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Risk-Based Capital and Investment Returns of Insurance Companies in Kenya- The Intervening Effect of Asset Allocation

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Abstract

This paper's main aim was to establish the intervening effect of asset allocation on the relationship between risk based capital and investment returns of insurance companies in Kenya. The study population entailed sixty-three insurance companies licensed by the Insurance Regulatory Authority to operate in the Kenyan market. The data used for analysis was secondary data and was collected from the annual returns submitted to the regulator. The duration of the data was a 5-year period (2014-2018). Computation of risk based capital was as per the risk based supervision model requirement for both life and general insurance companies. Asset allocation was operationalized based on previous studies and was a component of time horizon and investment vehicle of each company. Investment returns was computed using the investment income ratio, which is a profitability measure in the insurance industry. Linear regression was used to evaluate the nature of the relationship among various variables based on the hypothesis in the study and at a significance level of 5%. The study adopted ordinary least square method (OLS) in its analysis. Tests for normality, multicollinearity and independence were conducted to confirm suitability of the data before analysis. The study findings revealed that asset allocation has an intervening effect on the relationship between risk based capital and investment returns of insurance companies in Kenya. This implied that risk based capital, which is the independent variable, influences asset allocation, which in turn influences the investment returns of insurance companies in Kenya. Therefore, an increase in asset allocation would result to an increase in investment returns. At policy level, the findings will assist portfolio managers diversify their investment to maximize their returns without being concerned on the amount of capital to hold. This is supported by the study findings which indicate a positive relationship between risk based capital and investment returns, thus allowing the managers to justify their investments in high risk areas which attract a high capital charge. However, the duration of such investments also needs to be considered, since the study findings indicate that asset allocation has a positive effect on the amount of capital to hold in order to cushion it from unforeseen circumstances and its effect on investment returns. Duration of the investment and investment vehicle were used to determine the asset allocation score, thus deeming investment duration important.

Keywords: *Risk-Based Capital, Asset Allocation, Investment Returns, Linear regression analysis*

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Introduction

An insurance company should have enough capital to withstand any harsh economic condition. This has been addressed by the development of risk based supervision framework which is expected to oversee that all insurers and reinsurers incorporate all the risks they encounter when determining the capital to hold. Risk Based Capital (RBC) is derived from capital charges imposed to specific risks an insurance company faces on its underwriting business and on its investment portfolio. This has an influence on insurance companies' asset management thus informing asset allocation and the expected investment returns (Johansen, 2011). The introduction of RBC assumes that it will cover all quantifiable risks for existing business in an insurance company and what they will underwrite in the next twelve months (EIOPA, 2014). Diversification effects are also considered by using the correlation matrices when aggregating the appropriate capital. RBC may be derived from a standard formula across the insurance industry or by using internal models which is reviewed by the industry regulator. This formula aims to capture a higher percentage of quantifiable risk that most insurers are exposed to. The calculation method is homogenous in nature and is not tailored to any single risk profile, thus the value varying from one company to another.

Planchet and Tomas (2014) further explains that RBC considers any uncertainty arising from any logical and parameters estimation, but not for stochastic fluctuations and process risk. The process risk has been disregarded as insignificant with minimal impact, thus being included in systemic and parameter risk component to simplify the risk based capital standard formulae. To calculate risk based capital for insurance companies, a factor, which is predetermined as a percentage is calculated and applied to assets the company holds, premiums it underwrites, claims incurred, expenses and reserves being held. The capital charge is higher for those items which are deemed high risks and lower and lower for items which are considered less risky (Bragt et al., 2010).

Investors may take different approaches in determining where to invest and how to allocate assets in a manner they will attain maximum returns. One of the methods used is tactical asset allocation which is based on Markowitz (1952) portfolio selection theory. An investor may opt for an integrated asset allocation approach in order to maximize the investment portfolio returns. This approach was introduced by Sharpe (1987) where he provided a framework key

element which can be used in asset allocation decisions. Integrated asset allocation seeks to optimize an investors net worth. This approach looks at the current net worth of an investor, which is assets minus liabilities, and the standard deviation of the future net worth.

Insurance investment risk is different from that of a typical fund manager in the sense that investment risks for fund managers are both absolute, meaning that market value of the fund will rise and fall at a period and relative meaning that it may over or under perform the benchmark. Concentration is more on the asset side of the client and little or no consideration on the liabilities. Insurance companies' investment has to look at both the assets and liability sides of the company since they bear the liability of indemnifying policyholders. This makes it difficult for the companies to go for the perceived high risk high return investments. Risk based supervision regime gives companies greater investment flexibilities and allow better management of assets in respect to the size, complexity and risk appetite of the companies (Liebwein, 2006).

Proliferation of sophisticated financial assets within the insurance industry has spawned the emergence of complex risk management models. The concept of risk based capital was introduced in the insurance industry so that stakeholders of insurers can have an all-inclusive analysis of all risks an insurance company faces on both its assets and liabilities. This concept is important in assisting insurance companies determine adequately their capital based on the size, nature and complexity of their business. It retracts from the compliance based approach of holding a fixed amount of capital to a more informed decision on capital available in accordance to the risk exposure of the company. Portfolio managers face a challenge of trying to make the best investment decision without attracting high capital charges, and at the same time quantifying the differences in risk adjusted returns resulting from investments in various asset classes and potential adjusting of insurance company's portfolios as per the risk based capitals (Majtanova & Marcinech, 2017).

The stability of the insurance sector has been questioned globally especially a collapse of renown insurance companies during and after the 2008 financial crisis. To avert a cyclic experience in the sector, insurance regulators developed a risk based supervision model that consistently keeps in check the financial health of these companies and proactively determine their suitability in transacting insurance business (Hogan, Meredith & Pan, 2015). Various

empirical studies have been conducted to understand the effect of asset allocation on investment returns or RBC-investment return link. These empirical studies have been largely bivariate in nature, however the RBC-returns link is not usually direct, but it is explained by several control variables such as asset allocation, the size of the firm, the age of the firm among others.

Various empirical studies have adopted various metrics to measure RBC as well as investment returns. Hogan, Meredith and Pan (2015) used credit and market risk as proxies for risk based capital while Lastra (2004) utilized additional indicators of RBC (insurance. This study therefore extends RBC-returns link by incorporating asset allocation as an intervening variable to bridge these conceptual gaps. This study sought to answer the question: what is the effect of asset allocation on the relationship between risk-based capital and investment returns of insurance companies in Kenya?

Research Objective

The study's objective was to establish the effect of asset allocation on the relationship between risk based capital and investment returns of insurance companies in Kenya.

Empirical Review

Asset allocation is a key component in determining investment returns and can influence the association amongst RBC and investment returns of insurance corporations. Markowitz (1952) portfolio selection theory introduced a scientific approach of optimal asset allocation by outlining the risks an investor is willing to face and the anticipated returns. Eling and Pankoke (2014 b) analysed the equity risk of the solvency (risk based) supervision model which is a determinant of the RBC in the risk based supervision structure for insurance companies. The equity risk module contained a symmetric modification mechanism called equity dampener, which was meant to reduce procyclicality of capital requirements and thus systemic risk in the insurance sector. The researchers adopted a three steps approach to critique the module: first by analysing the vulnerability of the equity risk module with respect to the underlying technical basis, then working out potential basis risk (i.e., deviations of insurers' actual equity risk from the RBS equity risk) and, founded on these results, quantify the effect of the symmetric alteration mechanism on the aims of RBS. They concluded that

application of the standard model would not give a 99.5% confidence level as expected in the RBS approach thus portraying uncertainty on the intended goal to be achieved.

Andonov et al. (2012) reviewed the changes in pension funds strategic allocation on an annual basis by getting the difference between the targeted asset class in year t, in comparison to the previous year then multiplied by the standard set on the return of that asset class at a given time t. Their finding was that approximately 80% of pension funds actively manage their total assets, which created substantial differences in their returns. Majority of the funds follow laid out standard procedures on asset allocation instead of investing in multiple asset classes despite the opportunity it presents. Their study only focused on one product of insurance companies (pensions) and not all products an insurer underwrites. It also did not look at risk based capital and how it affects asset allocation and eventually investment returns of insurance companies. Xiong et al. (2010) study on the equal importance of asset allocation and active management findings were that despite market return, asset allocation influenced portfolio's returns. Active management also played an important role.

Beath (2014) reviewed the performance of defined benefit funds and how the funds relate to asset allocation. He analysed information on the performance of realized investments of the United States pension funds over a thirteen-year period and examined how the performance influenced the decision of asset allocation of the funds. He observed that there was a wide variation in the allocations of portfolio, returns, and investing costs of various asset classes which led to the major differences in the investment performance of direct benefit plans. The study looked at public traded assets and standardization of private equity to remove any bias.
Brown et al. (2009) reviewed the performance of portfolios containing multiple asset classes and based on asset allocation decisions. They decomposed the returns of the endowment funds by bench marking, market timing and security selection which reflected the investment decision in a typical endowment. Their findings clearly showed that asset allocation was not related to portfolio returns in cross sections, but from the data analysis it appeared to influence risk adjusted performance indirectly.

Ibbotson and Kaplan (2000) study focused on the true impact of asset allocation on returns by assessing what percentage asset allocation policy affect performance within a range of 40 to 90 percent. In their methodology, they divided compound annualized asset allocation policy by

the compound annualized portfolio return over a given time. This was to create a portfolio benchmark asset classes that matched the balanced fund asset allocation policy. Their findings confirmed that about 100% return amount was explained by asset allocation.

Conceptual Framework

This study conceptual model was as follows:

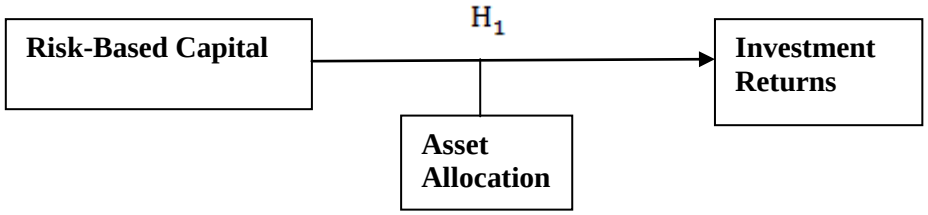

Figure 1: Conceptual Model

Research Hypothesis

This paper focuses on establishing the effect of asset allocation on the relationship between risk based capital and investment returns of insurance companies in Kenya. The null hypothesis that was tested in the study was as follows:

H_1: The relationship between risk based capital and investment returns of insurance companies in Kenya is not intervened by asset allocation.

Data and Methodology

This study adopted longitudinal (panel) design to describe the relationship between variables. The panel data used was for a five-year duration (2014-2018) collected from insurance companies' annual returns submitted to the insurance regulator. This yielded adequate data points for analysis. Risk-based capital was determined by the standard formulae as per RBS model as follows:

$$RBC = \sqrt{IRC^2 + MRC^2 + CRC^2} + \text{Operational Risk} \quad \text{Equation 1}$$

Asset allocation was computed as follows:

Asset Allocation Score = $Arithmetic\ mean\ (TH + IV)$ …… Equation 2

Where TH= Time horizon score

IV= Investment vehicle score

Investment returns in insurance companies was calculated as follows:

General Insurance Companies:

$$\text{Investment Income Ratio} = \frac{\textit{Net Investment Income}}{\textit{Net Earned Premium}} \quad \text{Equation 3}$$

Life Insurance Companies:

$$\text{Investment Income Ratio} = \frac{\textit{Net Investment Income}}{\textit{Life Fund}} \quad \text{Equation 4}$$

According to Baron and Kenny (1986), four steps were followed to test the intervening effect of asset allocation on the relationship between risk based capital and investment returns. The first step of the intervening analysis involved a regression analysis on the relationship between RBC (independent variable) and investment returns (dependent variable), ignoring asset allocation (intervening variable).

The model was as follows:

$$\mathbf{IR_{it} = \beta_0 + \beta_1 RBC_{it} + \varepsilon_{it}} \quad \text{Equation 5}$$

Where

IR is the investment income ratio,

RBC is the risk based capital,

i is the cross sectional unit where i =1…. N, t is the time period where t=1…. T

β_0 : The regression constant,

β_1 : The regression coefficient,

ε_i: is the random error term.

If the relationship between risk based capital (RBC) and investment returns (IR) is statistically significant, then one can proceed to the next step of mediation analysis.

The second step of the intervening analysis involved a regression analysis on the relationship between asset allocation and RBC ignoring investment returns. The model was as follows:

$$\mathbf{AA_{it} = \beta_0 + \beta_1 RBC_{it} + \varepsilon_{it}} \quad \text{Equation 6}$$

Where:

AA is the asset allocation score,

RBC is the Risk based capital,

i is the cross sectional unit where i =1…. N, t is the time period where t=1…..T

β_0 : The regression constant,

β_1 : The regression coefficient,

ε_i: is the random error term.

If the relationship between risk based capital (RBC) and asset allocation (AA) is statistically significant, then one can proceed to the next step of mediation analysis.

The third step of the intervening analysis involved a regression analysis on the relationship between asset allocation and investment returns ignoring RBC. The model was as follows:

$$IR_{it} = \beta_0 + \beta_1 AA_{it} + \varepsilon_{it} \quad \text{Equation 7}$$

Where:

IR is the investment income ratio,

AA is the asset allocation score,

i is the cross sectional unit where i =1…. N, t is the time where t=1…. T

β_0 : The regression constant,

β_1 : The regression coefficient,

ε_i: is the random error term.

If the relationship between asset allocation (AA) and investment returns (IR) is statistically significant, then one can proceed to the next step of mediation analysis.

The fourth step of the intervening analysis involved a regression analysis on the relationship between asset allocation (intervening variable), investment returns (dependent variable) and RBC (independent variable). The model was as follows:

$$IR_{it} = \beta_0 + \beta_1 RBC_{it} + \beta_2 AA_{it} + \varepsilon_{it} \quad \text{Equation 8}$$

Where:

IR is the investment income ratio,

RBC is the risk based capital,

i is the cross sectional unit where i =1…. N, t is the time period where t=1…..T

AA is the asset allocation score,

β_0 : The regression constant,

β_1 : The regression coefficient,

ε_i: is the random error term.

Adjusted R^2 was used to assess the outcome variable variation as a result of effects of the predictor variable. F- Test was conducted to assess the model fit by testing the significance of the model. Beta coefficient (β) showed the effect variation in the dependent variable as result of a unit change in the predictor variable. T-test was used to evaluate the significance of the beta coefficient of the independent variable at 95% significance level. If the relationship between risk based capital (RBC) and investment returns (IR) becomes statistically insignificant when asset allocation (AA) is controlled for; then full mediation if inferred.

However, if the relationship between risk based capital (RBC) and investment returns (IR) becomes statistically significant when asset allocation (AA) is controlled for, then partial mediation is presumed to have occurred.

Results and Discussions

Normality Test

The study conducted normality test using Shapiro-Wilk test. Table 1 below illustrates the findings of the test.

Table 1: Test of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
RBC	.080	249	.201	.966	249	.375
Asset Allocation Score	.107	249	.086	.928	249	.063
Total Assets	.058	249	.491	.981	249	.472
GWP	.077	249	.329	.962	249	.323

a. Lilliefors Significance Correction

Table 3 above shows p value > 0.05 where RBC recorded a value of .375, asset allocation score at 0.063 an indication that the data was normally distributed.

Multicollinearity

This study adopted the variance inflation factor (VIF) for determination of multicollinearity amongst the variables. Robinson and Schumacker (2009) indicate that if the VIF value is less than 10, then the level of multicollinearity can be tolerated. Table 2 below presents the results for the test conducted.

Table 2: Test of Multicollinearity

Variables	**Variance Inflation Factor (VIF)**	**1/VIF**
Risk Based Capital	3.970	0.2518
Asset Allocation	2.101	0.4759

a. Dependent Variable: Investment Returns

From table 2 above, the VIF for risk based capital is 3.970 with a tolerance level of 0.2518, and that of asset allocation is 2.101 with a tolerance level of 0.4759. The figures are less than 10 and a tolerance level of greater than 0.1. This indicates that the level of multicollinearity can be tolerated.

Serial Independence Test

Durbin Watson test was adopted to confirm independence among variables. The coefficient needs to be between 1.5 and 2.5 in order to confirm that the observations were independent. Table 3 below shows the results for the independence test.

Table 3: Independence test

Model Summary				
Variable	R^2	Adjusted R^2	S.E of the Estimate	Durbin-Watson
RBC	0.474292	0.465494	0.625171	1.961820
Asset allocation score	0.396796	0.389288	0.007570	2.074575
Investment income ratio	0.507624	0.505614	1.259701	2.000623

a. Predictors: (Constant), Asset Allocation, RBC
b. Dependent Variable: Investment Returns

From table 3 above, the coefficient observed as per the Durbin-Watson test for risk based capital was 1.961820, asset allocation score was 2.074575 and investment income ratio was 2. 000623. Since the coefficients lie between 1.5 and 2.5, it is an indication that the observations made were serially independent.

Correlation Analysis

Pearson Product Moment correlation coefficient (denoted by r) was used to perform a correlation analysis, with the value taking a range of +1 to -1. A proportionate increase or decrease in one variable leading to a proportionate increase or decrease in another variable infers a perfect positive correlation denoted positive 1. An increase in one variable leading to a decrease in another variable depicts a perfect negative correlation, denoted by negative 1. A zero (0) value point towards no association exists between variables. A value greater than zero indicates positive association while a value less than 0 indicates negative association. The correlation results are presented in table 4 below:

Table 4: Correlation analysis

Correlations			
	RBC	Asset Allocation	Investment Returns

RBC	Pearson Correlation	1		
Asset Allocation	Pearson Correlation	-.186**	1	
Investment Returns	Pearson Correlation	.669**	.341**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

From the correlation analysis, it is revealed that there are significant relationships within the study variables and in line with the study hypotheses.

Regression Analysis

The objective of the study was to establish the intervening effect of asset allocation on the relationship between risk based capital and investment returns. The developed hypothesis was:

Hypothesis 1: The relationship between risk based capital and investment returns of insurance companies in Kenya is not intervened by asset allocation

Four steps were followed to test the intervening effect of asset allocation on the relationship between risk based capital and investment returns as described by Baron and Kenny (1986). The first step of the intervening analysis involved a regression analysis on the relationship between RBC (independent variable) and investment returns (dependent variable), ignoring asset allocation (intervening variable) equivalent to hypothesis 1 above. The second step of the intervening analysis involved a regression analysis on the relationship between asset allocation (as the dependant variable) and risk based capital (as the independent variable) ignoring investment returns.

Table 5: Regression Results for the Relationship between Asset Allocation as the Dependent Variable and Risk Based Capital as the Independent Variable

Model	**R**	**R^2**	**Adjusted R^2**	**S. E of the Estimate**	
a. Predictors: (Constant), RBC	.186a	.035	.031	.00915	
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	.001	1	.001	8.894	.003b
Residual	.021	247	.000		
Total	.021	248			
Model	**Unstandardized**		**Standardized**	**t**	**Sig.**

	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	.070	.008		9.063	.000
RBC	-.003	.001	-.186	-2.982	.003

a. Dependent Variable: Asset Allocation
b. Predictors: (Constant), RBC

The third step of the intervening analysis involved a regression analysis on the relationship between asset allocation (as the independent variable) and investment returns (as the dependent variable) ignoring RBC. The fourth step of the intervening analysis involved a regression analysis on the relationship between asset allocation (as an intervening variable), investment returns (as a dependent variable) and risk based capital (as an independent variable).

Table 5 show an adjusted R^2 of 0.031 indicating that risk based capital explains a 3.1 % variation of asset allocation. The results further illustrate that risk based capital is a significant predicting variable of asset allocation since the p value is 0.003 which is less than the 0.05 level of significance. The regression model of risk based capital as the independent variable and asset allocation as the dependent variable ignoring investment returns is shown below:

$$\mathbf{AA_{it} = 0.07 - 0.003RBC_{it}}$$

Where:

AA is asset allocation and;

RBC is the risk based capital.

The results showed that there was a significant relationship between risk based capital and asset allocation, and that risk based capital had a negative effect on asset allocation. The third step was taken where investment returns was taken as the dependent variable and asset allocation as the independent variable.

Table 6 below show an adjusted R^2 of 0.113 which indicates that asset allocation explains 11.3% variation in investment returns. The findings as per table 5.3 further indicate that there is a significant relationship between asset allocation and investment returns since the p value is 0.000 which is less than the 0.05 level of significance.

The regression model can be presented as follows:

$$\mathbf{IR_{it} = 0.716 + 2.499AA_{it}}$$

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Where:
IR is the investment returns and;
AA is asset allocation.

Table 6: Regression Results for the Relationship between Investment Returns as the Dependent Variable and Asset Allocation as the Independent Variable.

Model	**R**	**R^2**	**Adjusted R^2**	**S. E of the Estimate**	
a. Predictors: (Constant), Asset Allocation	.341a	.117	.113	.06410	
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	.134	1	.134	32.604	.000b
Residual	1.015	247	.004		
Total	1.149	248			
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	Std. Error	Beta		
(Constant)	.716	.021		34.112	.000
Asset Allocation	2.499	.438	.341	5.710	.000

a. Dependent Variable: Investment Returns
b. Predictors: (Constant), Asset Allocation

The fourth step was to run a regression on investment returns as the dependent variable and asset allocation, risk based capital as the independent variables. The results are shown as follows:

Table 7: Regression Results for the Relationship between Investment Returns as the Dependent Variable while Asset Allocation and RBC as the Independent Variable

Model	**R**	**R^2**	**Adjusted R^2**	**S. E of the Estimate**	
a. Predictors: (Constant), Asset Allocation, RBC	.820a	.672	.669	.03913	
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	.772	2	.386	252.093	.000b
Residual	.377	246	.002		
Total	1.149	248			
Model	**Unstandardized**		**Standardized**	**t**	**Sig.**

	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	-.017	.038		-.447	.655
RBC	.079	.004	.759	20.413	.000
Asset Allocation	3.535	.272	.483	12.995	.000

a. Dependent Variable: Investment Returns
b. Predictors: (Constant), Asset Allocation, RBC

Table 7 above shows an adjusted R^2 of 0. 679 which indicate that risk based capital and asset allocation explains a 67.9% variation in investment returns. It further shows a p value of 0.000 which is less than 0.05 significance level thereby confirming a significant relationship among the study variables. Risk based capital also showed a significant relationship with investment returns with a p value of 0.000 as shown in table 5.1 b above, which is less than the 0.05 level of significance. Table 5.1 showed an adjusted R^2 of 0. 445 which indicated that risk based capital explained a 44.5% variation in investment returns. The percentage increase from 44.5% to 67.9% shows that the introduction of asset allocation increases the variation between risk based capital and investment returns. The conclusion therefore is that asset allocation has a positive significant intervening effect on the relationship between RBC and investment returns. The null hypothesis that the relationship between risk based capital and investment returns of insurance companies in Kenya is not intervened by asset allocation is therefore rejected. The resultant regression model is shown below:

$$\mathbf{IR_{it} = -0.017 + 0.079RBC_{it} + 3.535AA_{it}}$$

Where:

IR is the investment returns,

RBC is the risk based capital and;

AA is asset allocation.

Summary and Conclusions

The objective of the study was to establish the effect of asset allocation on the relationship between risk based capital and investment returns of insurance companies in Kenya. The study hypothesised that the relationship between risk based capital and investment returns of insurance companies in Kenya is not intervened by asset allocation. Since there was a significant relationship between risk based capital and investment returns, the study proceeded to check the intervening effect of asset allocation. The results of the study findings after introduction of asset allocation established that it has a positive significant intervening

effect the relationship between risk based capital and investment returns thus rejecting the null hypothesis (H_1). This implied that risk based capital, which is the independent variable, influences asset allocation, which in turn influences the investment returns of insurance companies in Kenya. Therefore, an increase in asset allocation would result to an increase in investment returns.

At policy level, the findings will assist portfolio managers diversify their investment to maximize their returns without being concerned on the amount of capital to hold. This is supported by the study findings which indicate a positive relationship between risk based capital and investment returns, thus allowing the managers to justify their investments in high risk areas which attract a high capital charge. However, the duration of such investments also needs to be considered, since the study findings indicate that asset allocation has a positive effect on the amount of capital to hold in order to cushion it from unforeseen circumstances and its effect on investment returns. Duration of the investment and investment vehicle were used to determine the asset allocation score, thus deeming investment duration important.

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