HEDGING FOREIGN EXCHANGE RATE RISK USING CURRENCY FUTURES: A CASE OF KENYAN MULTINATIONAL FIRMS

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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This Research Project has been submitted for examination with my approval as the Supervisor.

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Abstract

Currency futures contracts can be used in hedging exchange rate risk for firms. This study estimates the appropriate futures price that Kenyan multinational firms would have used during the year 2015 when the Kenya Shilling depreciated significantly relative to the US Dollar. The study also estimates the optimal hedge ratio for the two futures contracts based on simulated futures prices from historical exchange rates. The firms included in the sample are; NIC Bank, Britam, Equity Holdings, KCB Bank Group and Jubilee Holdings. The countries considered for the subsidiaries of these firms are Tanzania and Uganda. The results from the study reveal that the futures contract would have helped minimize the losses incurred by these firms during that period since the futures price at the beginning of the year is less than the spot exchange rate at the end of the year which the firms use to translate their financial statements. The hedging strategy using the futures contracts is also seen to be effective based on the R-squared values from the Ordinary Least Squares method used to obtain the optimal hedge ratios.

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List of Abbreviations

Ksh/KES – Kenya Shilling

US – United States

1 INTRODUCTION

1.1 Background of the Problem

In the recent years, many companies have adopted the use of currency derivatives with purposes of hedging against exchange rate risk. Exchange traded financial derivatives emerged in response to the collapse of the Bretton Woods system of exchange rates established in 1944. Under this system, most governments agreed to fix the exchange rate of their currencies relative to the US dollar which would then be converted to gold. A currency futures contract can be defined as legally binding agreement with an organized exchange to buy or sell today a set amount of foreign currency for delivery at a specified date and place in the future. Currency futures emerged after the abandonment of the gold standard for the dollar whereby the fixed exchange rate system was replaced by the floating exchange rate system. The futures were introduced in 1972 at the Chicago Mercantile Exchange to hedge against adverse exchange rate movements.

Derivatives are usually used for two purposes; hedging and speculation. Speculation refers to the purchase of financial derivatives in order to take positions in the expectation of profit whereas hedging is the use of instruments to protect against the risks associated with everyday management of corporate cash flow. Naidu and Shin (1981) state that currency futures are used to ensure the offsetting of losses from the currency spot market through gains from the futures market. This is done through two types of hedging: A selling hedge which involves taking a long position in the currency spot market and a short position in the currency futures market. A buying hedge which involves selling a currency in the spot market and buying a futures contract in the same currency simultaneously.

Futures are standardized in terms of their maturity and amount traded in order to foster liquidity. The clearing house levies a small tax from the traders and stores it as the reserves that cover losses from defaults. There are certain precautionary measures taken by the clearing house in the trading of futures so as to minimize counterparty risk and to clear offsetting trades. First, it requires an initial margin which is a deposit of which the minimum amount should be equal to the maximum allowed daily price fluctuation. Secondly, it carries out marking to market which requires the contract holder to settle any daily losses from adverse movements in the value of the futures contract. It effectively reduces credit risk to a daily performance period with daily gains

or losses added or deducted to or from the margin account. Thirdly, there is a maintenance margin which when reached; the trader receives a margin call so as to top up the margin account using the variation margin.

Marking to market is the most significant difference between futures and forwards; whose performance period is the contract maturity rather than a single trading day. According to Jacque (2014) , trading currency futures with a well capitalized exchange that happens to implement conservative prudential trading guidelines is considerably less risky than trading forward contracts. This is because trading forward contracts requires constant and repeated risk evaluation of the trader's counterparty. As stated by Sercu (2009), when one defaults in a forward contract, it leads to saving of the amount lost during the life of the contract. For futures, on the other hand, the gain realized is equal to the payment of the day's price change due to marking to market.

Several studies have been carried out within the scope of currency futures and their use. According to Klimczak (2008), the determinants of the type of derivative used and the different hedging strategies that a firm uses are driven by the individual firm's decisions rather than theory. Based on Allayannis and Weston (2001), the use of foreign currency derivatives increases a firm's market value because the firms that use currency derivatives were identified to have a higher value than those firms that do not use currency derivatives. Firms that usually use the currency derivatives are usually exposed to three types of exposures; economic, translation and transaction based on the argument by Hagelin and Pramborg (2004).

There is still need for development of the currency futures markets in the emerging countries like Kenya. This is because the multinational firms that have subsidiaries in other African countries are faced by foreign exchange risk due to the volatility of the local currency and the foreign denominated cash flows yet there is currently no futures market in Kenya. This is manifested through the translation exposure from consolidating the financial statements of these subsidiaries by the parent company. The choice of these futures contracts is based on the minimization of the variance of the position being hedged.

1.2 Problem Statement

According to the Modigliani and Miller theorem, firms should only take up the investment opportunities that increase the value of the firm either through reducing taxes, financial distress costs or if they assist in the resolution of the agency problem between shareholders and managers. Risk management has become a vital part of financial firms in the recent past. Firms are exposed to different risks which might be form external factors or internal factors. Therefore, they usually make decisions that mitigate these risks in order to reduce the volatility of their cash flows.

The use of a particular currency derivate is based on the firm's goals. According to Geezy, Minton and Schrand (1997), if a firm's goal is to hedge against exchange rate risk for purposes of long term foreign debt, currency swaps are preferred whereas if the aim is to hedge against risk exposure in the short term transaction then currency forwards and futures are preferred. Allayannis, Ihrig, and P.Weston (2001) devised a mechanism for measuring the exposure to exchange rate risk and an exchange rate index for firms with foreign subsidiaries. They arrived at the conclusion that firms that are geographically dispersed have relatively high exposure to exchange rate risk. Therefore, these firms hedge against this risk using financial derivatives. Angelos Kanas (1996) argue that the risk profile of economic exposure depends on whether the domestic currency depreciates or appreciates.

The depreciation of the Kenya Shilling in 2015[1] and other African countries relative to the US dollar resulted in tremendous losses for companies whose subsidiaries are in other foreign countries. This was due to the exposure to exchange rate risk faced by the companies. With the aforementioned studies that explain derivatives' use in depth, the main objective of this research project is to show the impact that investment in currency futures would have had on a multinational firm during that period.

[1] This is illustrated in the next page

1.3 Research Objectives

1. To price a futures contract that would have appropriately hedged the exchange rate risk from translation exposure faced by multinational firms in 2015.
2. To determine the optimal hedge that these firms should have used during that period.

1.4 Research Questions

1. What futures price would have appropriately hedged the exchange rate risk from translation exposure faced by the Kenyan multinational firms in 2015?
2. What is the optimal hedge that these firms should have used during that period?

1.5 Justification of the study

The beneficiaries of this study are the Kenyan multinational firms and firms from emerging countries where futures markets are non-existent. As laid out in theory, it important for these firms to mitigate the risks that they face in order to prevent potential losses. Of particular importance is the foreign exchange risk that these firms are exposed to and how it causes the variability of their profits when there is depreciation in the local currency and the foreign currency. This study will provide a solution to these firms by showing the impact of investing in futures in order to mitigate this exchange rate risk which is encompassed in the consolidation of the financial statements in the parent company's local currency.

2 LITERATURE REVIEW

In the modern theory of risk management, as stated by Stulz (1996), the management should be concerned about the factors that affect the present value of the future cash flows expected by the firm. However, in practice, corporations are more concerned about hedging transaction risk in the short run. This is done by increasing its ability to take risks through decreasing the volatility of its other activities. This proposition of companies not basing their hedging strategies on theories but on practical considerations is supported by Klimczak (2008). The risks that the corporations usually hedge are those that offer incentives for taking up that risk. Firms manage risks using Value at Risk (VaR) which is a measure of the loss that a firm will equal or exceed at some level of probability given a particular time period. In this research however, the desired method of managing risk is using currency futures.

Klimczak (2008) dwells on testing four risk management theories on 150 Polish listed companies between 2001 and 2005. These theories include: financial theory, agency theory, stakeholder theory and new institutional economics. A linkage is provided between these theories and hedging.

Financial theory states that hedging is only justified when it results in a higher firm value. Agency theory, on the other hand, focuses on the separation of ownership in firms which motivates the managers to seek investment in risky projects so as to earn higher compensation in returns. This theory leads to the aspect of agency costs which can be defined as costs that arise from conflicts between shareholders, bondholders and managers of the firm. As a result of this theory, shareholders push for hedging policies in order to increase the firm value. (Klimczak, 2008)

Institutional economics argues that a firm's practice with regards to risk management is determined by the accepted practices within that firm's industry. Stakeholder theory focuses interests of all parties affected by the firm's activities as the main determinant of corporate policy. Hedging is only appropriate if it promotes the interests of all stakeholders and reduces the chances of financial distress. Firms usually hedge due to direct accounting exposure rather than global exposure as theory suggests. Hedging is more popular for large companies. From the

findings, it can be concluded that new institutional economics, stakeholder theory and some elements of financial theory, form a useful basis for new models.

Some arguments have been brought forward to refute the existence of exchange rate risk and any need to hedge it. Dufey and Srinivasulu (1983) come up with counter arguments for these claims. First, there is a claim that exchange rate risk does not exist as purchasing power parity entails compensation for changes in the price levels and exchange rates. The counter argument for this is that the compensation only holds in the long run but not in the short run. Therefore, exchange rate risk does exist. Secondly, the Capital Asset Pricing Model suggests that there is no need to hedge exchange rate risk as this is already taken care of in the capital markets. However, when default risk is important, hedging can reduce it and add the debt capacity of the firm.

Thirdly, Modigliani-Miller states that there is no difference between the investors and the firm such that the investors can hedge exchange rate risk instead of the firm. It has been showed that there are several obstacles to individuals coping better with exchange rate risk. This is in terms of entry and information gap in the market. Another argument presented by Dufey & Srinivasulu (1983) is that there is no need to hedge exchange rate risk as it will even out with time. Also, if the foreign exchange markets are well priced, the derivatives are correctly priced hence there is no need to hedge. The counter argument for this claim is that the concept of self insurance assumes risk neutrality yet economic agents are risk averse. Firms do not hedge so as to earn excess returns but to achieve a desired combination of risk and return. The fifth argument is that the fluctuations in the exchange rate are associated with the investors' consumption bundles hence the firms do not need to hedge.

Contrary to this, the consumption bundle is usually investor specific which means that its management is better left to the shareholder and the firms should hedge exchange rate risk. The final argument is that the derivatives are also attached to some level of uncertainty hence the hedging does not reduce the exposure. However, hedging facilitates availability of information regarding anticipated cash flows which can be tailored to have the same maturity as the financial derivative contracts. Based on these findings from Dufey and Srinivasulu (1983), there is sufficient evidence to support the existence of foreign exchange rate risk and the need for the firms to hedge it.

He and Ng (1998) investigate whether the value of a Japanese multinational corporation is affected by exchange rate changes and whether the lagged exchange rate changes have any explanatory power of current stock returns. They test this relationship by regressing stock returns against both contemporaneous and lagged exchange rate changes. Using a sample of 171 Japanese multinationals for the period between January 1979 and December 1993, they conclude that the contemporaneous exposure effects are significant such that a depreciation of the Yen has a positive impact on stock returns of the multinational corporations.

They also conclude that exchange rate exposure is positively related to a firm's international operations, especially its export ratio and this exposure increases with firm size. The extent to which a firm is exposed to currency fluctuations can be explained by variables that are proxies for the firm's hedging incentives. Firms with a higher debt to equity, those that are highly leveraged, face larger expected costs of financial distress and therefore have a greater desire to engage in hedging activities.

Firms use derivatives to lower non-diversifiable costs that are associated with market frictions like taxes, financial distress costs and external financing costs. According to Sercu (2009), financial distress is a situation whereby the firm's income is not sufficient to cover its fixed expenses including financial obligations. This can lead to bankruptcy. If hedging can reduce the volatility of the firm's cash-flows and consequently reduce the likelihood of the firm being in financial distress, then hedging increases the firm's current value.

Howton and Perfect (1998) examine patterns and determinants of derivatives use in samples of 451 Fortune 500 and 461 randomly selected firms. They show that swaps are the most often used interest-rate contracts while forwards and futures are the most often used currency contracts. They conclude that derivatives use is directly related to financial distress and external financing costs, tax considerations and currency risk exposure. Currency derivatives use is directly related to cash flows and unrelated to leverage. The use of derivatives is inversely related to hedging substitutes.

According to Harrigan (1996), transaction foreign exchange exposure refers to potential losses incurred by a firm as a result of unforeseen changes in exchange rates. Translation foreign exchange exposure refers to unexpected losses attributed to translation of financial accounting statements of foreign subsidiaries to the parent firm's local currency. Economic exposure, on the other hand, measures the change in the present value of the firm that results from the changes in the future operating cash-flows caused by an unexpected change in exchange rates.

In their study, Hagelin and Pramborg (2004) investigate the reduction effect of foreign exchange exposure hedging for the translation and transaction exposures. Firms' foreign exchange exposure increases with the level of the inherent exposure. Inherent exposure is given by the difference between revenues and costs denominated in foreign currency. This exposure decreases with the firm size. The conclusion from their findings is that the use of financial currency derivatives and investing in foreign denominated debt does reduce foreign exchange exposure.

Smith and Stulz (1985) develop a positive theory of hedging by value maximizing corporations in which hedging is part of overall corporate financing policy. If the hedging policy affects the value of the firm, it must do so through: taxes, contracting costs or through investment decisions. Howton and Perfect (1998) and Bartram, Brown, and Fehle (2009) also support this proposition. With regards to this, Stulz (1996) states that in efficient markets, risk management pays off only if it produces real gains for the corporation. These gains are; reductions in bankruptcy and distress costs, reductions in expected tax payments, reductions in expected payments to stakeholders and reductions in costs of raising funds.

Hedging can be done through financial contracts like forwards, futures and options or by changing real operating decisions. If hedging reduces the variability of pre-tax firm values, it subsequently leads to an increase in the expected post-tax value if the cost of the hedge is not too large.

According to Guay and Kothari (2003) corporate derivatives use is minimal in non-financial firms as it does not have a huge impact on their portfolio value. Increased use of derivatives is evident for large firms and those that are located in several geographical regions.

Based on the multivariate tests carried out on the 234 non-financial firms sample of the study, geographic diversification and investment opportunities have the greatest explanatory power for the firms' hedging decisions. In support of Stulz (1996), this paper states that hedging is only taken up if its benefits exceed its costs.

Bartram, Brown, and Fehle (2009) show that derivatives usage is determined endogenously with other financial and operating decisions in ways that are firm specific but not specifically related to theories of why firms hedge. They argue that most studies conducted earlier are controversial in their results because their samples are no well defined. The sample used in their study consists of 7,319 firms in over 50 countries. The findings show that the reasons for hedging for some firms is consistent with theories while for other firms in the sample the findings are inconsistent with theories of why firms hedge. Derivatives use is significantly related to other important financial risks like leverage, debt maturity, holdings of liquid assets, dividend policy and operational hedges.

Judge (2004) identifies that the grouping of non-hedging firms as "other" in the previous studies may have blurred the distinction between firms that hedge other exposures other than foreign exchange exposures and those that do not hedge at all. With regards to a firm's tax structure, the more convex the taxes schedule for the firm, the greater the incentive to hedge. Firms in financial distress are more likely to hedge so as to reduce variability in their cash flows. There are conflicting arguments on the relationship between the firm size and hedging activity. For example, small firms are faced with direct bankruptcy costs which imply that they have a greater incentive to hedge yet the hedging activity entails transaction cost scale economies implying that larger firms are more likely to hedge. This shows that there is inconsistency with the hedging theories which is a similar conclusion to that of Bartram, Brown, and Fehle, (2009) in their study.

The currency futures facilitate foreign trade and investment. This is done by providing alternative ways of insuring the risks of international traders arising from the fluctuations in the currency values. According to Naidu and Shin (1981), a firm does not need to hedge all of the exposed assets in order to minimize exchange rate risk. In the case where the basis is the difference between the future exchange rate and the spot exchange rate, any change in the basis determines the effectiveness of the hedge to a large extent. From their study, it can be concluded that foreign exchange rate risk can be reduced through hedging using currency futures. In support of this, Hill and Schneeweis (1984) show that currency futures minimize foreign exchange risk by reducing the price volatility related to the foreign earnings of the firm. They however claim that hedging does not fully insure against losses any more than it assures gains.

Futures are preferred to forward contracts due to their standardization and logistics of their trade. According to Naidu and Shin (1981), future contracts are standardized with respect to the size of the contract whereas forward contracts are not standardized. Based on Harrigan (1996), future contracts are traded on the floor of an organized exchange while the trading of forward contracts occurs between individuals and banks or banks with other banks. These features of futures make them more favorable to investors as they significantly reduce default risk in the financial markets.

In conclusion, the main determinant of the hedging policy that a firm chooses is the goal that the particular firm would like to achieve in terms of whether it would like to lower financial distress costs, coordinate cash flows with investment, or resolve agency conflicts between managers and owners. Multinational firms are driven to invest in currency futures in order to reduce the translation exposure brought about by foreign exchange rate risk from their foreign subsidiaries.

3 METHODOLOGY

3.1 Research Design

The approach used is that of quantitative research. For achieving the aim of pricing the futures contract, the independent variables used are: the spot exchange rate between the Kenya Shilling and the foreign currency, where the local currency is the Kenya Shilling; the risk free interest rate for Kenya and the other country where the subsidiary of the firm operates and the time period for the futures contract. As for the optimal hedge determination, Ordinary Least Squares estimation is used.

3.2 Population

The population for this study encompasses all the Kenyan multinational firms that translate their consolidated financial statements based on the Kenya Shilling.

3.3 Sampling Methods

Convenient sampling is used in order to carry out the study. The firms chosen include the commercial banks and insurance companies that have foreign subsidiaries in the neighboring East African countries and whose parent company is based in Kenya. This is because their financial statements are accessible and their parent companies are situated in Kenya. These firms include KCB Bank Group, NIC bank, Jubilee Holdings, Britam and Equity Group Holdings.

3.4 Data collection

The data collection was conducted through secondary sources for the spot exchange rates and the 91-day Treasury bill rates which act as the proxies for the risk free rates for Kenya and the other countries involved. The spot exchange rate was collected from the Central Bank of Kenya. The 91-day Treasury bill rates were collected from the respective Central Banks for the countries involved. The translation exposures were calculated from the financial statements of the foreign subsidiaries collected from the banks' websites.

3.5 Model Specification

In order to hedge, the value of the position being hedged should be known. According to Jacque (2014), the translation exposure which is the impact of the exchange rate fluctuations on the parent firm's consolidated financial statements. Translation exposure TE is calculated as the difference between the exposed assets and exposed liabilities from the foreign subsidiary i.

$$TE = a_i(t) - l_i(t)$$

$$T\{S_{KSH,I}(t)\} = [a_i(t) - l_i(t)] * [S_{KSH,I}(t) - S_{KSH,I}(0)]$$

Where;

- TE – Translation exposure at time t.
- $T\{S_{KSH,I}(t)\}$ - The translation gain or loss denominated in the exchange rate between KSH and the foreign currency I at the time t.
- $[a_i(t) - l_i(t)]$ - The difference between the exposed assets and exposed liabilities from the foreign subsidiary at time t.
- $[S_{KSH,I}(t) - S_{KSH,I}(0)]$ - The difference between the exchange rate at time t and time 0.

Assuming that the countries involved in the study have futures markets built with the following characteristics:

- There are no transaction costs incurred during trade.
- There is a similar tax rate for all the net trading profits of the market participants.
- The firms in the market can borrow and lend money at the same risk free rate in each country.
- Participants of the market take advantage of the arbitrage opportunities as they occur.

The currency futures price, according to Hull (2009), is determined using the interest rate parity relationship is applied whereby;

$$F_0 = S_0 * e^{(r - r_f)t}$$

Where;

- F_0 - The currency futures price in Ksh of one unit of the foreign currency.
- S_0 - Current spot price in Ksh of one unit of the foreign currency.
- r - The Kenyan risk free rate at time 0.
- r_f - The foreign country's risk free rate at time 0.

The translation exposure is essential in the optimal hedge ratio estimation. It gives the exposure amount in the spot market for the parent company.

There are various ways used to obtain the optimal hedge ratio. These methods include the use of the minimum variance approach and the use of methods of estimation which include Ordinary Least Squares, Vector Auto-Regressive models (VARs) and the Vector Error Correction Models (VECMs).

Naidu and Shin (1981) use the mean-variance analysis developed by Markowitz in order to derive the optimal hedge portfolio.

Consider the following illustration:

- X_s - Holdings in the spot market
- P_s – Spot price in the Ksh of one unit of the foreign currency
- X_f - Holdings in the futures market
- P_f - Futures price
- R – Return on the hedged portfolio

$$E(R) = (X_s * \Delta P_s) + \left(X_f * \Delta P_f\right)$$

$$Var(R) = X_s^2\delta_s^2 + X_f^2\delta_f^2 + 2X_sX_f\delta_{sf}$$

Where;

- ΔP_s- Price change in the spot exchange rate between two time periods.
- ΔP_f - Price change in the currency futures contract between two time periods.
- δ_s^2- Variance of price changes in the spot currency market between two time periods.

- δ_f^2- Variance of price changes in the futures market between two time periods.

$$Let\ the\ hedge\ ratio\ b, = \frac{-X_f}{X_s}$$

$$Var(R) = X_s^2\left[\delta_s^2 + b^2\delta_f^2 - 2b\delta_{sf}\right]$$

$$\frac{\partial Var(R)}{\partial b} = X_s^2\left(2b\delta_f^2 - 2\delta_{sf}\right) = 0$$

$$The\ optimal\ hedge\ ratio;\ b^* = \frac{\delta_{sf}}{\delta_f^2}$$

However, the approach used in this study is that of Ordinary Least Squares method where the model to be estimated is as follows:

$$\Delta S_t = \alpha + \beta\Delta F_t + \mu_t$$

Where;

$$\Delta S_t\ represents\ the\ change\ in\ the\ spot\ exchange\ rate\ at\ time\ t$$

$$\Delta F_t\ represents\ the\ change\ in\ the\ currency\ futures\ price\ at\ time\ t$$

$$\mu_t\ represents\ the\ regression\ residuals$$

$$\alpha\ represents\ the\ intercept\ of\ the\ regression$$

$$\beta\ represents\ the\ optimal\ hedge\ ratio$$

4 FINDINGS AND DISCUSSION

4.1 Historical trend of the exchange rate series

In order to ascertain the need for the currency futures contracts in the Kenyan market, the series of the exchange rates between the Kenya Shilling and Uganda Shilling and Tanzania Shilling were plotted. These plots were for the period between September 2012 and December 2015.

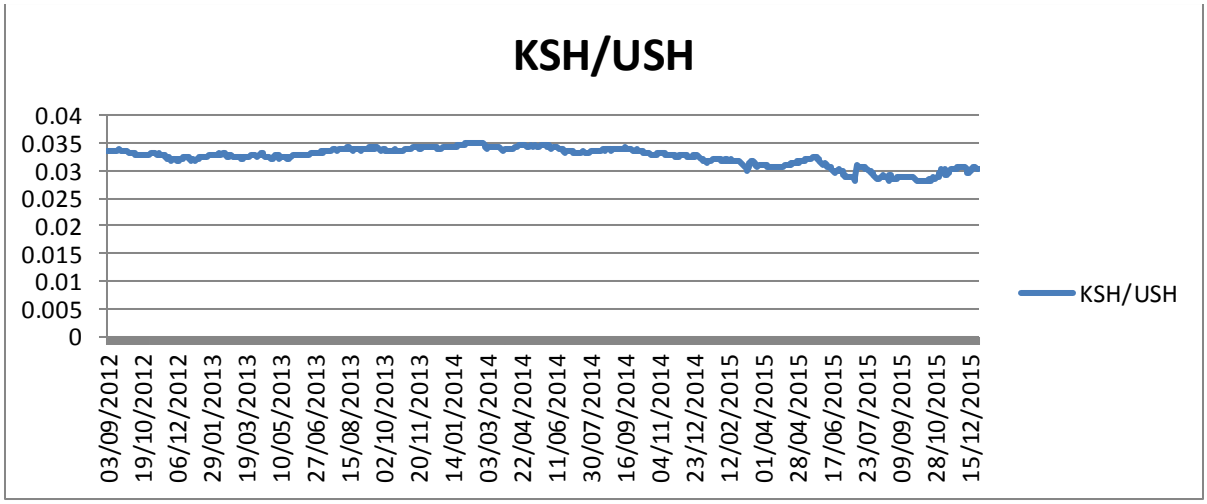

Figure 1: Spot exchange rate between the Kenya shilling and Uganda Shilling

It can be observed that the value of the Kenya Shilling relative to the Uganda Shilling between 2012 and 2014 was rather stable and it declined steadily in 2015.

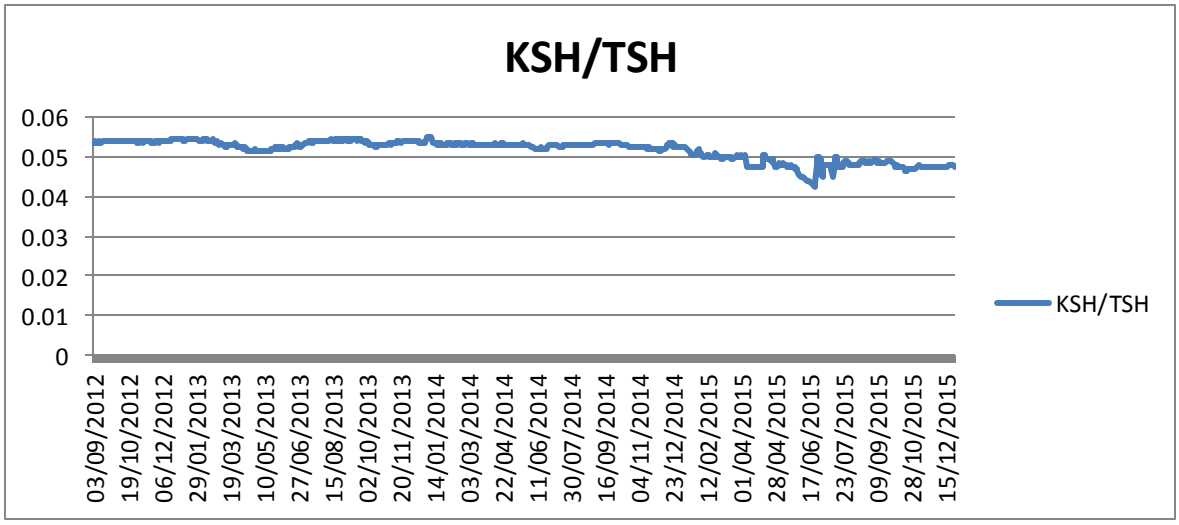

Figure 2: The spot exchange rate between the Kenya Shilling and Tanzania Shilling

This is observed in the case of the exchange rate between the Kenya Shilling and Tanzania Shilling which hit its lowest value in 2015 which shows that the firms whose subsidiaries were located in Tanzania and Uganda incurred a loss in the translation of their financial statements within the period of 2015.

The depreciation in the Kenya Shilling during this period shows that exchange rate risk does exist as stated by Dufey & Srinivasulu (1983) and that the Kenyan multinational firms face translation exposure of this risk. (Harrigan, 1996)

4.2 Estimation of the futures price

As for the futures price which would have appropriately hedged the exchange rate risk from translation exposure faced by Kenyan multinational firms in 2015, the futures contract was relayed in two scenarios: One of the scenarios is based on the assumption that there is no daily marking-to-market which is a form of a forward contract. The second scenario is based on daily marking-to-market of the futures contract.

4.2.1 Forward contract approach

Considering the first scenario of the form of a forward contract, it is assumed that the company locks in a forward or futures price now which has a one-year term to maturity.

Table 1: Tanzania Futures Price and Spot Price comparison

Futures Price locked in as at 2/1/15	KES 0.051/TSH
Prevailing Spot Price as at 31/12/15	KES 0.052/TSH

The futures price is 98% of the prevailing spot price at the end of the year. Although the difference between the prevailing spot price at the end of the year and the price of the futures contract is small, it is possible that this could lead to a huge difference when large amounts of currency are involved.

Table 2: Uganda Futures Price and Spot Price comparison

Futures Price locked in as at 2/1/15	KES 0.0310/USH
Prevailing Spot Price as at 31/12/15	KES 0.0318/USH

The futures price in this case is 97% of the prevailing spot price at the end of the year. This means that the futures contract would have locked in a better exchange rate that the firms could have used in translating their financial statements. This would reduce the losses incurred when the translation is carried out based on the prevailing exchange rate in the market. This is consistent with the findings of Hagelin & Pramborg (2004) who conclude that the use of foreign exchange derivatives reduces the translation exposure faced by multinational firms.

However, according to Sercu (2009), this forward contract approach is prone to default risk as there is no exchange to ensure that the counterparty delivers the underlying currency at the delivery date.

4.2.2 Daily marking-to-market approach

Daily marking-to-market for futures reduces the default risk as the gains or losses for each day are reflected on the investor's account with the clearing house. This brings out the main difference between futures contracts and forward contracts. The following assumptions are applied in the analysis:

Table 3: Assumptions used in the daily marking-to-market for the Tanzanian case

Initial margin(50% of the futures price as at 2/1/15)	KES 0.0259/TSH
Maintenance margin (70% of the initial margin)	KES 0.018/TSH
Term to maturity	0.25

Table 4: Assumptions used in the daily marking-to-market for the Ugandan case

Initial margin(50% of the futures price as at 2/1/15)	KES 0.0159/USH
Maintenance margin (70% of the initial margin)	KES 0.0111/USH
Term to maturity	0.25

The initial margins (KES 0.0259/TSH and KES 0.0159/USH) and the maintenance margins (KES 0.018/TSH and KES 0.0111/USH) are manipulated based on the number of contracts that a firm has purchased. This also affects the period when the margin call is required. The selection of the initial margin is based on the futures contract that the company purchases at the beginning of the year 2015. It has been calculated as 50% of the futures price as at 2/1/15. It is meant to protect the investors from variations in the futures price over time. The maintenance margin is the level at which the company's account with the clearing house should be sustained. In this case, it is taken as 70% of the initial margin. When the margin falls below this level, the margin call is triggered so that the investor can top up to the initial margin.

4.3 Optimal Hedge Ratios estimated using Ordinary Least Squares

Before calculation of the initial margins and maintenance margins for the companies, the optimal number of contracts they should purchase is calculated based on the optimal hedge ratio. The optimal hedge ratio is obtained from the simulated futures prices based on the historical spot exchange rates between September 2012 and December 2014. The Ordinary Least Squares regression gives the following output:

$$\Delta S_{KES/TSH(t)} = -0.00000032868 + 0.790\Delta F_{KES/TSH(t)}$$

$$\Delta S_{KES/USH(t)} = -0.00000157526 + 0.879\Delta F_{KES/USH(t)}$$

For the Tanzanian case, the optimal hedge ratio estimate is 0.790 and for the Ugandan case, the optimal hedge ratio is 0.879. The coefficients are statistically significant based on their t-statistic values (45.1982 and 66.8384 respectively). The R^2 values for both regressions are 0.779 and 0.885 respectively. This shows the variation in the spot exchange rate that is explained by the variation in the futures price. These values show that the futures contracts are effective. This is consistent with the findings of Sah & Pandey (2011). The optimal number of contracts is calculated based on the assumption that the size of each futures contract is KES 1,000,000.

Table 5: Optimal number of Contracts for the exposure from the Tanzanian subsidiaries

Company	Translation exposure in KES '000	Optimal number of contracts[2]
Britam	946,850	748
KCB	17,564,730	13,877
NIC	238,391	188
Jubilee Holdings[3]	-685,064	-541
Equity Holdings	2,792,000	2,206

Table 6: Optimal number of contracts for the exposure from the Ugandan subsidiaries

Company	Translation exposure in KES '000	Optimal number of contracts
Britam	1,092,832	960
KCB	15,954,815	14,022
NIC	103,864	91
Jubilee Holdings	-96,478	-85
Equity Holdings	1,902,000	1,672

From the tables 5 and 6, it is evident that the number of futures contracts that a firm should purchase is dependent on the level of exposure. If a company faces significant translation exposure, it has to purchase more currency futures contracts. All the firms except Jubilee take long positions in the futures contract so as to hedge the translation risk from their Ugandan and Tanzanian subsidiaries. This shows that in order for the firms to buy the Kenyan shillings at the end of the year when translating the financial statements, they should lock in a futures price now and purchase the optimal number of contracts estimated.

[2] The optimal number of contracts is rounded off to the nearest contract.

[3] The negative sign implies taking a short position in the futures contract.

Table 7: Margins based on the optimal number of contracts for Tanzanian subsidiaries

Company	Initial margin deposited as at 2/1/15 in KES	Maintenance Margin in KES	Closing balance as at 31/12/15 in KES
Britam	19.43	13.60	22.05
KCB	360.49	252.34	409.09
NIC	4.88	3.42	5.54
Jubilee Holdings	14.05	9.84	12.16
Equity Holdings	57.31	40.11	65.03

Table 8: Margins based on the optimal number of contracts for Ugandan subsidiaries

Company	Initial margin deposited as at 2/1/15 in KES	Maintenance Margin in KES	Closing balance as at 31/12/15 in KES
Britam	15.30	10.71	13.56
KCB	223.42	156.39	198.00
NIC	1.45	1.01	1.29
Jubilee Holdings	1.35	0.95	1.51
Equity Holdings	26.64	18.65	23.61

Based on the tables 5 and 6, the initial margins, maintenance margins and the closing balances for the firms are obtained. These are presented in tables 7 and 8. It can be inferred from the table that the level of the margins is also dependent on the level of translation exposure that a firm faces. KCB has the highest level of margins since it has the highest level of translation exposure as presented in tables 5 and 6.

5 Limitations, Conclusions and Recommendations

5.1 Limitations of the study

The main limitations of the study included the limited availability of data since the Central Bank website only had historical exchange rates beginning from September 2012. This limited the scope of the data used to obtain the optimal hedge ratios. The second limitation of the study was that it was based on many assumptions since there are no existent futures markets in any of the three countries. These assumptions formed the basis for the study. The third limitation was the small number of firms whose subsidiaries are located in Uganda and Tanzania while the parent company is based in Kenya.

5.2 Conclusions

From the study conducted above, it can be concluded that if there was an existent futures market in Kenya, Uganda and Tanzania, the Kenyan multinational firms would have benefited from entering into a futures contract which would lock in an exchange rate at the beginning of the year 2015. The futures contracts' prices are KES 0.0310/USH and KES 0.051/TSH. This would have reduced the losses incurred due to the depreciation of the Kenya Shilling during that period. It is also evident from the study that the futures contracts are effective since the R-squared from the optimal regressions are high (0.779 and 0.885).

5.3 Recommendations

1. The results from this study are based on only five multinational firms. Future studies should consider more multinational firms so as to draw a more market-specific conclusion concerning the use of futures.
2. Future studies should consider a wider sample period as this will be beneficial in obtaining the optimal hedge ratio for the futures contracts.
3. The initial and maintenance margins used in this study are hypothesized. Therefore, more research should be carried out so as to obtain the appropriate margins in the futures market.
4. Future studies should also consider the other methods of estimating the optimal hedge ratio like the Vector Autoregressive models and Vector Error Correction models. This is because Ordinary Least Squares method has limitations brought about by its assumptions of homoscedasticity of the error term and no autocorrelation of the error terms.

5. Future research should be done on the dynamics of the futures markets in Kenya, Uganda and Tanzania if they are to be developed.

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