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Quantification of Foreign Exchange Exposure in Insurance Companies in Kenya

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Abstract

The study sought to quantify foreign exchange exposure in insurance companies in Kenya. This was achieved through evaluating twenty Kenyan insurers using two main objectives. The first was to establish the statistical significance of foreign exchange exposure for Kenyan insurance companies. A by-product of this, was that the optimal lag at which the different insurers experience the highest exposures could be defined. The second objective was to determine whether general insurers experience more significant foreign exchange exposure than life insurers. To accomplish this, the study employed a cash flow-based technique; the Almon Polynomial Distributed Lag model, which modelled the change in individual companies' operating income caused by changes in the foreign exchange rate.

Using the above model, the study found that sixty percent of the insurers sampled had significant foreign exchange exposure. This reinforced the conclusion that the insurance industry in Kenya has a statically significant foreign exchange exposure. However, the study failed to prove that general insurers experienced exposure to a greater level of severity than life insurers.

Chapter One: Introduction

1.1 Background Information

1.1.1 Definition of Terms

In the context of Kenyan insurance providers, currency risk, also known as foreign exchange rate risk, applies to companies which write policies in foreign currencies, or which provide policies to policyholders inhabiting countries outside the home country, where premiums are paid in foreign currencies. For instance, a Kenyan Insurance company which provides motor insurance where the premiums are paid in dollars or pounds.

For these companies, foreign exchange risk is the risk that a change in the exchange rate will result in the domestic company receiving a lower amount of Kenyan Shillings in premiums than originally anticipated. Conversely, it could mean that the domestic company would have to pay out a higher amount of Kenya Shillings in claims than originally anticipated. An exchange rate between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in terms of another currency¹.

Exchange rate exposure describes the influence of exchange rate movements on the value of a firm or sector of the economy. (Dominguez & Tesar, 2008). These movements usually result in foreign exchange gains or losses. There are three types of exchange rate exposure; accounting exposure, transaction exposure and economic exposure. The form of foreign exchange exposure described above, which impacts the cash flows involving exchange transactions during a certain period, is referred to as transaction exposure. When the currencies in which the cash inflows are denominated depreciate relative to the currencies in which the cash outflows are denominated, a foreign exchange loss occurs.

¹ *Exchange Rate* definition is retrieved from Investopedia:

<http://www.investopedia.com/terms/e/exchangerate.asp>.

A gain occurs when the inverse is true. These gains and losses affect the amount of cash available to the firm. The second form of exposure, accounting exposure, also known as translation exposure, applies when assets and liabilities denominated in a foreign currency need to be converted into the domestic currency for accounting purposes. For instance, when the value of foreign assets translated at current exchange rates rises faster than the value of liabilities translated at current exchange rates, a foreign exchange gain happens. A loss occurs when the inverse happens. Economic exposure relates to the overall impact that exchange rate fluctuations can have on the level and variability of the firm's future operating cash flows, that is, its economic value. (Rodriguez, 1979)

Export Development Canada has released several research reports concerning foreign currency risk in Canadian firms. This was motivated by the fact that studies showed that many Canadian companies lacked basic knowledge on how to identify and manage this risk. Results from a survey carried out in 2009 of Canadian firms showed that 75% of firms were willing to accept lower profits to manage this risk and increase the predictability of profits. (Canada E. D., 2009) This survey shows a willingness for firms to mitigate their currency risk, once shown that their exposure to the risk has a statistically significant effect on profits.

In a separate report released in 2010, Export Development Canada concludes that failure to manage foreign exchange risk means that a company is implicitly assuming that the exchange rate will either remain stable or trend in a direction favourable to it, which is an invalid assumption that could lead to a loss of profits. (Canada E. D., 2010)

This background therefore motivated the need to illuminate whether Kenyan insurance companies were making similar invalid assumptions with regards to their foreign exchange exposure. This was achieved through investigating the statistical significance that currency exposure had on the profits of insurance companies.

1.1.2 Trends of Currency Movements

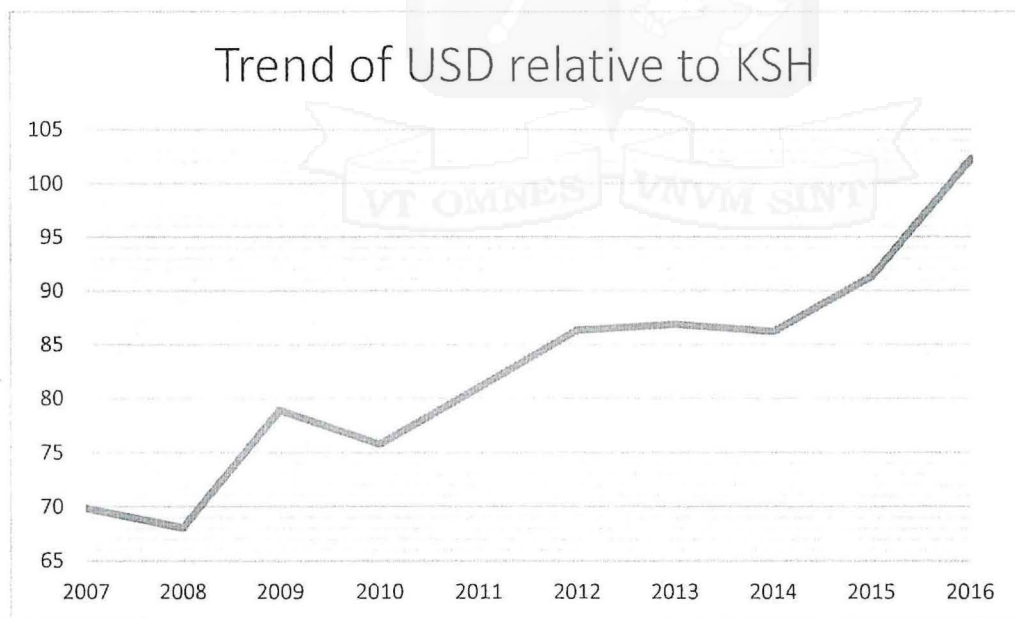
The annual currency change of the U.S. dollar relative to the Kenya shilling during the past decade is as shown in table 1 below where negative values correspond with periods in the graph during which currency appreciation occurred, while positive values show a depreciation. For instance, the period from 2009 and 2010 where the shilling appreciated by 4.01% is denoted by a decline in the graph in Figure 1.

Table 1: Annual Currency Change of USD relative to KSH

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Percentage change in exchange rates	-0.032	-0.026	0.160	-0.040	0.069	0.066	0.006	-0.008	0.060	0.120	0.014

The graph below shows how the U.S. Dollar has been evolving relative to the Kenya Shilling for the past decade.

Figure 1: Trend of USD relative to KSH



As shown, the general trend is that the Kenya Shilling has been depreciating against the dollar.

The annual report released by the Central Bank of Kenya in 2009 shows that the depreciation in the 2008/2009 fiscal year triggered a sale of shares allocated to foreign investors and consequently led to huge outflows of foreign exchange, and subsequently a further increase in exchange rates. Additionally, Kiptui and Kipyegon (2008) postulate that generally, in periods when the Kenya Shilling appreciates leading to a decline in exchange rates, this attracts public attention especially from exporters who argue that the strength of the Kenya Shilling erodes their competitiveness. This explains why, as seen above, a decline in the exchange rate in one year usually leads to an increase in the next year.

In the 2010/2011 financial year, Kenya's current account deficit stood at 10% of its GDP. This meant that the country was importing too much and exporting too little, which made it vulnerable to shocks. This vulnerability led to the large increase in exchange rates that can be seen from the graph. While it could be argued that a weaker exchange rate would make imports more expensive and exports more competitive abroad, Kenya's high inflation rate eroded the potential benefits of a weaker exchange rate.

The rising insecurity in 2013 largely due to terrorism led to a large drop in tourism. This meant there were less dollars in the economy and subsequently a higher demand for them, which effectively led to the depreciation of the shilling. Furthermore, Kenya embarked on major infrastructural projects in the 2014/2015 financial year. For instance, the Standard Gauge Railway in which most of the materials were imported, thus increasing the demand for the dollar.

In 2017, analysts predict that the shilling will continue to depreciate. This is because, firstly, prices of oil continue to rise globally, which could worsen Kenya's current account position. Furthermore, capital inflows into the capital markets are expected to reduce due

to uncertainty caused by the general elections in August. This will affect the shilling negatively.

1.1.3 Impact of Currency Risk on an Insurer's Claims

The world of business is becoming increasingly global, and thus more and more companies are establishing themselves as multinational corporations. Under today's system of floating exchange rates, currencies often move dramatically over short periods. This means that dealing in foreign markets leads to exposing oneself to fluctuations in currency exchange rates, which in turn causes instability in profit margins as well as significant losses to a multinational corporation's bottom line (Manon & Viswanathan, 2005).

The top insurance companies in Kenya, Jubilee Insurance Company and Kenindia Assurance Company, also operate within the East African Region. When issuing insurance contracts, the policies are usually written in U.S. Dollars to avoid conversion of the Kenya Shilling into multiple currencies. Fluctuating exchange rates of the U.S. dollar relative to the shilling impact the claims that an insurer is liable to pay to their policyholders due to the timeline between the date of the original accident/the date the claim is incurred and the date of settlement of the claim. Claims settlement data from the Insurance Regulatory Authority website shows that the insurance industry settled on average 10.8% of its total liability claims under general insurance business by the end of 2016, while it had settled 75.2% of total non-liability claims under general insurance business by the end of 2016.

The timeline on the unsettled claims varies for numerous reasons. Firstly, jurisdiction laws and regulations may be involved. Incurred claims which involve legislation in Kenya can take a year or more to settle. Additionally, claims involving multiple claimants usually take longer to settle. As this timeline increases, so does the risk of experiencing fluctuations in the exchange rate. If at the time of settlement, the value of the Kenya Shilling has deteriorated, then the cost to the insurer of paying the claim will be much higher.

1.2 Problem Statement

There has been research carried out on foreign exchange risk and exposure in Kenya. Previous studies have taken the perspective of financial companies and their exposure to currency movements (Ngari, 2012; Mbithi, 2009; Wekesa, 2011; Wanyoyi, 2011). However, it has been shown that foreign exchange exposure impacts financial firms in a significantly different way than it does non-financial firms. (Allayannis & Weston, 2001).

Furthermore, existing research focuses on currency risk management within developed markets. Developed economies have financial instruments such as derivatives which are used to hedge currency risk. Derivative trading is still relatively new in the Kenyan market, and therefore the instruments used to manage risk domestically will differ slightly from those generally used in developed countries.

There was therefore a need to combine existing information with current techniques and new methodologies to adapt a suitable model of foreign exchange exposure to Kenya, a developing insurance market. Using this model, this study illuminated whether the currency exposure of Kenyan insurers is significant, and if so, whether general insurers experience greater foreign exchange exposure than life insurers.

1.3 Research Objectives

- 1 To establish the statistical significance of foreign exchange exposure for Kenyan insurance companies.
- 2 To determine whether foreign exchange exposure is more significant for General Insurers than it is for Life Insurers.

1.4 Research Questions

H₀: Foreign exchange exposure is statistically significant for Kenyan insurers.

H₁: Foreign exchange exposure is not statistically significant for Kenyan insurers.

H₀: Foreign exchange exposure is more significant for General insurers than it is for Life insurers.

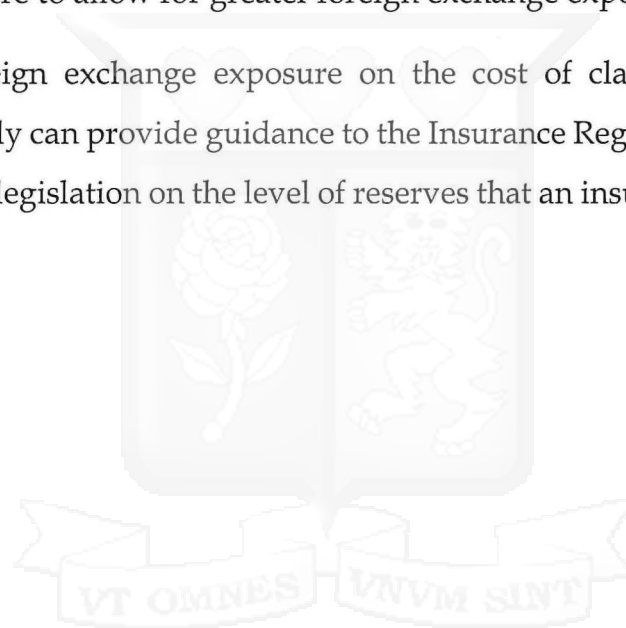
H₁: Foreign exchange exposure is not more significant for General insurers than it is for Life insurers.

1.5 Significance of the Study

The study would be of great benefit to insurance companies, which would use the conclusions reached to amend their reserving processes appropriately to include the gains/losses from currency exposure.

The results of the study may also motivate insurance companies to amend their management structure to allow for greater foreign exchange exposure management.

If the effect of foreign exchange exposure on the cost of claims proves significant statistically, this study can provide guidance to the Insurance Regulatory Authority, who may need to amend legislation on the level of reserves that an insurer is required to hold.



Chapter Two: Literature Review

2.0 Introduction

According to a study by Li, et al (2009), no systematic difference exists in the foreign exchange risk profiles of life and non-life insurers in the U.S. The study concludes that they have similar risk exposure management strategies arising from similar risk pooling and financial intermediary functions. This study sought to investigate whether the same is true for insurance companies in Kenya.

2.1 Foreign Exchange Risk in Kenya

Mbithi (2009) carried out a similar study on the effect of foreign exchange rates on the financial performance of firms listed at the Nairobi Securities Exchange. The study found that listed firms' financial performance is indeed affected by foreign exchange movements, and that unrealized foreign exchange gains/losses influenced the net income of listed companies as they were published either in income statements or as owners' equity.

Wanyoyi (2011) conducted a survey of Foreign Exchange Risk Management Practices of Kenyan Based Subsidiaries of Multinational Corporations. The study was unable to link foreign currency risk to the companies' operational costs, and thus their profits.

Wekesa (2012) conducted a study on the relationship between foreign exchange risk management and profitability of airlines in Kenya. The study found that exchange risk management has a positive impact on the profits of airlines in Kenya.

Ngari (2012) carried out a study on foreign exchange exposure on firms listed in the Nairobi Stock Exchange. The study concluded that exposure can be minimized where firms have been able to match their foreign currency revenues and costs leaving them with little net exposure.

There clearly exists a knowledge gap with reference to studies done in Kenya regarding the insurance industry.

2.2 Stock Market Approach

The stock market approach is a widespread method of measuring the aggregate number of foreign exchange exposures in given countries.

Jorion (1990), conducted a study aimed at analysing the foreign exchange exposure of U.S multinationals. This study has been the basis of numerous other studies in foreign exchange exposure management. He used the stock market approach for exchange rate exposure identification. This method looks at the effect of the exposure on firm value, which is measured by stock price returns. The study found that exposure was significantly positively correlated with the foreign sales measure. However, the study also reported potential problems of measurement error and instability. These problems were compounded by the information asymmetry between insiders and outsiders in the stock market.

A study by Aabo & Brodin (2014) also questions the validity of this approach for exchange rate exposure identification at the firm-specific level, due to the averaging effects arising from the grouping of firms while finding aggregate measures in the stock market approach. In actuality, managers of specific firms are not interested in sensitivity at an aggregate level, but rather for their own firms.

Aggregate numbers have been shown to be sensitive to the methodology applied. The research design of such studies potentially disguises firm-specific information such as operational and managerial differences, which makes it harder to identify significant currency exposure (Bartov & Bodnar, 1994). Investors may also misprice currency exposure in stock returns leading to potential estimation errors. Mispricing may arise from the difficulty in determining the extent to which a currency movement is temporary or permanent.

2.3 The Cash Flow-Based Approach

This is an alternative approach to the stock market approach. Li, et al (2009), suggest avoiding the errors of the stock market approach by using a cash flow-based approach which minimises the noise in foreign exchange exposure detection. This methodology

provides managers with insight on how to control firm-specific cash flow volatility, which is their primary concern.

Krapl and O'Brien (2012) suggest that there are two different methodologies within the cash flow-based approach. These are the cash flow method for financial firms and the corporate cash flow method for non-financial firms. The first was used in U.S. insurance firms by Li, et al (2009) and the second was followed by Lee and Jang (2010,2011), who investigated foreign exchange exposure for U.S. tourism and lodging firms.

In the first method, foreign exchange exposure is estimated according to the sensitivity of the company's cash flow to exchange rates fluctuations. On the other hand, the second method estimates both stock price and cash flow exposure, and shares these with the features of the company features. One can compare the stock market approach with the above methods in terms of their merits and drawbacks. For one, the stock market approach is flexible and forward looking in its expectations. Conversely, the cash flow-based approach is past-oriented and does not incorporate anticipations of future exposure. However, it does allow a decomposition of exposure into short and long-term components, which is crucial in understanding the nature of existing exposures (Martin & Mauer, 2003).

Additionally, the cash flow-based methodology is more appropriate for this study since not all the companies that will be considered in this study are publicly traded companies listed on the Nairobi Securities Exchange that offer their stocks, shares or bonds for sale to the public. Therefore, the stock market approach would neither be possible nor feasible.

2.4 Foreign Exchange Exposure and Time Horizon

Chow et al (1997) studied the variation in firm value associated with changes in exchange rates for U.S. Multinational firms. This was done by analysing stock returns for U.S. multinationals for over sixty months to uncover the existence of exposure in their sample of firms. They found that the statistical significance of the exchange rate exposure

increased with the length of the time horizon. They concluded that, to the extent that hedging effectiveness is positively related to hedging effort, most firms successfully hedged the effects of short-term exchange rate changes through low cost, easily accessible financial market products like derivatives; forwards, futures and swaps. However, longer term exposure would need to be hedged using operational hedges, which is more difficult, and less often carried out. This exposure will likely be more pronounced.

A survey of 16 UK multinationals found that firms do not consider economic exposure, that is long-term exposure, as often as they do transaction exposure (short-term exposure). However, due to the small sample size, and the fact that six of the firms studied had not made any attempt to hedge economic exposure, while the other ten used foreign currency derivatives to attempt to hedge long-term exposures, the results of the survey were deemed inconclusive (Belk & Glaum, 1990). This shows an obvious lack of management in hedging longer-term economic exposure, and thus this form of exposure will likely be more apparent than short-term exposure.

A study of both long-term and short-term currency exposure in Australian companies by Faff and Nguyen (2003) linked the time horizon nature of the exposure to the use of foreign currency derivatives. They found that Australian firms are generally more exposed to long-term currency movements, which they partly attributed to the high effectiveness of using foreign currency derivatives to manage short-term currency movements. This is in line with the conclusion reached by the study carried out by Chow et al (1997).

Martin & Mauer (2003) study the exchange rate exposures of U.S. Banks using a cash-flow-based methodology. Using a sample of 105 individual U.S. banks, they were able to decompose foreign exchange exposure into short-term and long-term exposure. Short-term period was classified as less than a year, while long-term period was two years or more. The study concluded that long-term exposure was more significant and prevalent than short-term exposure.

2.5 Foreign Exchange Exposure and Size Effects

A study of the determinants of corporate hedging sampled 169 firms and studied their hedging using derivatives; forwards, futures, options and swaps. The study found that larger firms had significant information and transaction cost scale economies and therefore hedged more than small firms. (Nance, Smith, & Smithson, 1993).

In studying the Economic Exposure of U.S. Multinational firms, Chow et al (1997) found that the cross-sectional differences in the magnitude of exposure are significantly related to firm size. They found that managing economic exposure required matching foreign currency inflows and outflows through operational hedges. These hedges can be expensive to perform and thus large firms more likely to attempt them. This is because the larger firms are more likely to benefit from significant economies of scale in terms of both capital and human resources.

Allayannis & Weston (2001) examine the use of foreign currency derivatives in a sample of seven hundred and twenty large U.S. nonfinancial firms, and its potential impact on firm value. They find a positive relationship between currency derivative usage and firm value for internationally oriented firms. They also find that because of the high fixed costs of hedging, large firms are more likely to use currency derivatives than small firms.

A study of the exchange rate sensitivities of U.S. bank holding companies and of Japanese banks found that increased derivative usage lowers currency exposure. (Chamberlain, Howe, & Popper, 1997). From this conclusion, it should follow that larger firms therefore have lower currency exposure. This is because larger firms are likely to use more derivatives than smaller firms. However, it is worth remembering that financial and nonfinancial firms have different experiences. Chamberlain et al (1997) found that the largest U.S. banks generally exhibited larger foreign exchange exposures. They attributed this to the fact that these large banks act as dealers in derivative contracts and can use this position to assume speculative positions. Therefore, the difference in their results with studies by Allayannis & Weston (2001), Chow et al (1997) and Nance et al (1993) could be attributed to the banks' more central role in the derivatives market.

An analysis of the determinants of corporate hedging strategy using futures and options was carried out with evidence from the life insurance industry. (Colquitt & Hoyt, 1997). The study found that the size effect could have either a positive or negative effect on the use of derivatives. The costs of such effects are found to be lower for smaller firms. Additionally, given that hedging the volatility of firm value reduces the probability of bankruptcy, the use of derivatives to hedge is arguably negatively related to firm size. On the other hand, informational economies and cost economies of scale could also potentially apply to insurers, indicating a positive relation with insurers' choice of hedging with derivatives.

The effects of an insurer's size on hedging is further investigated by Cummins, Phillips and Smith (1997). Their findings are consistent with the studies by Allayannis & Weston (2001), Chow et al (1997) and Nance et al (1993) where large insurers are seen to use derivatives more than small insurers.

Dominguez & Tesar (2008) studied the relationship between currency fluctuations and firm value for firms from eight different countries. This study shows foreign exposure directly relates to firm size and foreign sales.

There exists very little literature studying foreign exchange exposure in insurance industries world-wide. In Kenya, such research does not yet exist. This study therefore sought to fill the knowledge gap of currency exposure identification in the developing Kenyan insurance industry. This was accomplished using a cash flow-based model proposed by Martin & Mauer (2003), modified to incorporate inflation as a macroeconomic variable because Kenya has experienced relatively high inflation during the time period studied in this research.

Chapter 3: Methodology

A survey by Bodnar et al (1998) shows that exposure can be identified and modelled using a cash flow-based methodology. This involves using a company's unanticipated income, which in this case refers to the unexpected component of cash flows that would be caused by foreign exchange volatility.

3.1 Research Design

This study was an explanatory study, seeking to investigate the causal relationship between the unanticipated operating income variable and the foreign exchange variable.

This study also incorporated an inflation factor as a macroeconomic variable, which was used to explain fluctuations in exchange rates.

The study was quantitative as it used statistical tools and models to analyze the effect of the exchange exposure variable on the unanticipated income variable.

3.2 Population and Sample of the Study

The study spanned the period January 2010 to December 2016. Sample quarterly data within this period was used. Twenty companies were selected based on the availability of consistent financial statements for the past seven years. Consistency was a vital factor in choosing the companies to include in the study because insurance companies in Kenya undergo restructuring often. One way this occurs is the splitting of operations into independent Life and General divisions. Another way this can happen is through mergers and acquisitions. For instance, Saham Group acquired a majority stake of 66.7 percent in Mercantile Insurance Company Ltd in April 2014. Other examples of this are Prudential Plc, UK making a return to Kenya by wholly acquiring Shield Assurance Company Ltd in September 2014, Britam Investment Group acquired 99 percent of Real Insurance Company Ltd in December 2014 and Pan Africa Insurance Holdings, a subsidiary of Sanlam Group of South Africa, acquired a 51 percent stake in Gateway Insurance Company Ltd in 2015.

These mergers and acquisitions were motivated by the fact that in the 2015/16 budget, the government proposed to increase the minimum capital requirement for insurance companies to sh600 million for companies underwriting general insurance and sh400 million for long term insurance business by June 2018.

This information was relevant to the study because it impacted the availability of consistent historical financial statements from which the operating income variable can be derived.

3.3 Data Collection

In this study, operating income was defined as net premiums, less total commissions and other expenses. Data for companies' operating income, total commissions and expenses are obtained from the Association of Kenyan Insurers' reports.

This study considered the exposure relative to the U.S. dollar. Data for the U.S for the long-run government bond yield, GDP and inflation were obtained from research by the St. Louis Fred Organization. GDP data for Kenya was obtained from Central Bank of Kenya and quarterly reports by the Kenya National Bureau of Statistics. Exchange Rate, Inflation and long-run government bond yield data were obtained from the Central Bank of Kenya.

3.4 Model Specification

3.4.1 Specification of Variables

The model used aimed to estimate foreign exchange exposure for each insurance company, clarifying the associations between the operating income and exchange rates. Therefore, the explanatory/independent variable was the operating income variable, while the dependent variable was the foreign exchange variable.

The model employed also incorporated macroeconomic variables like interest rates, economic output, gross domestic product and inflation. Interest rates and inflation were key risk factors because insurance is a long-run business where premiums are collected, and claims are paid after a certain period in the future. High and unexpected inflation

can distort the ability of an insurance company to cover claims. Additionally, because inflation corrodes purchasing power and increases demand for the currency, it influences the exchange rate.

Furthermore, fluctuating interest rates inhibit the insurance company in making realistic estimates of investment income from the invested premiums.

3.4.2 Model Formulation

As previously mentioned, a cash flow-based approach was used. This approach is outlined below.

First, the unanticipated operating income for each firm was estimated using a seasonal random walk model. Second, the foreign exchange variable was estimated using a linear regression model and a residual was obtained. This residual captured the unexplained change in foreign exchange rates. These two models were used to remove potentially contradictory effects on the exchange rate-cash flow relationship.

These variables were then used in the main estimation model following a distribution lag technique to find the frequency of detecting significant exchange rate exposures in insurers. This technique best described the relationship between unanticipated operating income and short-term and long-term exchange rate movements. It involved using a model for time series data, in which current values of the dependent variable were predicted based on both the current and past-period (lagged) values of the independent variable. The optimal lag was based on the lowest absolute t-statistic. (Li et al, 2009)

The above is explained in more detail below.

The first step was to estimate the unanticipated operating income for each insurance company. As previously mentioned, a seasonal random walk model was used. A time series for unexpected annual operating income was estimated as the residual μ_{it} . This was done by regressing the previous annual lagged values of operating income on the current values as shown below;

$$OI_{it} = \alpha_i + \theta_i(OI)_{i(t-1)} + \mu_{it} \dots\dots\dots (1)$$

where

- OI_{it} represents the operating income before adjustments for depreciation for insurer i at time t
- μ_{it} is the residual or unanticipated operating income for insurer i at time t
- α_i, θ_i are regression coefficients for insurer i

This model is advantageous in that it is relatively stable and will not be affected by sudden changes in the data. (Li, Moshirian, Wu, & Wee, 2009).

The standardised unanticipated operating income variable UOI_{it} was derived by dividing the residuals by their standard deviation, that is, $UOI_{it} = \frac{\mu_{it}}{\sigma}$.

To ensure the stationarity of the residuals and consequently the UOI_{it} variable, the OI_{it} variable was tested for the presence of unit roots. This protected against spurious regression results. If non-stationarity is detected, the first or second difference of the OI_{it} equation was used, which does not have an impact on the economic meaning of the residuals.

The second step was to estimate the foreign exchange rate. The residual from this estimation captured the unexplained change in the foreign exchange rates. The foreign exchange rate variable, $FOREX$, was derived from the residual of the following equation;

$$FX_{(U.S,t)} = \alpha_{(U.S,t)} + \phi_{1(U.S,t)}(IR_{U.S,t}) + \phi_{2(U.S,t)}(OP_{U.S,t}) + \phi_{3(U.S,t)}(In_{U.S,t}) + FOREX_{(U.S,t)} \dots (2)$$

where;

- $FX_{(U.S,t)} = \frac{E_{U.S,t}}{E_{U.S,(t-1)}}$
- $IR_{U.S,t} = \frac{INT_{U.S,t}}{INT_{Kenya,t}}$
- $OP_{U.S,t} = \frac{GDP_{U.S,t} / GDP_{U.S,(t-1)}}{GDP_{Kenya,t} / GDP_{Kenya,(t-1)}}$

- $ln_{U,S,t} = \frac{Inf_{U,S,t}}{Inf_{Kenya,t}}$

and;

- $FX_{(U,S,t)}$ is used to represent the relative change in spot exchange rates, given by the ratio of the exchange rate for USD to the Kenya shilling at time t to the exchange rate for the USD to the Kenya shilling at time t-1.
- $IR_{U,S,t}$ is used to represent the parity condition regarding spot interest rates, given by the ratio of the long-run government bond yield for the U.S. ($INT_{U,S,t}$) and Kenya ($INT_{Kenya,t}$) at time t, respectively.
- $OP_{U,S,t}$ is used to act as a proxy for the difference in the relative changes in economic output for the U.S. and Kenya
- $GDP_{U,S,t}$ and $GDP_{Kenya,t}$ are the level of real economic activity in the U.S. and Kenya, respectively at time t
- $In_{U,S,t}$ is used to represent the CPI inflation rate, given by the ratio of , the inflation index for the U.S. relative to the inflation index for Kenya at time t.
- $FOREX_{(U,S,t)}$ is the residual of the estimated model. Thus, it captures the exchange rate variation not explained by the variation in interest rates, economic activity and CPI inflation rate.

The third stage included estimating the sensitivity of unanticipated operating income (from the first stage), to contemporaneous and lagged foreign exchange variables (from the second stage). The unanticipated operating income for each Kenyan insurer and the foreign exchange variables were used for estimating exposure to exchange rate risk for each insurer, using the distributed lag technique as shown below;

$$UOI_{it} = c_i \sum_{q=0}^{Li} \beta_{iq} FOREX_{t-q} + \varepsilon_{it} \dots\dots\dots (3)$$

where;

- c_i is the intercept for insurer i

- β_{iq} are the foreign exchange exposure coefficients, which represent the sensitivity of cash flows to short and long-run exchange rate changes for insurer i
- ε_{it} is the stochastic error term
- $FOREX_{t-q}$ is the percentage change in the unexplained exchange rate factor in period $t-q$
- L_i is the maximum lag length, which in this case is 12 quarters, following the study by Martin & Mauer (2003)

Stationarity tests were also conducted for the three independent variables in the second equation. The presence of stationarity was eliminated by using first differences. This first difference was only used after a test for cointegration has been performed. The test ensured that the independent variables in the equation had no long-term relationship between them. This test will be described in the next chapter.

3.4.3 Test for Stationarity

This was done using an Augmented Dickey-Fuller test.

According to Bourbonnais (2003), a Dickey-Fuller (DF) test is usually run by the following regression;

$$Y_t = \varphi_1 Y_{t-1} + \mu_t$$

under the following hypotheses:

$$H_0 : \varphi_1 = 1 \quad H_1 : \varphi_1 < 1$$

If H_0 is accepted, the time series is non-stationary.

The Augmented Dickey-Fuller test is based on the assumption $H_1 : \varphi_1 < 1$ and an estimation of the following model by least square method;

$$\Delta Y_t = \lambda Y_{t-1} - \sum_{j=2}^p \varphi_j \Delta Y_{t-j+1} + \mu_t$$

The value of p can be determined by Akaike Information Criterion(AIC).

Chapter Four: Data Analysis and Discussion of Results

4.1 Data and Descriptive Statistics

The descriptive statistics for operating income for the companies chosen are shown below.

Table 2a: Summary Statistics for each Company

Company No	1	2	3	4	5	6	7
Company Name	Cannon	CIC Life	First Assurance	Geminia	Directline	Jubilee	Kenindia
Mean	91,961	407,707	295,943	122,880	304,137	1,429,209	274,817
Median	71,255	338,787	261,849	99,026	268,643	1,253,384	247,920
Range	256,534	720,442	363,708	365,226	465,259	2,989,147	342,555
Std. Dev.	54,519	164,680	101,379	78,919	112,651	742,916	97,632
Observations	28	28	28	28	28	28	28

Table 2b: Summary Statistics for each Company

Company No	8	9	10	11	12	13	14
Company Name	Madison	Occidental	ICEA LION Life	Mayfair	APA Insurance	The Monarch	Fidelity Shield
Mean	300,132	145,050	320,930	79,430	788,753	31,858	109,944
Median	161,629	132,910	282,031	74,922	703,485	23,537	97,654
Range	1,029,599	222,932	610,288	125,206	1,277,420	103,928	136,834
Std. Dev.	278,540	56,348	148,675	33,080	305,377	26,165	37,648
Observations	28	28	28	28	28	28	28

Table 2c: Summary Statistics for each Company

Company No	15	16	17	18	19	20
Company Name	Invesco	Heritage	Kenya Alliance	UAP General	GA Insurance	Corporate
Mean	143,834	206,505	91,501	765,859	204,829	55,680
Median	139,050	202,104	89,101	680,622	181,900	48,957
Range	324,158	305,987	174,383	1,744,635	305,490	75,102
Std. Dev.	85,993	84,845	43,999	393,923	74,276	19,349
Observations	28	28	28	28	28	28

Of the companies chosen, Jubilee Insurance is one of the largest insurers in East Africa. Indeed, it can be seen from Table 2a that Jubilee Insurance has the highest mean operating income. APA Insurance and UAP General also retain a sizeable market share, with the second and third highest operating income values as seen in Table 2b and 2c respectively.

All three of these companies also have risk values that are approximately half their operating income values, which suggest healthy risk management systems.

The Monarch Insurance Company and Corporate Insurance possess the smallest market shares. Corporate Insurance also has a low level of risk, as shown by its standard deviation value in Table 2c, which is the lowest of all sampled insurance companies. The Monarch also has a low level of risk; however this risk value is very close to their operating income variable, suggesting poorer risk management systems than a company of comparable market share like Corporate Insurance.

Below are summary statistics for the macroeconomic variables.

Table 3: Summary Statistics for Macroeconomic Variables

Statistic	FX	IN	IR	OP
Mean	1.011	0.231	0.208	0.978
Median	1.011	0.223	0.166	0.994
Range	0.135	0.645	0.340	0.162
Std. Dev.	0.026	0.146	0.100	0.044
Observations	28	28	28	28

The mean of the FX variable is 1.011, which shows that on average, the exchange rate had been increasing by 1.1% every quarter for the past 7 years. The low range and standard deviation show that the exchange rate did not vary greatly from the mean value.

The IR variable shows the long-term government interest rate in the US relative to Kenya. Table 3 shows that during the study period, on average, the yield on a US long-term government bond was 20.8% that of a long-term government bond in Kenya.

The IN variable shows US inflation rates relative to Kenya's. Table 3 shows that on average, the inflation rates in the US were a proportion of 23.1% of the inflation rates in Kenya. The high range shows that this proportion may vary significantly over the 28 quarters observed.

The OP variable shows the increase in the US' GDP per quarter relative to the increase in Kenya's GDP per quarter. The value of 0.978 suggested that Kenya's GDP was growing at a slightly faster rate than that of the US during the study period.

4.2 Unit Root Tests

4.2.1 Test for the presence of a unit root

Testing for the presence was important for two principal reasons. Firstly, if the data was non-stationary, the usual central limit theorem on which the asymptotic standard normal distribution for the t-statistic is based could not be applied. This meant that even for large sample sizes, the t-statistic would not have had an approximate standard normal distribution, therefore no statistical inferences about regression parameters could have been made using the t and F statistic, (Wooldridge, 2001). The second reason was that testing the variables for a unit root helped examine whether different variables are driven by the same data generating process, and avoided spurious regressions.

The operating income measure in equation 1 was tested for stationarity. The results are shown in Table 4.

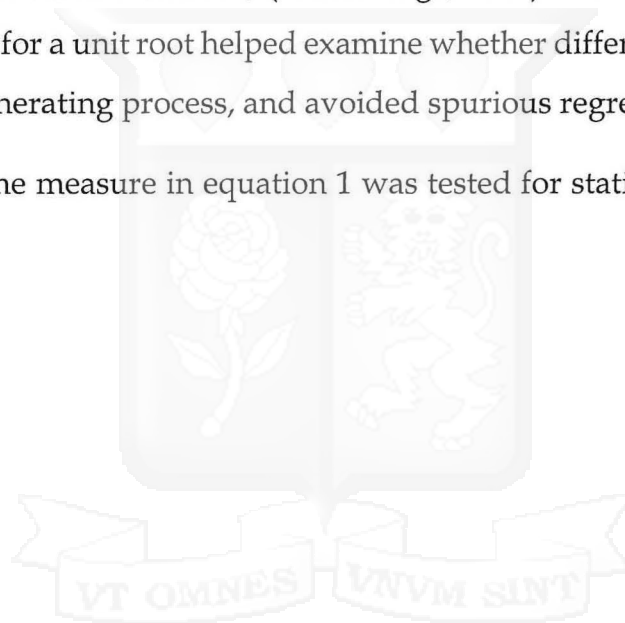


Table 4: Time Series Properties for each Company

Company	Coefficient Value	t-statistic	Critical Value at 5%	Prob	Order of integration	Unit Root Present
1	-2.013	-3.385	-3.012	0.024	I(1)	No
2	-3.742	-14.692	-2.998	0.000	I(2)	No
3	-3.980	-49.129	-2.998	0.000	I(2)	No
4	-4.543	-21.461	-2.998	0.000	I(2)	No
5	-4.180	-76.871	-2.998	0.000	I(2)	No
6	-4.285	-3.369	-3.021	0.025	I(1)	No
7	-3.991	-29.755	-2.998	0.000	I(2)	No
8	-11.351	-4.329	-3.030	0.004	I(2)	No
9	-4.955	-4.006	-3.021	0.007	I(1)	No
10	-3.988	-18.647	-2.998	0.000	I(2)	No
11	-4.134	-49.544	-2.998	0.000	I(2)	No
12	-4.192	-92.201	-2.998	0.000	I(2)	No
13	-4.157	-13.913	-2.998	0.000	I(2)	No
14	-4.047	-41.533	-2.998	0.000	I(2)	No
15	-4.098	-21.795	-2.998	0.000	I(2)	No
16	-3.779	-16.553	-2.998	0.000	I(2)	No
17	-3.914	-21.479	-2.998	0.000	I(2)	No
18	-4.284	-24.839	-2.998	0.000	I(2)	No
19	-4.116	-36.974	-2.998	0.000	I(2)	No
20	-3.896	-26.872	-2.998	0.000	I(2)	No

The test rejected the null hypothesis of a unit root if the t-statistics for the coefficient values shown in Table 4 above were greater than the corresponding critical values at the chosen significance level. The test showed that all companies were able to reject the presence of a unit root at the 5% level of significance. I(1) and I(2) represent the first and second differences of the Operating Income Variables.

The same test for stationarity was carried out for the macroeconomic variables in equation 2.

The results are shown in Table 5 below.

Table 5: Time Series Properties for each Macroeconomic Variable

Variable	Coefficient Value	t-statistic	Critical Value at 5%	Probability	Order of Integration	Unit Root Present
FX	-1.040	-5.203	-2.976	0.0002	I(0)	No
IN	-1.115	-5.392	-2.981	0.0002	I(1)	No
IR	-0.754	-3.803	-2.981	0.0081	I(1)	No
OP	-1.443	-4.937	-2.986	0.0006	I(1)	No

The test rejected the null hypothesis of a unit root if the t-statistics for the coefficient values shown in Table 5 above were greater than the corresponding critical values at the chosen significance level. The test showed that variables were able to reject the presence of a unit root at the 5% level of significance, and only first differences were necessary for the IN, IR and OP variables.

4.2.2 Test for Cointegration

Two variables are said to be cointegrated if they have a long-term relationship between them.

If a unit root test carried out on I(0) variables reveals non-stationarity, traditionally the solution is to take the first difference of the variables and use them instead in the estimation equation. This will only be valid if the residuals have been tested for cointegration.

Since the first difference of the variables; inflation, interest and output were used as the independent variables in equation 2, the possibility of over differencing (cointegration) was investigated using the method of Engle and Granger (1987). The results are shown below.

Table 6: Test for Cointegration of Macroeconomic Independent Variables

Engle-Granger Cointegration Test
Null Hypothesis = Variables are not Cointegrated

Variable	Conclusion	t-statistic	Probability	Significance Level
D(IN)	No Cointegration	-2.695	0.415	5%
D(IR)	No Cointegration	-2.098	0.697	5%
D(OP)	No Cointegration	-1.655	0.859	5%

The null hypothesis that the variables are not cointegrated was accepted if the probability values are greater than 5% (the significance level). As shown above, even at the 1% and 10% significance levels, there was no evidence of cointegrated variables

4.3 Estimation of Models

4.3.1 Insurance Companies

Below are the results obtained from regressing the operating income variables using equation 1.

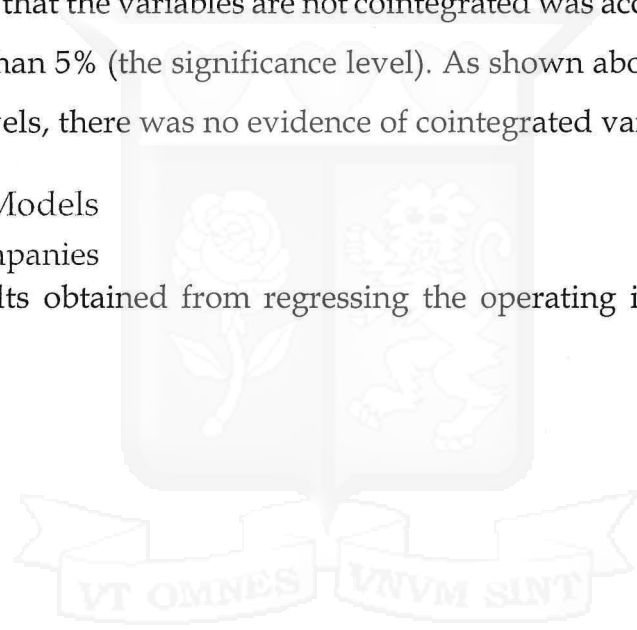


Table 7: The seasonal random walk results for operating income for all insurance companies

Company	α_i			θ_i			Adjusted R-squared	Heteroskedasticity Test	Newey-West method used
	Value	t-statistic	Prob	Value	t-statistic	Prob			
1	59,455	2.4775	0.0214	0.3349	*1.5787	0.1287	0.0609	0.0810	-
2	187,145	2.4003	0.0253	0.5627	3.2305	0.0038	0.2909	0.1649	-
3	50,098	*1.8476	0.0781	0.8713	10.1229	0	0.8152	0.0190	Yes
4	22,557	*-0.9454	0.3547	1.5908	7.1042	0	0.6826	0.0030	Yes
5	13,102	*-0.7024	0.4898	1.1573	18.5667	0	0.9373	0.7870	-
6	604,181	2.5861	0.0169	0.7236	4.5970	0.0001	0.4668	0.0453	-
7	50,579	*1.3714	0.1841	0.8264	6.3751	0	0.6328	0.0000	Yes
8	93,373	*1.4488	0.1615	1.0059	4.7785	0.0001	0.4870	0.9482	-
9	19,062	*1.2659	0.2188	0.9806	9.4721	0	0.7941	0.3100	-
10	58,074	*1.0374	0.3108	0.8973	5.1049	0	0.5214	0.5900	-
11	13,622	2.5962	0.0165	0.9543	14.7913	0	0.9045	0.0500	-
12	13,787	*-0.3983	0.6942	1.1482	25.7946	0	0.9665	0.2500	-
13	9,580	*1.8116	0.0837	1.0534	6.3230	0	0.6289	0.0810	-
14	7,954	*0.7714	0.4487	0.9886	10.6892	0	0.8312	0.5900	-
15	45,481	2.7791	0.0109	0.8976	8.2063	0	0.7426	0.0900	-
16	69,246	*1.9832	0.0600	0.6533	4.0278	0.0006	0.3983	0.3700	-
17	40,826	3.4872	0.0021	0.6714	5.7605	0	0.5832	0.2200	-
18	115,800	*1.1176	0.2758	1.0713	7.5937	0	0.7113	0.0400	Yes
19	21,444	*1.0090	0.3240	1.0009	9.6022	0	0.7986	0.2290	-
20	10,951	*1.4799	0.1531	0.7952	6.3090	0	0.6278	0.3700	-

The values of α_i and θ_i , as well as their t-statistic and probability values are shown in Table 7 for the twenty sampled insurance companies. In this case, the size of the coefficient dictates the size of the effect that variable had on the dependent variable, the Unanticipated Operating Income (UOI_{it}). The sign on the coefficient showed the direction of the effect. For instance, for company 6, Jubilee Insurance, increasing θ by 1 would cause an increase in the UOI_{it} by 73.4%.

The values with an asterisk show the coefficients which have a t-statistic less than 2 (or similarly the coefficient values which a probability less than 5%, the significance level). For these values, the independent variable, which in this case was the unanticipated operating income variable at the previous time period (t-1) did not have a significant effect on the dependent variable UOI_{it} . From the table above, it was evident that only Company 1 could reject a significant relationship between the unanticipated operating income at time t and at time (t-1). Conversely, for fourteen companies, the constant α was

statistically insignificant at the 5% significance level, which meant there was no statistically significant linear dependence of UOI_{it} on α_i .

The Adjusted R-squared of the regression is the fraction of the variation in the dependent variable that is accounted for by the independent variables. A value greater than 1 shows that the model is a poor fit to the data. As seen in Table 7, all values were below 1, and it was thus concluded that equation 1 was a good fit to the data.

The seasonal random walk model assumes heteroscedasticity, that is, that the error terms have the same variance. Subsequently, this assumption is invalid if the variance of the error term is not constant. The White test (1980) is used to verify that the data are homoscedastic with the null hypothesis:

$$H_0: \text{the data are homoscedastic.}$$

The test revealed that 15% of the sample firms had statistically significant heteroscedasticity at the 10% significance level. These values are shown in bold.

The Newey-West method was used to correct the standard errors for autocorrelation and heteroscedasticity. It is also known as HAC (Heteroscedasticity and Autocorrelation-Consistent) standard errors. (NBER, 2008)

4.3.2 Measuring the Foreign Exchange Variable

First, a linear regression was carried out to implement equation 2. The results are shown in Table 8 below.

Table 8: The Regression Results of Foreign Exchange Rate on the Macroeconomic Independent Variables

Variable	Coefficient	t-statistic	Probability	Adjusted R-squared	F-statistic
D(IN)	0.077	1.861	0.076	0.093	1.887
D(IR)	0.108	0.895	0.380		
D(OP)	0.184	1.128	0.271		

The notations D(IN), D(IR) and D(OP) show the first differences of the inflation, interest and output variables, since these variables were seen to be I(1) variables, that is, they are not stationary but their first difference is.

As seen in Table 8, an increase in the inflation variable by 1 with all other variables remaining constant would cause an increase in the foreign exchange variable by 7.7%. Similarly, an increase in the interest rate and output variables by 1 would cause an increase in the foreign exchange variable by 10.8% and 18.4% respectively, with all other variables remaining constant for each case.

The values in Table 8 show that the D(IN) variable was significant at the 10% significance level, given that the probability value 0.076 was less than 0.1. This supported the modification of the existing methodology to include an inflation variable, as it was seen to have a significant effect on the foreign exchange rate variable. However, the D(OP) and D(IR) variables were no longer significant even at the 10% significance level.

Therefore, there was need to employ stepwise multiple regressions. The reason for favouring this method over the first regression method used was that it determines which variables explain the greatest and most significant proportions of the variance in the variable of interest. (Cramer, 2004). Usually, this method is helpful when inspecting independent variables when the actual significance of the independent variables is not known in advance. The stepwise multiple regressions show the variable which was entered first in the regression, as well as how much of the variance in the dependent variable is because of that variable. This is repeated for the variable entered second and third. The importance of each independent variable is explained, as ranked by its effect on the variance in the dependent variable.²

The results of this are shown in Table 9 below:

² *Regression Methods*. (2017). Retrieved from PennState Eberly College of Science: <https://onlinecourses.science.psu.edu/stat501/node/329>

Table 9: The Stepwise Regression Results of Foreign Exchange Rate

Variable	Coefficient	t-statistic	Probability	Adjusted R-squared	F-statistic
D(IN)	0.077	3.634	0.000	0.103	1.983
D(OP)	0.184	1.861	0.048		

As can be seen in Table 9, the first differences of the inflation and output variables were now significant at the 5% level of significance.

Before using these results in the main estimation model (equation 3), equation 2 had to be tested for multicollinearity. Multicollinearity occurs when two independent variables are highly correlated. It can be identified easily using a correlation matrix.

Table 10: Correlation Matrix between Foreign Exchange Rate and Macroeconomic Variables

	FX	D(IN)	D(IR)	D(OP)
FX	1	-0.104	0.205	0.227
D(IN)	-0.104	1	0.460	0.122
D(IR)	0.205	0.460	1	0.291
D(OP)	0.227	0.122	0.291	1

As shown above, the pairwise correlations were low and thus the regression did not possess multicollinearity.

4.3.3 Estimation using the Almon Polynomial Distributed Lag Model.

Table 11: Significance of Currency Exposure (to USD) of Kenyan Insurance Companies

Company	Prob (F-Statistic)	Coefficient Value	t-statistic	Optimal Lag	Adjusted R-squared	Heteroskedasticity Test	Newey-West
1	0.17554	-0.003	-0.003	3	0.160	0.453	-
2	0.76396	-0.031	-0.082	3	-0.140	0.012	Yes
3	**0.02122	0.111	0.028	1	0.427	0.054	-
4	***0.00084	-0.378	-0.313	2	0.672	0.000	Yes
5	**0.02584	-5.856	-1.029	1	0.406	0.006	Yes
6	0.95373	0.094	0.238	3	-0.217	0.043	Yes
7	***0.00001	-6.740	-2.388	1	0.836	0.830	-
8	0.62974	0.152	0.441	3	-0.088	0.784	-
9	***0.00921	0.139	0.691	3	0.505	0.160	-
10	0.74690	-0.227	-0.346	2	-0.133	0.191	-
11	0.83709	1.179	0.160	1	-0.168	0.003	Yes
12	***0.00038	-1.413	-0.566	1	0.714	0.117	-
13	0.87177	0.075	0.290	3	-0.181	0.285	-
14	*0.05117	-0.016	-0.060	3	0.330	0.279	-
15	**0.04257	-0.027	-0.095	3	0.351	0.324	-
16	0.38392	-0.457	-1.145	2	0.021	0.010	Yes
17	**0.01623	-0.028	-0.128	3	0.453	0.568	-
18	**0.01890	0.172	0.032	1	0.438	0.006	Yes
19	*0.08843	-0.340	-0.530	2	0.260	0.044	Yes
20	**0.02425	-0.112	-0.414	3	0.413	0.670	-

As previously mentioned, this method involved predicting current values of the dependent variable (UOI_{it}) based on both the current and past-period (lagged) values of the independent variable ($FOREX_{t-q}$) where q was the lag-length.

Significant foreign exchange rate transaction exposure was considered by the F-statistic produced from estimating equation 3. The Prob (F-Statistic) value is the marginal significance level of the F-test. If the p-value for each company was less than the significance level, it was concluded that there existed a significant relationship between unanticipated operating income and short-term and long-term exchange rate movements.

In Table 11, the probability figures with one asterisk show significant foreign exchange exposure at the 10% significance level. Twelve out of twenty of the companies under investigation showed significant exposure to foreign exchange risk at this level. At the 5% level, shown by 2 asterisks, ten companies showed significant exposure. Finally, at the 1% level, only four companies showed by three asterisks displayed significant exposure.

This model was also used to show the optimal lag at which the companies experienced the highest foreign exchange exposure. The optimal lag was based on the lowest absolute t-statistic. The coefficient values column in Table 11 shows the coefficient at the optimal lag for each insurance company. Note that the F-test is a joint test so that even if all the t-statistics are insignificant, the F-statistic can be highly significant.³ From Table 11, 10 companies had an optimal lag of 3 quarters, 4 companies had an optimal lag of 2 quarters and 6 companies had an optimal lag of 1 quarter.

Due to the evidence of heteroskedasticity in 40% of the companies sampled (at the 5% significance level), the study uses the Newey-West method to correct the standard errors for autocorrelation and heteroscedasticity.

Of the twelve companies shown to have significant foreign exchange exposure, five companies were general insurers while the other seven operated life business as well. A test of the value of the difference between the two proportions was carried out to determine whether the difference was in fact significant. The test statistic can be seen below:

$$\frac{(\theta_1 - \theta_2)}{\sqrt{\frac{\theta_1(1-\theta_1)}{n_1} + \frac{\theta_2(1-\theta_2)}{n_2}}} \sim N(0,1)$$

where:

³ *Equation Output*. Retrieved from http://www.eviews.com/help/helpintro.html#page/content/Regress1-Equation_Output.html

θ_1 is the proportion of life insurers

θ_2 is the proportion of general insurers

The null hypothesis under this test was that the two proportions were the same. That is, there was no significant difference between them.

The t-statistic from this test was 0.57735, which is less than 1.96, the t-statistic at the 5% significance level of a standard normal distribution. The null hypothesis could therefore not be rejected, and it was concluded that there was no significant difference between the two proportions.

Finally, adjusted R-squared, which is used to test suitability of the model for the data, had a value less than 0.9 for all sampled companies. which showed that the model was suitable.

4.4 Main Findings

From Table 11 above, it was apparent that at the 10% significance level, 60% of Kenyan Insurers were exposed to foreign exchange exposure. Compared to existing insurance literature, this was consistent with a study carried out by Li et al (2009), where the exposure of US Insurance companies to seven foreign currencies was investigated. Compared to banking literature, these frequencies were consistent with Choi and Elysiani (1997) but proportionately higher than Chamberlain et al (1997), Choi and Kim (2003) and Martin & Mauer (2003). This suggested that among financial institutions, foreign exchange rate risk exposure is higher for insurance companies than banks due to lower levels of financial and operational hedging. Currency hedging in an insurance company is more complicated than in, say a banking or investment company due to the uncertainty in both amount and timing of claims. The difference could also be due to dissimilarity in the risk management, and thus risk profiles of insurers and banks.

The test of differences showed that the difference between the proportion of general insurers and life insurers exposed to foreign exchange risk was insignificant. This is in line with the study by Li et al (2009) described above, which also found that there were

no differences in the exposure frequencies detected. This suggests similar risk exposure management strategies between life and non-life insurers.



Chapter Five: Conclusions and Recommendations.

5.1 Conclusion

Currency risk is one of the most challenging risks that insurers in emerging markets like Kenya can undertake. These markets typically do not have financial investments opportunities for hedging to reduce the impact of financial exposure. Indeed, Kenya's derivatives market is in its infancy; the Nairobi Stock Exchange set it up in 2015. This means that many of the standard tools used to hedge currency risk, such as swaps, futures and options contracts have not been available in the market. Furthermore, few studies have been done on insurance companies' exposure to foreign exchange risk especially in an emerging market like Kenya.

This study extended existing literature carried out in developed economies on foreign exchange exposure by documenting the ubiquitous nature of foreign exchange exposure in the Kenyan Insurance Industry. It also tested whether general insurers exhibit higher exposure than life insurers. Past studies study currency exposure on an aggregate level, which may mask or limit the identification of the exposure. This study carried out regressions at a firm level, which allowed for the heterogeneity of individual insurer's economic relationships. The study also sought to determine whether non-life insurance companies had a significantly higher exposure to foreign exchange risk than non-life insurers.

From this study, it can be concluded that the insurance industry has significant foreign exchange exposure. It can also be concluded based on the sample of companies in this study, that the difference in exposure between non-life insurance companies and life insurance companies is insignificant.

5.2 Policy Recommendations

The high exposure discovered in this study stresses the importance of greater foreign exchange rate exposure management within the Kenyan insurance industry. There is need to delve deeper in the investigation of foreign exchange rate exposure management in order to identify areas that warrant improvement. For instance, general insurance

companies who only operate in Kenya may have very lax currency exposure management policies, as they do not consider themselves vulnerable to changes in the exchange rate. However on average, 30% of general insurance business in Kenya is motor insurance. Most claims come from accidents, which usually involve importing of car parts in order to settle claims and remunerate policyholders' claims. Importing leaves them vulnerable to changes in the exchange rate, yet there exists no regulation on managing and reserving for this risk. This is just an instance of the various possibilities of currency exposure which have been overlooked, both by insurers and regulators.

Therefore a possible policy recommendation would be an increase in reserves by regulators for insurance companies who are unable to qualitatively and quantitatively show significant foreign exchange exposure management.

5.3 Limitations

Due to the dynamic nature of the insurance industry mainly caused by mergers, acquisitions and restructuring of companies, a limitation to this study was the unavailability of sufficient historical data for companies' operating incomes. This limited the sample size of the study, as well as the length of the study period.

5.4 Areas for further study

Identification is only the first step. There is room for further study into methods by which individual insurers in Kenya can quantify their exposure. This can be achieved by modifying research from developed economies to suit the Kenyan economy, and using that as a foundation for building quantification models.

Furthermore, to better understand macroeconomic insurance risks, insurance companies' interest rate exposure and their association with foreign exchange rate transaction exposure should be considered more deeply. This is important because interest rates influence the ability of an insurance company to generate positive returns on any money invested. If inflation is higher than interest rates, then instead of increasing savings, an insurance company will lose money. False expectations about the risks associated with

foreign exchange and its constituents (i.e. inflation and interest rates) would eventually lead to insolvency.



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