependent variable used was the gross premium which was a proxy for the growth of micro insurance and the independent variables used were incurred expense ratio, incurred claims ratio and net income ratios which were proxies for product pricing. The coefficient of determination was used to check the fitness of the model. A t-test statistic was used to test the significance at 5%. The findings of this research establish that there exists a relationship between the gross premium and the incurred expense ratio, incurred claims ratio and net income ratios. The study established that there was 87.9% variation in gross premium which could be explained by the independent variable thus deeming the regression model fit. There was a positive correlation between the expense ratio 0.555, claims ratio 0.239 and net income ratio 0.914 and the gross premium, which is significant at 5% implying that an increase in the above ratios will indicate an increase in the gross premium. This doesn't mean that there is an increase in the earned premiums but simply indicating an increase in the business underwritten.

Key Words: Product Pricing, Micro insurance growth, gross premium, incurred expense ratio, incurred claims ratio, net income ratio

1. Introduction

In the environment we live in, all activities are subject to risk of loss from unforeseen events. To alleviate this burden to individuals, what we now call insurance has existed since at least 215 BC with a common goal of pooling related risks and offering a cushion to the unforeseen circumstances. This concept has been practiced in various forms for over 1400 years (IIBI Report, 2001). Currently traditional insurance products are expensive and not readily available to the poor. This has led to the development of micro insurance. Micro insurance can be defined as the protection of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved (Churchill, 2007). It has been considered as "the next revolution" in addressing risks and vulnerability in low income countries (Morduch, 2006).

Low income households are also exposed to various risks in their day to day activities. One way of protecting themselves from those risks is by taking insurance covers. Micro insurance can play a major role in helping them to maintain financial confidence even in the face of significant vulnerability. It seeks to reach out to customers that are not yet served by the existing traditional insurance. Despite focusing on low income sector, micro insurance should be managed in accordance with the general accepted insurance principles and practices as it still falls under the broader insurance market (Insurance Regulatory Authority, 2014).

Product Pricing involves looking at the frequency and severity of insured risks and the expected average pay-out resulting from these risks. Its framework mainly focuses on actuarial control cycle which entails relying on historical data to predict future behaviour for premium rate creation and an analysis on the administration expense, risk analysis and financing structure (Annals of Actuarial Science, 2014). Pricing is usually done by calculating the expected claims, administration cost, risk premium and profit margin of a product before it is released in the market (Association of Kenya Insurers, 2012).

Most companies face difficulties in pricing because of insufficient data on micro insurance. There is much less reliable data on the low-income target market and the group is also much less uniform. Therefore, it is very hard for insurance companies to accurately determine what price they should charge for the cover. The target market of low-income population has much less disposable income, and a small increase in the price will make it much less affordable thus reducing the demand (Adriaan, 2014). The micro insurance product risks are also unknown; therefore, insurers would like to charge an additional margin in the premium to protect them against possible unforeseen losses. The cost of distribution is also much higher as a percentage of the premium for low-premium policies. In order to make a profit, insurers rely on achieving large volumes of sales.

Because it is difficult to predict the exact number of sales they will achieve, it is hard to price appropriately. If pricing is not done accurately, it will lead to low premium rates thus exposing the company to the likelihood of making losses when claims occur. Competition is forcing insurers to adjust rates more frequently to retain existing customers and attract new ones. Yet many insurers take weeks, if not months, to implement a new rating structure, and the effective performance of these models rapidly deteriorates over time. Inevitably, insurance is changing its approach with regards to product pricing.

As insurance becomes more and more of a commodity, insurance companies are trying to differentiate themselves from their competitors based on customer services, claims experience, and financial strength, but mostly by price. Thus, to gain a competitive advantage, insurers are beginning to use price optimization to see how demand varies at different price levels and come up with recommend prices that will improve profit (Stuart, 2013).

Despite the challenges, it is of great importance that product pricing is done accurately so that the premium rates are competitive and of good value. If this is ignored, the company will be at risk of charging low premiums which will lead to liquidity constraints in the event of multiple claims arising (Dror and Armstrong, 2006). Micro insurance is an emerging trend in the financial market thus its regulation is not clearly provided in most jurisdictions. The Insurance Regulatory Authority (IRA) has recently developed a regulatory framework for micro insurance which will clearly distinguish it as a form of insurance business rather than a subclass as previously perceived. It will improve the supervision of micro insurance leading to potential growth in the sector.

As much as it is important to develop micro insurance so as to tap the potential market of low income earners, most insurance companies face major challenges in coming up with suitable products for the target market. Downsizing of the traditional insurance products so that they suit low income earners is not the best approach of micro insurance. Downsized formal insurance sometimes ignores the more frequent and stressful shocks facing the poor as well as positive attributes of the informal strategies that poor people already use to cope with risk (Sebstad and Cohen, 2001). Micro insurance growth can be measured by analysing the product awareness and the client's satisfaction. This can be done by analysing the renewal ratio, coverage ratio or the growth ratio. The awareness and satisfaction performance indicators focus on how readily the target market enrols in the micro insurance programme and retain the coverage (Wipf and Garand, 2010).

A reasonable approach to product pricing is to design products in such a way that they fit the needs of the target market. This can be done by doing research on the basic risks that the target market is facing and coming up with suitable products that help in mitigating the risks. An insurance company can't set its prices based on known costs for production and distribution like most businesses. Instead, an insurer needs to project the costs of future claims by examining historical data. The process is reliable only when the insurer uses a sufficient amount of accurate data. This is what is termed as product pricing. Potential micro insurance clients are exposed to a myriad of risks, all of which cannot be feasibly insured (Roth et al, 2007). The products formed fail to meet consumer expectations (Brown and McCord, 2000). According to (Mbogo, 2010) micro insurance products in Kenya do not meet the consumers' needs adequately. This is because there is inadequate differentiation between products from different insurance companies, making it difficult for consumers to distinguish between competitor offerings in terms of product features (AKI, 2008). Product design also affects the quality of the product. Micro insurance clients may not afford to pay high prices on insurance products, but they need high quality products, in fact better-quality micro insurance product (faster settlement of claims, fewer exclusions and wider coverage) to attract them to insurance (Njuguna, 2012). Prahalad (2005) shows that the poor too are brand conscious. Low-income earners buy insurance if the products meet their needs and are fairly priced (Brown and McCord, 2000). Price charged should cover all claims and operating expenses and generate a profit for the company. In most cases, micro insurance policy premium is often lower than the cost incurred in administering the products, thus most companies avoid micro insurance or tend to overprice their product thus limiting the uptake.

The main intention of having micro insurance products is to target the low income earners. This automatically means that the products the companies should develop must be cheap and at the same time cover the expected risks that the policyholders will be facing and meet the administration costs incurred while developing the product. Most products are usually bundled together such that one product can cover various types of risks (IRA Policy Paper, 2014). Insurers find it cheaper to underwrite group risks compared to individual risks. When adequate pricing is done, the company will be able to meet the cost of issuing micro insurance products in the market. On the other hand the value of the product will determine the reception of the target market. Micro insurance products should be economically viable to both the insurance company and to the target market. If the products are affordable, this will increase the uptake of the product thus increase the growth of the industry at large.

Most studies have not focused on the concept of product pricing in relation to micro insurance development. This research study attempted to answer the question; does product pricing affect the growth of micro insurance by insurance underwriters in Kenya?

The Research Objective is to establish how product pricing affects the growth of micro insurance by insurance underwriters in Kenya.

2. Literature Review

2.1 Theoretical Review

Various theories have been used to have an understanding on various factors which affect micro insurance development both directly and indirectly. Some of these theories touch on how customers form satisfaction judgments. Since micro insurance focuses on the low income earners, it can be perceived to target a specific market.

2.1.1 Game Theory

Myerson (1991) defines game theory as the study of mathematical models of conflict and cooperation between intelligent rational decision-makers. Game theory provides general mathematical techniques for analysing situations in which two or more individuals make decisions that will influence one another's welfare. Smith, 2002 sets out an introduction to the concepts of game theory for general insurance actuaries and hints at where the theory might have some application. The paper introduces the model developed by Cournot (1838) to address the issue of competition between two suppliers to a market who need to make decisions on how much to produce. This might have provided a framework for exploring how different insurance firms may interact.

However, in reality, most insurance companies execute their strategy by deciding what price to set, rather than deciding what quantity to produce, as assumed under the Cournot model. In insurance, the double auction model can be applied in pricing thus determining the premium rates. This model applies the game theory concept. The players are the Insured and the insurer. There are two different conditions for this game. When the risk coverage is fixed, they will negotiate about the premium. While when the premium is fixed, they will negotiate about the risk coverage. In this paper, the first condition will be discussed. Therefore, their strategy is premium. In this game, the insurer is the seller who sells the insurance product to the Insured. The Insured is the buyer of the insurance product.

2.1.2 Financial Pricing Theory

A possibly more appropriate theoretical construct to analyse the issue of whether commissions are passed through to buyers is insurance financial pricing theory (Myers and Cohn, 1987). Financial theory posits that insurers operating in competitive insurance and financial markets will collect premiums sufficient to cover the expected losses and expenses from issuing insurance policies as well as a profit loading sufficient to cover the cost of capital (i.e., the economic cost of bearing risk). Expenses that are passed along in this model include all commissions, administrative expenses, and taxes, including corporate income taxes. Thus, under financial pricing theory, the pass-through rate for all types of commissions would be 100%, and insurers on average would earn a fair competitive rate of return equal to the cost of capital. The financial pricing result centres on the hypothesis that insurance markets are competitive, such that insurers do not on average earn profits in excess of the cost of capital. Most economists who have evaluated insurance markets have concluded that property-casualty insurance markets are competitively structured. Thus, the prediction of this theory is that the entire cost of the commissions would be passed through to buyers. The amount of the commission that actually is passed along to buyers depends upon whether conditions in the insurance market more closely resemble those assumed in the micro-economic tax incidence literature, where commissions represent deadweight costs and there are some monopoly profits earned by insurers, or those assumed in the financial pricing literature, where commissions are expenses for services rendered and insurance markets are competitive (Cummins and Doherty, 2005).

2.1.3 Winner's Curse Theory

This theory is a concept of the auction theory. Auction theory suggests that bidders should "shade" their bids to allow for the impact of winner's curse. Rothwell, et al., (2009) applied the winner's curse concept of auction theory to setting the price of an insurance policy. This suggests that firms bid to underwrite a customer's risk by quoting a premium. However, the true cost of that policy is unknown as it is not possible to predict precisely what will be the claims cost. In this event, insurers will determine the price they will bid by considering their expectation of what is the cost of claims. The winner's curse theory suggests that an insurer who bids the lowest price and wins the business is likely to have underestimated the cost and therefore is likely to be cursed by less profit than expected. The winner's curse model assumes that insurers are identical, independent and compete for the same risks at the same level of profitability. Therefore, the consumer has no preference for an insurer and will always pick the organization that provides the cheapest price. The price submitted by the insurer is based on their perception of the risk driven from their own data. This brings in uncertainty in that the premium will be based on certain distributional assumptions (Warren, et al., 2012).

2.1.4 Assimilation Theory

This theory is based on Festinger's (1957) dissonance theory. Dissonance theory posits that consumers make some kind of cognitive comparison between expectations about the product and the perceived product performance. This view of the consumer post-usage evaluation was introduced into the satisfaction literature in the form of assimilation theory. According to Anderson, 1973, consumers seek to avoid dissonance by adjusting perceptions about a given product to bring it more in line with expectations. Consumers can also reduce the tension resulting from a discrepancy between expectations and product performance either by distorting expectations so that they coincide with perceived product performance or by raising the level of satisfaction by minimizing the relative importance of the disconfirmation experienced. Payton, et al., (2003) criticized this theory by arguing that it has a number of shortcomings. First, the approach assumes that there is a relationship between expectation and satisfaction but does not specify how disconfirmation of an expectation leads to either satisfaction or dissatisfaction. Second, the theory also assumes that consumers are motivated enough to adjust either their expectations or their perceptions about the performance of the product. A number of researchers have found that controlling for actual product performance can lead to a positive relationship between expectation and satisfaction. Therefore, it would appear that dissatisfaction could never occur unless the evaluative processes were to begin with negative consumer expectations.

2.2 Empirical Review

There are key issues that currently influence micro insurance development in Kenya and around the world. Most underwriters lack the necessary capacity to develop, underwrite the products and process the claims necessary to accommodate the unique features of micro insurance. According to the Kenyan micro insurance policy paper, insurance companies are struggling to keep the transaction and administrative cost low which has a major impact on the pricing of products. The majority of the potential market for micro insurance is employed in the informal sector with inconsistent incomes that are difficult to sustain the consistent premium payments. Ramesh and Nishant (2006) study concentrated on the factors affecting demand for health insurance in a micro insurance scheme in India. Their research focused on the field of demand for health insurance in respect to low income earners. They attempted to analyse factors which determine health insurance purchase decision by using a model having continuous, categorical and interval variables and estimating the model in two stages, buying decision of insurance due to the cost of product and the extent of health insurance purchase. They used primary data which was collected through questionnaires. The data was collected on different economic variables like those that income, gender and education and information related to variables like healthcare expenditure and hospitalization.

The study used an econometrics analysis to find the factors that affect health insurance purchase decisions. In their estimation procedure, they did an analysis on both the health insurance purchase decision and the factors that affect the extent of insurance purchase. According to their study, the dependent variable was the extent of insurance purchase and the independent variables were income, health expenditure, age, child, hospitalization costs, coverage of illness, and coverage of service and industry expenditure. All the independent variables can be merged to form the expenses incurred and the income. The model that was used by the researcher was a multi linear regression model .A test was done to see whether the independent variable had a problem of multicollinearity. The inverse of the correlation matrix was used in detecting multicollinearity.

Ekundayo (2012) analysed the impact of risk pricing on profit maximization of insurance companies in Nigeria. In the study, the researcher used both primary and secondary data. Primary data was obtained through administering a questionnaire to randomly selected non-life insurance underwriters and insurance brokers. Secondary data was obtained from 30 insurance companies. Both descriptive and regression were used in the analysis. The study observed that operation expenses of insurance companies in Nigeria is strongly correlated to profitability and should be properly managed. Operation expenses are part of the costs that are supposed to be considered when pricing a micro insurance product so that a company may make positive returns from their products. If the cost of production is high, the premium rates charged will be high thus making the product expensive for the intended target market.

Njuguna (2012) analysed the Risk Management Practices, a survey of micro insurance service providers in Kenya. The study used a descriptive research design as it sought to determine the micro-insurance risk management practices of insurance companies in Kenya. According to Burns (2000) a descriptive research design utilizes elements of both quantitative and qualitative research methodologies to offer description of the state of affairs as it exists at present. In this study, primary data was collected by use of questionnaires. An analysis was done on the risks involved in product design, adverse selection, moral hazard, pricing, and correlation of risks, regulatory, fraud, premium default, inadequate distribution channels, and low penetration. In data analysis percentages, means and standard deviations were calculated to help in describing the data. Pearson Correlations and Chi-Tests were also calculated to determine the level of association between the variables of interest. Visual binning was applied to determine the most severe risks facing micro-insurance providers and the effectiveness of the risk management strategies postulated in the study. According to the findings, insurance companies conduct constant micro-insurance price reviews/revisions so as to reduce the risk of cost incurred being higher than the price charged or the policy being too expensive to be afforded by the low-end market.

Radeva (2012) focused on performance measurement and long term balance between financial and social performance in health micro insurance in India. The research was based on investigating the delivery models of health micro insurance and how they relate to performance measurement. The performance measures was analysed according to 16 key performance indicators created by the micro insurance industry. The researcher analysed the product value by calculating the incurred expense ratio, incurred claim ratio and net income ratio. On product awareness and client satisfaction, the researcher calculated renewal ratio, coverage ratio and growth ratio.

Gitau (2013) research focused on the challenges facing development of micro insurance at CIC insurance group limited in Kenya. In the study, both primary and secondary data was collected and were qualitative in nature. Content analysis was used to analyse the data. The findings indicated that the data obtained was compared with existing literature in order to determine areas of agreement and disagreement. The research finding specifically on product pricing was that transaction cost, collecting premiums where there is likely to be a lack of bank accounts, and assessing and paying out of small claims tend to be relatively high. For the company to meet the increasing cost, the premium rates must be higher thus limiting the access to low income earners. This makes the development of micro insurance low because the target market cannot afford high prices yet they need high quality products for their needs.

Oino (2013) researched on multiple linear regression approach to modelling determinants of profitability of life Insurance companies in Kenya. The research main objective was to establish the relationship between the profitability of life insurance companies and the selected internal factors of the companies. The research also analysed the assumptions of multi linear regression model. The findings were that there was a correlation between return on asset which was the dependent variable and the company size, volume of capital, underwriting risk and liquidity which were the independent variables. From the study, it is clearly indicated that the model can be used to measure the profitability of insurance companies. Each independent variable had an effect on the return on assets. Since micro insurance development is a performance indicator of the insurance industry, the model would be a viable method to apply in this study.

3. Methodology

An experimental research design is a study design used to test cause and effect relationships between variables. The study looked at the relationship between the growth of micro insurance which was measured by the gross written premium, the dependent variable and product pricing which was measured by the incurred expense ratio, incurred claim ratio and the net income ratio, independent variables. The study looked at the usefulness of the model in explaining the growth of micro insurance by assessing the calculated ratios. The usefulness of the overall model was determined by coefficient of determination, R^2 and the analysis of variance (ANOVA).

The target population for this study was 7 insurance companies in Kenya registered and licenced by the Insurance Regulatory Authority which offer micro insurance products. Data from the 7 companies was considered in analysis. The study adopted secondary data collection for all the related variables. Data was collected from the financial statements of the insurance companies, the financial condition reports that are prepared annually by actuaries for submission purpose to the regulator and also from the underwriting and claims reports of the insurance companies. This was the best source of collecting the data since the information is for publication purposes and submission to the regulatory entities thus making it a legal requirement.

This increased data validity and reliability. For the dependent variable, data on the gross premium was collected, while incurred claims, incurred expenses, net income and earned premiums were collected to calculate the ratios used in the independent variables. The data collected was edited, coded, and tabulated into manageable summaries. This study used a quantitative method of data analysis which was conducted using descriptive statistics. In this study, I adopted the methodology by (Ramesh and Nishant, 2006) which is a multi linear regression model, but reduced the number of independent variables to three. It was a probabilistic model that includes more than one independent variable. To measure the effect of product pricing on the growth of micro insurance by insurance underwriters in Kenya, the study considered the product value and the product awareness. The product value entailed an analysis of the incurred expense ratio, which is a ratio of the incurred expenses and earned premiums, Incurred claim ratio, which is a ratio of the incurred claims and earned premiums and the net income ratio, which is a ratio of the net income and earned premiums. All these ratios formed part of the independent variable (X).

The growth of micro insurance was measured by the gross written premium. The model clearly indicated how the X variables influenced the outcome of Y and also the correlation between the X variables.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Y- Gross written premium was used as a proxy for growth of micro insurance

X_1- Incurred Expense Ratio

X_2-Incurred Claims Ratio

X_3- Net Income Ratio

ε- Error term

β_0-is the mean of the responses at x = 0

$\beta_1, \beta_2, \beta_3$-were used to measure the effect of each independent variable

The relevant ratios were calculated from the data collected so as to get the independent variables. The coefficient of determination R^2 was used to show how the model fits the data, and thereby representing a measure of the usefulness of the model in predicting Y only if the sample contains substantially more data points than the number of β parameters in the model. The numerical value of R^2 was used to check the fitness of the model to the data. Analysis of variance was used to test the hypothesis of all the β parameters except β_0.A t test statistic was applied so as to determine whether each individual independent variable was significant in explaining the growth of micro insurance by insurance underwriters in Kenya. A 5% level of significance was used. Since the growth of micro insurance is a performance indicator of the insurance industry, the model was viable method to apply in this study keeping in mind the assumptions of multicollinearity, normality, and linearity. All the assumptions were tested statistically using Statistical Package for the Social Sciences (SPSS).

4. Summary and Interpretation of findings

From the research findings, it is clear that there exists a positive correlation coefficient between the dependent variable and the independent variables. This is an indication that the independent variables affect the dependent variable positively. An increase in the incurred claims ratio, incurred expense ratio and net income ratio will lead to an increase in the gross premium. This can be explained by the fact that if the gross premium increases, it means that the company is underwriting more business, which will lead to an increase in the expenses incurred while issuing the products, an increase in the expected claims due to the increase in clientele and also an increase in the net income. The fitness of the model was determined by analysing the numerical value of R^2. The value of R^2 was 0.879 implying that there 87.9% variation in gross premium can be explained by the net income ratio, claims ratio and incurred expense ratio thus deeming the model fit. Based on the analysis of variance, the p value was less than 5% and was used as a test of significance. The study also tested the multiple linear regression assumptions which included multicollinearity, collinearity and normality. There was linear dependence amongst the observations since several Eigen values were close to zero, thus indicating that the predictors are highly inter correlated and that small changes in the data values may lead to large changes in the estimates of the coefficient. The bell shaped histogram indicated that the residuals were normally distributed around the mean of zero. The probability plot also showed a linear relationship between the independent variables and the dependent variable.

5. Conclusion

The study found out that there exists a relationship between the gross premium which was a proxy for the growth of micro insurance and the incurred expense ratio, incurred claims ratio and net income ratios which were proxies for product pricing. The study established that there was a positive correlation between the expense ratio, claims ratio and net income ratio and the gross premium. An increase in the above ratios indicated that there was an increase in the gross premium. This is realistic because when the gross premium increases, it means that the insurance companies are underwriting more business. This will automatically lead to an increase in the expenses incurred in issuing the products, an increase in the number of claims expected or even incurred since the company now covers a wider clientele and also an increase in the net income. From the above literature, we have seen that an increase in the gross premium on the micro insurance products indicates that there is a high purchase of the product. This is an indication that there is product awareness and there is growth of micro insurance. The model has proven to be a useful tool for measuring micro insurance growth and can be used by companies in planning to venture in micro insurance.

This study intended to establish whether there is a relationship between product pricing and the growth of micro insurance in Kenya. The intention was to look at the product value vis a vis the product awareness. The proxies intended to represent product pricing clearly indicates that it's a major determinant on the consumption of micro insurance products. Growth can only be ascertained if the micro insurance products a company offers are appreciated and are consumed by the target market.

The model used proved to be viable and in line with the previous studies done in regards to measuring performance of micro insurance. There is consistency with the empirical studies since they indicate a positive correlation between the dependent and independent variables in measuring performance of micro insurance.

The net income ratio was the key performance indicator since it measures how viable or profitable micro insurance is. One of the most important indicators is the micro insurer's net financial result or net income since this reflects a summary of all activities in the period reviewed. The incurred claims ratio and incurred expense ratio outlined the total cost incurred by a company when issuing a micro insurance product.

5.1 Limitations of the study

Micro insurance being an emerging market in the insurance sector in Kenya, the study faced various limitations. Most of the companies were not willing to give out the data in regards to micro insurance products due to fear of competition from other insurance companies. This posed a major challenge based on the data validity and reliability. The Insurance Regulatory Authority is currently developing a regulatory framework on micro insurance. This has slowed down the growth of the micro insurance sector because there is no standard template of reporting micro insurance business as a subclass on its own thus leading to most companies reporting micro insurance data as part of the miscellaneous products. This made it difficult to extract accurate data. Most insurance companies lack independent data in regards to operating and investment income specifically for micro insurance thus posing difficulties in establishing accurate net income ratio.

The sample selected majorly focused on companies which offer general insurance products and only one life product leading to a bias. The study did not put into consideration the life products. This had an effect on the independent variables since they were all ratios with respect to earned premiums and in life products it's not applicable. The model used coefficient of determination R^2 to measure data validity. The numerical value of R^2 was 87.9% which is relatively high. This does not guarantee that the model fits the data well, because as anscombe's quartet shows, a high R^2 can occur in the presence of misspecification of the functional form of a relationship or in the presence of outliers that distort the true relationship. The study focused on all the micro insurance products and did not categorize the products. This may have a positive or negative influence on the findings since different products incur different costs when issuing and also have different income depending on their nature and how lucrative they are.

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Table 1: Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
gross premium	144	7387501.00	10186.00	7397687.00	1.2614E6	2.20644E6
expense ratio	144	1.2968	.0045	1.3013	.331169	.2712085
claims ratio	144	3.3198	.0130	3.3328	.627519	.7378167
net income	144	5.1561	-.1633	4.9928	1.001249	1.2165349
Valid N (list wise)	144					

Source: SPSS Output

Table 2: Correlations

		gross premium	expense ratio	claims ratio	net income
gross premium	Pearson Correlation	1	.555[**]	.239[**]	.914[**]
	Sig. (2-tailed)		.000	.004	.000
	N	144	144	144	144
expense ratio	Pearson Correlation	.555[**]	1	-.024	.679[**]
	Sig. (2-tailed)	.000		.778	.000
	N	144	144	144	144
claims ratio	Pearson Correlation	.239[**]	-.024	1	.049
	Sig. (2-tailed)	.004	.778		.562
	N	144	144	144	144
net income	Pearson Correlation	.914[**]	.679[**]	.049	1
	Sig. (2-tailed)	.000	.000	.562	
	N	144	144	144	144

Source: SPSS Output

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.938[a]	.879	.876	7.75601E5

Source: SPSS Output
  a. *Predictors: (Constant), net income, claims ratio, expense ratio*
  b. Dependent Variable: gross premium

4.4.1 Test of Significance

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.120E14	3	2.040E14	339.100	.000[a]
	Residual	8.422E13	140	6.016E11		
	Total	6.962E14	143			

Source: SPSS Output
  a. *Predictors: (Constant), net income, claims ratio, expense ratio*
  b. *Dependent Variable: gross premium*

Based on the ANOVA, we can conclude that the regression model is significant since the p value is less than 5%

Table 5: Coefficients

	Unstandardized Coefficients		Standardizd Coefficients			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	-587841.542	117204.782		-5.016	.000		
expense ratio	-829738.654	326855.410	-.102	-2.539	.012	.535	1.868
claims ratio	565640.793	88276.164	.189	6.408	.000	.992	1.008
net income	1766833.166	72933.592	.974	24.225	.000	.534	1.871

The resultant model is:

Gross Premium= -587841.542-829738.654X_1+565640.793X_2+1766833.166X_3

Where X_1 is the Incurred expense ratio, X_2- Incurred claim ratio and X_3-Net income ratio. Based on the table 5 above, all the three independent variables are highly significant in predicting the gross premium since their corresponding p values are less than 5%

Table 6: Collinearity Diagnostics

Model	Dimensio n	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	expense ratio	claims ratio	net income ratio
1	1	2.926	1.000	.03	.02	.04	.03
	2	.650	2.121	.01	.04	.56	.11
	3	.291	3.173	.54	.01	.33	.33
	4	.133	4.695	.42	.93	.08	.54

Source: SPSS Output
a. Dependent Variable: gross premium

An eigenvalue close to zero indicates linear dependence amongst the observations. From Table 6 above, there is a clear indication that several eigenvalues are close to 0, indicating that the predictors are highly inter correlated and that small changes in the data values may lead to large changes in the estimates of the coefficients. There is linear dependence amongst the variables

Table 7: Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-602327.0000	7.8095E6	1.2614E6	2.06868E6	144
Residual	-1.74677E6	2.66649E6	.00000	7.67422E5	144
Std. Predicted Value	-.901	3.165	.000	1.000	144
Std. Residual	-2.252	3.438	.000	.989	144

Source: SPSS Output
a. Dependent Variable: gross premium
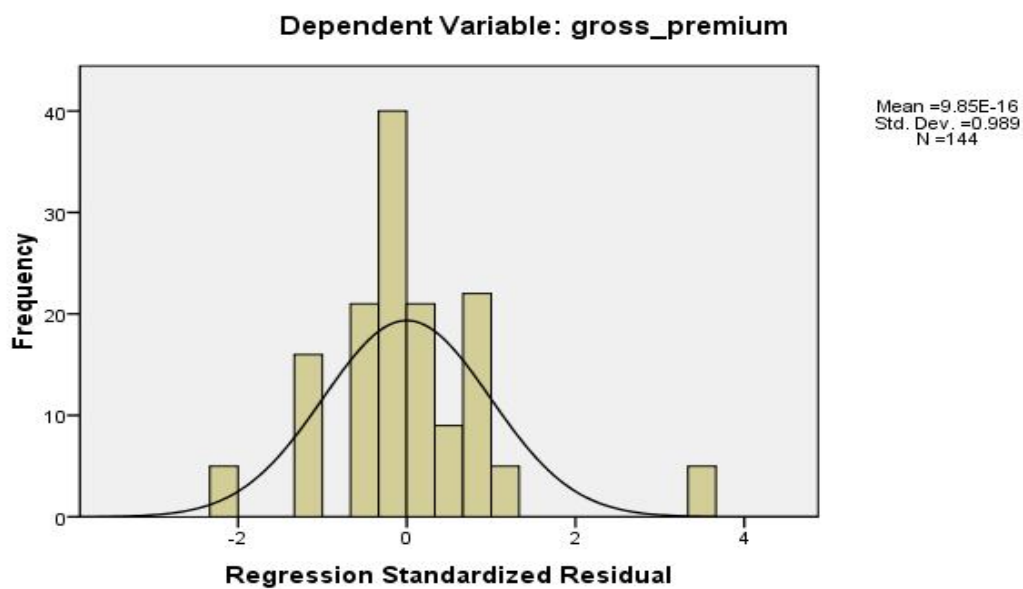
4.2.2 Test for Normality

Figure 1: Plot of Residuals

When the residuals are normally distributed with a mean of zero, we tend to get a bell shaped histogram. Figure 1 above clearly indicates that the residuals are normally distributed around the mean of zero.