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Derivatives Hedging and Performance of Non-financial Firms Listed in the Nairobi Securities Exchange, Kenya

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Abstract:

Since 2010, Kenyan listed non-financial firms have made huge losses due to derivatives hedging. In 2015, Kenya Airways reported a net loss of Kes. 25.7 billion, out of which Kes. 7.5 billion was attributed to derivatives usage. This saw the firm value as measured by Tobin's Q ratio drop from 0.08 in 2014 to 0.04 in 2015. Kenol Kobil reported a net loss of Kes. 6.28 billion for the 2012 financial year, a drop of 292 percent compared to a profit of Kshs. 3.2 billion in 2011, out of which Kes. 4.6 billion was attributed to derivatives hedging. In 2012, the firm value was 0.63 as measured by Tobin's Q ratio. In 2013, a Tobin's Q ratio of 0.53 was witnessed, a drop from 0.63 in 2012 even after cancelling some derivative contracts. Therefore, this study sought to find out the effect of derivatives hedging on the performance of non-financial firms listed in the Nairobi Securities Exchange as measured by the Tobin Q's ratio. The study targeted all the 34 Nairobi Securities Exchange listed non-financial firms as of 31st December 2017, out of which 10 firms were sampled purposively and studied for a period of six years. A descriptive survey research design and a positivism study philosophy were utilised in the study. The study used both primary and secondary data. Primary data was collected through a questionnaire while secondary data, which was used to evaluate the performance of the Nairobi Stock Exchange listed non-financial firms, was obtained from the published financial statements of the firms. The collected data was analysed using estimators of Stata 15. The study applied both descriptive and inferential statistics to analyse the quantitative data that was collected. The study employed panel data (Fixed effects) based on the Hausman specification outcome, to determine the effect of derivatives hedging on the performance of non-financial firms listed in the Nairobi securities exchange. A negative relationship was found between the derivatives hedging and the performance of the non-financial firms. Currency derivatives, commodity derivatives and interest rate derivative hedging were positively related to the performance of non-financial firms listed in the Nairobi Securities exchange. Exchange rates were found not to have a moderating effect on the relationship between derivatives hedging and the performance of the non-financial firms.

Keywords: *Commodity derivatives, currency derivatives, interest rate derivatives, exchange rates, non-financial firms and firm value*

1. Background of the Study

Milton Friedman in his book, *Capitalism and Freedom*, argues that the business of a business is to utilize its resources and engage in activities geared at increasing its profits and hence increase the shareholders' wealth as long as its undertakings are in an unrestricted and open competition short of chicanery or deception, (Friedman, 1970). According to Selvam, Gayathri, Vasanth, Lingaraja and Marxioli (2016) firm performance is mainly the organizational effectiveness which has two major components, i.e., financial and operational outcomes. The firm's operational performance is the antecedent to the firm's financial performance, hence an increase in the shareholders wealth. A firm that wants to maximize its market value, has to arrange its affairs in such a way that the operational risks are reduced or mitigated and that there is a smooth flow of its operations to ensure none of the production processes stops. From sourcing of the raw materials, financing, production and eventual sale of the finished goods, the process should never stop at all. Inflation is generally viewed as the main source of financial risk in Kenya. This is because it negatively affects the exchange rate by depreciating the currency as well as increasing the interest rates. This leads to poor performance of the non-financial firms who really rely on importation of raw materials as well as borrowing locally and internationally to finance their operations. In the recent past, Kenya has had one of the worst inflationary pressures since independence (CBK, 2017).

According to Chui (2012), derivatives have been in use for long with early trading being traced to Venice around the 12th century. Derivatives products are commitments whose value depends on other 'securities' and depends on future events not yet known with certainty, (Kobayashi, 2008). As per Khediri (2010), derivatives can be classified into three main types, Currency derivatives, Commodity derivatives and Interest rate derivatives. Commodity derivative is any contract that uses commodities such as electricity, oil, precious metals like gold, silver and copper as well as agricultural products like maize, wheat, barley, coffee, tea among others as the underlying assets, (Neftci, 2000). For the commodity derivatives, forwards and futures are commonly used as the tools of hedging, (Chui, 2012). Currency derivatives are also referred to as the Foreign exchange derivatives. The underlying asset here is the currency. According to Chui (2012), the developing trade and financial assimilation across nations have led to a surge in demand for protection against exchange rate shifts over the past few decades. Forward exchange contracts are very popular hedging tools which allow traders to sell or buy a pre-agreed foreign currency amount at a pre-agreed exchange rate at an agreed future date. The 2012 Central Bank of Kenya guidelines noted that interest rate derivatives include all derivative contracts and off-balance sheet instruments that react to interest rate changes. It identified examples such as forward rate agreements (FRAs), interest rate futures, interest rate and cross currency swaps, forward foreign exchange positions, interest rate options, and mortgage derivative products, (CBK, 2012). The exchange rates are determined by the exchange rate system in the country. Generally, there are two types of exchange rate systems; Fixed Exchange Rate System, that is undertaken by a state's government or its central bank by tying the official exchange rate to another country's currency or the price of gold. The main purpose of fixed exchange rate system is to keep the said currency's value within a narrow band hence maintain a stable system.

1.1. Statement of Problem

Non-financial firms mainly use derivatives to hedge against risks with a view of safeguarding firms' profits hence increase their market value and growth opportunities. Despite currency, commodity, and interest rate derivative hedging by non-financial firms from 2010 to 2017, the intended effects were not realised. For example, Kenya Airways reported a net gain of Kes 2.5 billion in 2012 from the use of oil derivatives, a 652% rise from Kes 328 million reported in 2011 financials. Despite such a gain, the firm's Tobin Q ratio dropped from 0.19 in 2011 to 0.07 in 2012. In a turn of events, the 2013 financials reported a net gain of Kes 602 million which was drop of 75.60% from 2012 gain. The Tobin's Q ratio improved from 0.07 to 0.16. In the two years, (2012 & 2013), KQ was using futures derivatives to hedge against oil risks which led to an improvement to its firm value. In 2014, Kenya Airways Plc changed from futures to options and this change led to a net loss of Kes 1.6 billion which represented a 6.23% of the total loss for the 2014 financial year. This led to a 50% drop in its Tobin's Q ratio to 0.08 from 0.16 ratio realised in 2013. Due to Derivatives hedging, Kenol Kobil in 2012 reported a loss of Kes 4.6 billion was reported that was 73.25% of the total loss for the year, (Kenol Kobil, 2013). The performance as measured by Tobin's Q ratio was 0.63, which was way below the recommended of 1.00, (Tobin, 1977). After cancelling the derivative contracts in 2013, the Tobin's Q ratio dropped to 0.53.

1.2. Objectives of the Study

The study sought to establish the effect of derivative hedging on the performance of non-financial firms listed in the Nairobi Securities Exchange and the specific objectives of the research were

- To determine the effect of currency derivatives hedging on the performance of non-financial firms listed in the NSE, Kenya
- To examine the effect of commodity derivatives hedging on the performance of non-financial firms listed in the NSE, Kenya
- To evaluate the effect of interest rate Derivatives hedging on the performance of non-financial firms listed in the NSE, Kenya
- To establish the moderating effect of exchange rates on the relationship between Derivatives hedging components and the performance of non-financial firms listed in the NSE, Kenya

2. Literature and Empirical Review

The risk management theory argues that, to reduce the expensive external funding costs, firms utilize hedging strategies. Risk is the likelihood that an event will befall and unfavourably affect the accomplishment of objectives. Risk management is the course that tries to manage the uncertainty that impacts the attainment of purposes, with the goal of attaining the objectives and thus generating value for the firm in which it is applied, (COSO, 2004). The main forms of risks include credit risk, financial risks, liquidity risk, compliance risk, market risk and operational risk, (Kiio, 2016). In an unfavorable external environment firms may find coming up with external funds to be expensive, (Admati, 2012).

According to Keynes, interest is a monetary phenomenon purely since the interest rate is calculated in monetary terms. Keynes described interest as the reward for parting with liquidity for specified time, (Wray, 2006). Liquidity Preference Theory establishes that, in comparison, future spot rates may be different from the premium offered (interest) in forward rates. The premium, therefore, will be utilised as an exchange tool for the consumption of the scarce liquid resources, payment of goods & services and the fact that short term expenditures cannot be ascertained with ease, (Kiio, 2016). In the study, the non-financial firms raise debt capital as a form of financing, this way of financing increases the risk of bankruptcy and financial distress costs.

International Fisher Effect (IFE) theory suggests that foreign currencies that have high interest rates tend to depreciate since the expected inflation rates are reflected by the high nominal interest rates. Available evidence between the interest and inflation rates is mixed just like in the Purchasing Power Parity theory, (Madura, 2010). It has been

observed that, a relationship between subsequent changes in spot exchange and interest rate differentials seem to exist in the long run but with considerable variations in the short term.

Haushalter (2000) investigated the hedging policies of 177 Oil and Gas producers in the US for periods 1992 to 1994. The study found that, out of the total yearly production, the amount hedged differed in every year with 13.8% hedged in 1992, 14.4% in 1993 and 16.8% hedged in 1994. Furthermore, different financial instruments were found to have been used at different rates. 10.5% hedged using options, swaps were used at 50.8%, fixed price agreements stood at 40.4%, futures and forwards hedging was at 37.0% while volumetric production pay-out was at 9.8%. Khediri (2010) investigated the association between corporate hedging and firm value of 320 large French non-financial companies for the year 2001. Using multivariate analysis, the use of financial derivatives was found not to be associated with firm value at all. Chanzu and Gekara (2014) sought to find out the effect of use of derivatives on financial performance of companies listed in the Nairobi Securities Exchange. Efficiency in trading derivatives affected market capitalisation by 47.4%, price stabilization in derivatives was at 52.6% while price discovery in derivatives was at 60.5%. Ayturk, Gurbuz and Yanik (2016) examined the usage of financial derivatives (commodity, interest rate and currency derivatives) and their effect on the value of non-financial Turkish firms for periods 2007 – 2013. The study found a positive relationship with system GMM estimators and a hedging premium of 0.53% which was not statistically significant for the hedgers. It was concluded that, financial derivative usage does not affect the non-financial firm value. Ouma (2016) investigated the effect of currency derivatives on the value of non-financial corporations in Kenya. The study findings disclosed a negative association between currency derivatives utilisation and the company's value as proxied by the Tobin's Q ratio.

3. Study Design and Methodology

The study adopted a descriptive survey research design. Descriptive research establishes and presents the way things are and helps a researcher to describe a phenomenon in terms of attitude, values, and characteristics, (Mugenda & Mugenda, 2003). Also, a descriptive design permits a researcher to collect, present and expound information for clarification purposes. According to Glass and Hopkins (1984), a descriptive study has its objective as a description of something regarding who, what, where, when, and how, of a phenomenon, which was the concern of this study hence it involved description, analysis and the interpretation of the prevailing circumstances during the time of the study. This method was the most suitable for the research hence the study sought to assess and define the relationship between Derivatives hedging activity and the NSE listed non-financial firms' performance. The study assumed positivism approach as the conceptual hypotheses were drawn from existing theories and identified knowledge gaps. Positivism presumes that the social world exists objectively and externally, that the knowledge is valid only if it is based on observations of this external reality and the universal and general laws exists or that theoretical models can be developed that are generalizable, can explain cause and effect relationships and which lend themselves to predicting outcomes, (Saunders, Lewis & Thornhill, 2009).

The study population was all the NSE listed non-financial firms. As at December 2017, 34 non-financial firms were in operation. The exclusion of the Banking, Insurance, Investment, Investment Services firms was to allow the study to focus on the non-financial firms since the financial firms used derivatives for speculation purposes often than for hedging purposes. Purposive sampling technique was used in the selection of the participants from the respective market segment. This was because, the sampling technique allowed the researcher to only use the firms that have the required study data with respect to the study objectives. As per Dolores (2007), purposive sampling is the deliberate choice of an informant due to the qualities of the information possessed. The study utilised both primary and secondary data. To collect the primary data, a structured questionnaire was used. Saunders, Lewis and Thornhill (2009), content that for a descriptive study, questionnaires are the best tools to be used. Orodho (2009), advocate for a questionnaire use when one needs to collect large amounts of data in a short period of time. The questionnaires were self-administered by the researcher to be completed by the respondents. The use of a structured questionnaire was to allow the respondents to only give the necessary data and to conform to the positivist approach used by the study. The secondary data focussed on the performance of firms as it was measured using the Tobin's Q ratio and was collected from the firm's published financial reports for periods 2012 - 2017.

Direct Relationship Model

$$Y_t = \beta_{0t} + \beta_{1t}X_{1t} + \beta_{2t}X_{2t} + \beta_{3t}X_{3t} + U_{it} \quad (1)$$

Where;

Y_t = Performance of firms

β_{0t} = Constant

X_{1t} = Currency Derivatives

X_{2t} = Commodity Derivatives

X_{3t} = Interest Rate Derivatives

β_{1t} , β_{2t} and β_{3t} = Regression Coefficients to be determined

U_{it} = Regression Error term

Moderated Relationship Model

$$Y_t = \beta_{0t} + \beta_{1t}X_{1t} + \beta_{2t}Z_t + \beta_{3t}X_t*Z_t + U_{it} \quad (2)$$

Where,

Y_t = Performance of Firms

X = All the three predictor variables

Z = Hypothesized exchange rate moderator variable

X*Z = Predictor Variable*Exchange Rates

β_{0t} = Value of Tobin Q when all predictors are zero

β_1 = Coefficient estimate for all the predictor variables

β_2 = Coefficient estimate for the moderating variable

β_3 = Coefficient estimate for the product term

U_{it} = Regression Error Term

Descriptive statistics, panel multiple regression analysis and correlation analysis were used to analyse the data collected. After extracting secondary data from the published financial statements, it was put in excel program that was used to calculate the Tobin's Q ratio for each of the non-financial firms across time. The panel multiple regression analysis was done through GLS estimators and Stata version 15 software. To draw conclusions, the research hypotheses were tested at 95% level of confidence.

4. Study Findings and Discussions

4.1. Descriptive Statistics

Hart (1987) contented that the response rate in a business survey vary from 17% to 60% with an average of 36%. However, Nachmias and Nachmias (2004) as well as Mendenhall *et al.*, (2003) observed that a 50% response rate was adequate. The study response rate was 80% and therefore considered adequate as it was above the 36% and 50%. This asserted the validity and reliability of the study findings as it was supported by a Cronbach alpha of 0.762.

	Tobin's q ratio	Currency Derivatives (Kes million)	Commodity Derivatives (Kes million)	Interest Rate Derivatives (Kes million)
Mean	1.60	915	9,130	1,439
Median	0.99	137	3,919	692
Std Deviation	1.54	1,585	12,136	2,042
Minimum	0.04	-	183	-
Maximum	4.96	5,387	49,128	9,942
Count	48	48	48	48

Table 1: Descriptive Statistics

Results in Table1 illustrates the summary of the descriptive statistics of Tobin's Q ratio, currency derivatives, commodity derivatives and interest rate derivatives. For periods 2012 – 2017, the mean of Tobin's Q ratio was 1.66 with a median of 0.99 and a standard deviation of 0.96. Ayturk, Gurbuz and Yanik (2016), found that the non-financial firms that were using derivatives to hedge, had a mean of 1.26, a median of 1.13 and a Tobin's Q standard deviation of 0.50. From the study results, it shows a moderate variation over the time in the firms' replacement cost and hence the firm's value as measured by the Tobin's Q ratio. The minimum Tobin's Q ratio was 0.04 with a maximum of 4.96. This shows that some listed non-financial firms' shares had a higher market value than others and so such firms were able to acquire additional capital since the value of capital exceeds the cost of acquiring it, hence increasing the value of those firms. Allayanis and Weston (2001) found that the non-financial firms that were using financial derivatives generally had a higher and median Q's than non-users. Also, the non-financial firms had Q's that were nearer to 1.

On average currency derivatives hedging was Kes. 915 million with a standard deviation of 1,585 million. The minimum currency derivatives used was zero with a maximum amount of Kes. 5,387 million for the years 2012 to 2017. This shows that some NSE listed non-financial firms did not find the currency derivatives attractive while others found them worthwhile using as a tool to mitigate foreign currency risk. The standard deviation shows a above moderate variations of the users. The study findings on currency derivatives hedging was in line with the findings by Kimani (2013) who found that, the mean usage of currency derivatives amongst the firms were Kes. 181,850.19 million, having a standard deviation of Kes. 74,601.64 million with the minimum value of currency derivatives used at Kes 92,493.00 million and a maximum value at Kes. 323,312.00 million.

Commodity derivatives were used on average of Kes. 9,130 million with a standard deviation of Kes 12,137 million between the years 2012 to 2017. This shows a moderate variation in the usage of commodity derivatives. The minimum amount of commodity derivatives used was Kes. 183 million while a maximum of Kes. 49,128 million was observed. This shows that all the NSE listed firms were actively using commodity derivatives to mitigate against commodity risks. Most of the firms are affected by the weather and few are in oil and gas and were being affected by the international commodity prices and production hence the need to cushion themselves against the unexpected global shocks. Commodity derivatives were used more than any other derivative instrument for the years under study.

Finally, the results in Table1 show a mean of Kes. 1,439 million with a median of Kes. 692 million and a standard deviation of 2,042 million. This was supported by the minimum interest rate derivative of Kes. 0.00 and a maximum of Kes. 9,942 million. Some NSE listed non-financial firms did not use any interest rate derivative as a form of managing interest rate for the years 2012 to 2017. This shows that the firms mostly allowed the market rates to prevail and this was

supported by the capping of interest rates in Kenya in 2016 for any borrowing from a Kenyan bank at 4% above the CBK rate.

Instrument	Currency Derivatives	Commodity Derivatives	Interest Rate Derivatives
Options	Call	Put	-
	3%	2%	
Swaps	-	-	12%
Forwards	95%	88%	-
Futures	-	12%	-
Interest Rate Locks	-	-	88%
Total	100%	100%	100%

Table 2: Derivatives Usage

From the Table 2, the non-financial firms listed in the NSE used two instruments for currency derivatives. Call and put options were rarely used at 3% and 2% respectively while forward contracts were used at 95%. The non-financial firms used forward contracts and futures for commodity derivatives hedging at varying rates. Forward contracts were the mostly used at 88% while futures were the least used at 12%. For both currency and commodity derivatives, forwards were the mostly used instruments. For the interest rate derivatives, interest rate locks were the mostly used at 88% with swaps being utilised at 12%. Only two instruments were used in the interest rate and commodity derivatives. The NSE listed non-financial firms used locks to avoid the uncertainty of the interest rate as well as using forward contracts to fix the future prices for the raw materials and sales. Haushalter (2000), found that, the Oil and Gas producers hedged using 10.5% options, swaps were used at 50.8% while futures and forwards were being used at 37%. In this study, options and futures were the least of the hedging instruments used. Kiio (2016) found that firms used 26.7% forward exchange contracts to mitigate currency risks while 2.2% were using options and swaps to hedge against currency risks. 26.7% of the firms used interest rate forwards and 2.2% used a combination of futures, options and swaps to hedge against interest rate risks. For commodity derivatives, 44.4% of the sampled firms used forward contracts to hedge against commodity price risks.

	Currency Derivatives		Commodity Derivatives		Interest Rate Derivatives	
	Count	Percentage	Count	Percentage	Count	Percentage
0 - 25	22	65%	11	23%	38	100%
26 - 50	12	35%	1	2%	-	-
51 - 75	-	-	4	8%	-	-
76 - 100	-	-	2	4%	-	-
Over 100	-	-	30	63%	-	-
Total	34	100%	48	100%	38	100%

Table 3: Number of the Derivative Contracts

From the Table 3, the currency derivatives contracts that ranged from 0 – 25 were 22 and this represented 65% of the total currency derivative contracts used between 2012 and 2017. For the range 26 – 50, 12 contracts were made by the NSE listed non-financial firms. For commodity derivatives, for the range of 0 – 25, eleven contracts were drawn, 26 – 50 range had one contract which was the least, 51 – 75 range saw four contracts drawn while for 76 – 100 range had 2 contracts drawn and finally, there were 30 contracts that were above 100 range. The highest range was above 100 and it represented a 63% of the total commodity derivative contracts drawn between 2012 and 2017, with the lowest range being 26 – 50 that had 2%. For the interest rate derivatives, only 38 contracts were done in the range of 0 – 25 and this was 100%. The reason for this could be that most of NSE listed non-financial firms were using a specific lender and that they already knew their financial requirements beforehand.

4.2. Diagnostic Tests

4.2.1. Test for Multicollinearity

Variance inflation factor (VIF) and tolerance levels were used to test for multicollinearity in this study. The VIF, which is the reciprocal of tolerance levels, illustrates by how much inflation of the coefficient estimate is attributed to multicollinearity, (Agunga, 2016). Landau and Everitt (2004) and Field (2009), explained that VIF with values less than 10 and tolerance levels of more than 0.2, rules out any possibility of multicollinearity amongst the study variables. The multicollinearity test results are presented in the Table 4.

Variable	VIF	Tolerance Levels
Currency Derivatives	2.23	0.45
Commodity Derivatives	1.68	0.60
Interest Rate Derivatives	1.58	0.63
Mean VIF	1.83	

Table 4: Multicollinearity Test Results

From the Table 4, all the predictor variables had VIF values of less than 10 and tolerance levels of greater than 0.2, which ruled out any presence of multicollinearity amongst the study variables as explained by Landau and Everitt (2004) and Field (2009). The test results imply that all the independent variables met the minimum threshold and the variables showed no multicollinearity. Hence regression could be done as there was no relationship between the predictor variables.

4.2.2. Test for Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of logtqr
chi2(1) = 0.16
Prob > chi2 = 0.6877

Table 5: Test for Heteroskedasticity Results

To test heteroskedasticity of the panel data, the study used the Breusch-Pagan test as depicted in Table 5. The null hypothesis was that the error term was homoscedastic. The calculated p value (0.6877) was more than the critical p value (0.05). Therefore, we failed to reject the null hypothesis (constant variance) and concluded that there was no heteroskedasticity in the data.

4.2.3. Hausman Specification Test

To accurately determine the appropriate model to be used, either fixed effects or random effects model, the study estimated both models and then Hausman specification test was performed. The results are presented in Table 6.

	Coefficients		(b- B)	Sqrt (diag(V_b-S_B))
	(b)	(B)		
	Fixed	Random	Difference	SE
Currency Derivatives	0.161223	0.1291979	0.0320251	-
Commodity Derivatives	0.1193329	-0.0508743	0.1702072	0.012329
Interest Rate Derivatives	0.0305356	0.0305619	-0.0000263	-

Table 6: Hausman Specification Test

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B)

= 31.94

Prob>chi2 = 0.0000

Table 6 shows the results of the Hausman test. The null hypothesis was that random effect model was appropriate. The p-value obtained was 0.0000 which was less than 0.05 necessitating the rejection of the null hypothesis. Hence, the appropriate model for the study was fixed effects.

4.3. Fixed Effects Regression Results

The diagnostic tests indicated that there was neither multicollinearity nor heteroskedasticity in the data. Furthermore, the Hausman test indicated that fixed effects model was the best for the study. Therefore, the estimation of the study direct relationship equation 1 was done by running a within fixed effects model. The estimated equation results are presented in the Table 7.

tqr	Coef.	Std. Err.	t	P > t	95% Conf.
Currency derivatives	.161223	.0721226	2.24	0.035	.0120261
Commodity derivatives	.1193329	.1754083	0.68	0.503	-.2435267
Interest rate derivatives	0.0305356	.0483298	0.63	0.534	-.0694422
Constant	-6.153709	3.815247	-1.61	0.120	-14.04615
Sigma_u	1.7689306				
Sigma_e	.35225675				
rho	.96185762 (fraction of variance due to u_i)				

Table 7: Fixed Effects Model Regression Results

F test that all $u_i = 0$: $F(5,23) = 35.23$

Prob > F = 0.0000

Table 7 presents a within fixed effects regression results that were used to determine the direct relationship equation (1). All the variables were logarithmically transformed since log transformed variables present better statistical distribution attributes over the raw variables as suggested by Ayturk, Gurbuz and Yanik (2016) and Hirsch and Seaks (1993). The rho, also known as intraclass correlation and which is estimated as $\{(\text{Sigma}_u)^2 / ((\text{Sigma}_u)^2 + (\text{Sigma}_e)^2)\}$ explains the variance due to differences across the panels. The study rho is 0.9619 which is greater than 0.90. This asserts the reliability of the variables. Sigma_u is the standard deviation of residuals within u_i and the Sigma_e is the standard deviation of all the residuals i.e., overall error term e_i . The 't' column presents the t-values that test the hypothesis that each coefficient is different from 0. To reject this, the t-value has to be higher than 1.96 for a 95% confidence. If this is the case, then one can conclude that the variable has a significant influence on the predicted variable. The higher the t-value, the higher the relevance of the variable. On the other hand, the 'p > |t|' column is two tail p-values test for the hypothesis that coefficient is different from 0. To reject this, the p-value must be lower than 0.05 for a 95% confidence interval and if that is the case, then the explanatory variable has a significant influence on the dependent variable.

The first study objective was to determine the effect of currency derivatives hedging on the performance of NSE listed non-financial firms in Kenya. The regression results presented in Table 7, give a coefficient of 0.161223. The t-value is 2.24 and a p > |t| of 0.035. The t value is greater than the critical t at 95% (1.96) and the p value is less than 0.05. For a 95% confidence interval study, one rejects the null hypothesis when the t value is greater than 1.96 and when P value is less than 0.05. Therefore, the study rejected the null hypotheses and concluded that currency derivative hedging was statistically significant at 95% confidence interval. This is inconsistent with the findings by Khediri (2010) who found that the use of financial derivatives was not statistically significant. Panaretou (2013) postulated that currency derivatives were not statistically significant at 5% significance level. Also, Ayturk, Gurbuz & Yanik (2015) found that currency derivatives were not statistically significant. The three studies above studied non-financial firms and measured firm value using the Tobin's Q ratio. However, this study's findings are consistent with Kiio (2016) who found foreign currency hedging was statistically significant at 5 percent level. The currency derivatives hedging, and the value of non-financial firms listed in the NSE are positively related. This means that a unit change in the currency derivatives hedging, would result to a 16.12% increase in the value of a non-financial firm. Such a positive relationship is consistent with the findings by Kiio (2016) but in contrast with Ouma (2016) who found a negative relationship between currency derivatives usage and the firm value of NSE listed non-financial firms, using the Tobin's Q ratio to measure the firm value.

Secondly, the study sought to examine the effect of commodity derivatives hedging on the performance of non-financial firms listed in the NSE. From the regression results in Table 7, the coefficient of commodity derivatives hedging is 0.1193329 with a t value of 0.68 and a P value of 0.503. With a t value less than 1.96 and a p value greater than 0.05, the study failed to reject the null hypotheses that commodity derivative hedging do not have significant effect on the performance of non-financial firms listed in the NSE and concluded that, commodity derivatives hedging is not statistically significant at a 5% significance level. This contrasts with the findings by Chanzu & Gekara (2014) and Lookman (2004), who found commodity derivatives to be statistically significant. On the other hand, the study findings are consistent with Jin & Jorin (2006) who found that commodity derivatives were not significant and so, they did not affect the value of the firm. Further, the regression model shows a positive relationship between commodity derivatives and the firm value, measured using the Tobin's Q ratio. The results imply that, the more a firm uses commodity derivatives, the more the value increases. This could be since there exists no structured derivatives market in Kenya.

The third study objective was to establish the effect of interest rate derivative hedging on the performance of NSE listed non-financial firms. The coefficient of the interest rate derivatives is 0.0305356 with a t value of 0.63 and a P value of 0.534. The t value was less than the critical t of 1.96 and the p value was greater than 0.05. This therefore meant that the study fails to reject the null hypothesis and conclude that interest rate derivatives usage is not statistically significant at 5% significance level. The regression results in Table 7 indicate there is a positive relationship between interest rate derivatives hedging and the value of NSE listed non-financial firms. A unit increase in the level of interest-bearing instruments leads to a 3.05% increase in the value of the firm. The study findings were inconsistent with the findings by Lenée and Oki (2017) as well as Alam and Afza (2017) who found that interest rates negatively affect the firms as well as being not statistically significant. Also, the capping of interest rates in Kenya in 2016 could have had an impact on the interest rate usage as the study covered two years after the introduction of the caps. The study findings showed that currency derivatives hedging was statistically significant while commodity derivatives hedging and interest rate derivative hedging before moderation were not statistically significant at 5% significance level.

The fourth and the final study objective was to establish the moderating effect of exchange rates on the relationship between the components of derivatives hedging and the performance of non-financial firms listed in the NSE. The null hypothesis was that exchange rates do not have significant moderating effect on the relationship between derivatives hedging and the performance of non-financial firms listed in the NSE. To attain this objective, the fitness of the model was tested. Step-wisely, the exchange rates were regressed on currency derivatives, commodity derivatives and interest rate derivatives as suggested by Muller, Judd & Yzerbyt (2005), Field (2009) and Hayes (2009). The moderation results are presented in Table 8.

	Regression before moderation (model 3.3)	Moderator alone (model 3.4)	Regression during moderation (model 3.5)	Change on moderation (Model 3.5 - 3.3)
R ²	0.5695	0.0003	0.5699	0.0004
F	12.35	0.01	8.94	-3.41
P- Value	0.0000	0.9091	0.0001	0.0001
β_0 Const	16.5041 (0.000)	2.0634 (0.863)	14.9774 (0.143)	
β_1 cud	-.0665 (0.471)		-.0672 (0.475)	
β_2 cod	-.6662 (0.001)		-.6645 (0.001)	
β_3 ird	-.0034 (0.978)		.0039 (0.976)	
β_4 exr		-.3012 (0.909)	.3336 (0.874)	

Table 8: Summary of Moderation Effect of Exchange Rates on the Relationship between the Derivative Hedging Components and Performance of Non-Financial Firms

According to Mackinnon *et. al.* (2002), if β_0 in model 3.5 is not statistically significant, but β_4 in model 3.4 is statistically significant, then the exchange rate is an explanatory variable. However, if β_4 in model 3.5 is statistically significant, then the exchange rate is a moderator variable whereby the effect and direction are presented by the β_{is} from the estimated regression model in table 8. From the Table 8, in model 3.5, the exchange rate is not statistically significant and so, the exchange rate is not a moderating variable between the components of derivatives hedging and the performance of non-financial firms listed in the Nairobi Stock exchange. Therefore, the study failed to reject the null hypotheses and concluded that the exchange rates did not have any moderating effect on the derivatives hedging and the value of the non-financial firms listed in the Nairobi securities exchange. The study results on the moderation effect of the exchange rates on the relationship between derivative hedging components and the performance of non-financial firms, contradict the findings by Mantari and Nuryasman (2017), who studied the impact of Exchange rate as a moderator to signalling theory. The study found that, the exchange rates had a moderation effect on the pre-existing relationship between the predictor variables of capital structure, company's growth rate and the profitability of the firm value. However, the study findings agree with the findings by Samuel and Teddy (2014), who found that exchange rates did not have any moderation effect. Inflation was found to have a statistically significant moderation on the relationship between interest rates and the gross domestic product.

5. Conclusions

Derivatives hedging is an important risk management tool that helps improve the performance of non-financial firms. All the derivatives hedging components were found to jointly and independently affect the performance of the non-financial firms listed in the NSE. The study concluded that, in the absence of the derivative hedging, the firms' performance is negatively affected. The first study objective found that currency derivative hedging had a positive statistically significant effect on performance of the non-financial firms listed in the NSE. Secondly, the study concluded that commodity derivatives did not affect the value of NSE listed non-financial firms as measured by the Tobin Q ratio. Furthermore, the study established that interest rate derivatives were positively related to the performance of the non-financial firms and were statistically not significant. Lastly, the study found there was no moderating effect of the exchange rates on the relationship between derivatives hedging dimensions and the performance of Nairobi Securities exchange listed non-financial firms. Therefore, the study concluded that NSE listed non-financial firms should use more of currency derivatives for hedging purposes and find a better hedging tool to commodity and interest rate risks.

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