The Effect of Selected Macro-economic Variables on Exchange Rates in Kenya

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Abstract

Purpose – This paper sought to establish the effect of selected macro-economic variables on exchange rates in Kenya. The selected macro-economic variables for this study were interest rates, inflation rates and trade flows.

Methodology – The study was modeled as a descriptive survey. A data collection sheet was used to collect secondary data from the published bulletin and other publications by Central Bank of Kenya and Kenya National Bureau of Statistics for a period of ten years between 2006 and 2015. The data was examined using descriptive, correlation and regression analyses.

Findings - Results of the study showed that interest rate had a positive correlation coefficient of 0.446 with exchange rate, Inflation rate and exchange rate had a correlation coefficient of negative 0.395 while the Level of aggregation of trade flows had a correlation coefficient of positive 0.829 to the exchange rate. The value of R square was 0.745, a discovery that 74.5 percent of the deviations in exchange rates in Kenya occurred due to changes in interest rate, inflation rate and trade flows at 95 percent confidence level. The significance value obtained was less than p=0.05 implying that the model was statistically significant in predicting how the macro economic variables of interest rate, inflation rate and trade flows affect exchange rates in Kenya.

Implications - The Kenyan shilling has been depreciating in value over the years implying a weakening of its purchasing power in the international markets. Policy makers should come up with policies that will contribute to reversing this trend. Managing the prevailing levels of inflation, interest rates and trade flows will be key as they have been found to significantly affect exchange rates.

Value - The study will act as a guide to various banking sector policymakers key being the Central Bank of Kenya and the Treasury in formulation of the policies which will manage exchange rates and spur growth and profitability in this sector. The monetary policy decision makers can innovatively formulate foreign exchange strategies that ensure that the exchange rate in the financial market at any time do not negate investments in the economy.

Key Words*: selected macro-economic variables, exchange rates in Kenya*

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Introduction

According to Bah and Amusa (2003) the exchange rate of a country determines the

growth of that country in terms of trading across borders and is a measure of its international competitive edge. Because of the importance of exchange rate in the determination of a country's level of trade, the need to study exchange rate determinants and behavior of foreign markets arises. The evaluation of the determining factors of exchange rates has been an important task for both academicians and policy makers with the major motivation of establishing the link between exchange rates and export growth. In his study, Bergen (2010) found that the most observed analyzed and government manipulated economic variables are rates of exchange. Similarly, Kanamori (2006) in his theoretical background noted that the rate of exchange for a country is determined by macroeconomic factors, speculative factors and economic expectations.

According to Defrenot and Yehoue (2006) exchange rates have been determined by governments rather than market forces for the better part of the twentieth century. Long before World War I currencies were quoted in terms of gold and after World War II most of the world currencies were quoted in reference to the U.S. dollar. Barnett and Ho Kwag (2007) in their research noted that exchange rates are very dynamic and equilibrium in foreign markets is determined by the demand and supply forces of foreign exchange. In recent decades, rapid developments of global capital market and financial services have been observed. Civcir (2003) found that the dynamic character of exchange rates impact the overall macroeconomic situations of various countries.

Kenya has been characterized by the evolution of exchange rate regimes together with general macroeconomic policies that have been in place ever since Kenya gained independence in 1964. Ndung'u (2009) states that from the period 1963 to 1974, the Kenyan shilling was fixed against the U.S. dollar but after discrete devaluations, the shilling was tied to the special drawing rate (SDR). However, the periods from 1974 to 1981 saw volatile movements of the nominal rate of exchange in relation to the dollar. This caused the shilling to depreciate even further and was consequently devalued in 1982.The exchange rate regime was subsequently changed in 1983 to a crawling peg system till 1993 when a floating exchange rate system was adopted. When the foreign exchange market was liberalized, Kenya gained the right to control inflation but lost the

right to lock in domestic prices and thereby transmitting effects of globalization directly into the country.

According to Sharma and Singh (2011), macroeconomic variables are the variables independent of the level of income. They are factors that are applicable to the whole economy and national and local level whose effects are felt by a large population rather than individuals and also affect gross domestic product (GDP), rate of inflation, rate of interest and balance of payments, rate of unemployment and the levels of income. These effects have to do with the structure of the economy, performance behaviors and the decision making of the economy at the broad level. Their effects are felt through the national income, output levels, consumption, unemployment, inflation, savings, investment, international trade and international finance. Macroeconomic variables act as indicators of what is currently trending in the economy (Khalid et al., 2012).

A primary condition that is needed for currencies to trade in a common market is that one must be quoted in terms of the other. A rate of exchange is the price of one currency quoted in terms of another (Mishkin & Eakins, 2009). Exchange rate quotations can be direct that is the quantity of home currency needed to buy a unit of the foreign currency or an indirect quotation that is how much of the foreign currency is obtainable from the home currency (Howells & Bain, 2007). Exchange rate is called the nominal rate of exchange when inflationary effects are included in the rare and is referred to as the real rate if these effects have not been included in the rate. Before the year 1972, countries in the world operated on a fixed rate regime where every country's currency was quoted against the dollar (Lothian & Taylor, 1997).

Exchange rates are determinable through demand and supply. Levich (2001) asserts the importance of exchange rate as the single most important price in the economy because of its ability to determine the international balance of payments. Youngblood (2004) noted a negative association between the spot rate of exchange (domestic currency price of foreign currency) and the differential of the nominal rate of interest (the domestic interest rate minus the foreign interest rate) within short periods and at short time scales

where prices are sticky. At the same time, the study showed a positive association when periods are longer and prices are flexible. According to the international fisher effect, the expected change in the current rate of exchange between any two countries is equal to the difference in the nominal rates of interest at that time. The rationale according to the IFE is that for countries that have higher interest rates, they will also experience high inflation levels that will cause their currencies to depreciate against those countries with lower levels of interest.

Razin and Collins (2007) noted that exchange rate deviations from purchasing power parity valuation are similar to price based on supply and demand of currency. Demand and supply relationship is based on a number of factors. Multiple factor rate of exchange reflects its relationship with other economic categories - cost, price, money, interest, the balance of payments. Tucker (2007) defines inflation as increases in price of goods and services in the economy in a consistent and general manner. Sloman and Kevin (2007) in explaining demand pull and cost push inflation mention that demand pull arises from persistent rise in aggregate demand and thus firms react by raising prices and to a small extent output. In contrast, cost push inflation causes an increase in costs associated with production.

When a country experiences negative balance of payments, in its current account, it signifies overspending on foreign trade as compared to earnings from abroad. This causes an excess demand for foreign currency hence lowering its exchange rate (Taylor, 2001). A negative balance of payments hence causes the depreciation of the local currency. If prices of exports rise at a greater rate than that of imports, terms of trade improve showing greater exports demand and hence results in increased export revenues. This increase in turn increases demand for a country's currency. If export prices rise at a lower rate as compared to imports, currency will be devalued in comparison to trade partners (Bergen, 2010). According to Edwards (2009) if the terms of trade deteriorate, exchange rates depreciate.

Research Objective

The study sought to establish the effect of selected macro-economic variables on

exchange rates in Kenya

Methodology

This study adopted a quantitative approach which involved collection and analysis of numerical data. The study was modeled on a descriptive design. A descriptive study involves describing a phenomena or characteristics connected with the subject population. It therefore allows for estimation of the proportions of a population that exhibit these characteristics. It is also possible to discover associations among different variables whereby, one can determine whether or not variables are independent (or unrelated) and if they are not, then one can determine the magnitude or strength of the relationship (Cooper & Schindler, 2008). This study focused on aggregate data collected from the Kenya economy between 2006 and 2015. This length of time is desirable as it is long enough to provide sufficient variables needed in confirming how the selected macro-economic variables affect exchange rates in Kenya. This study used secondary data obtained from published bulletin and other publications by CBK and KNBS. Data for trade flows, consumer price index (proxy for inflation) was obtained from KNBS while interest rates and exchange rates were obtained from CBK.

Analytical Model

The effect of selected macro-economic variables on exchange rates in Kenya was modeled using the following equation to obtain the estimates:

$$\mathbf{Y = ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + ε}$$

Where:

- **Y**= Exchange Rate as measured by average monthly exchange rates (KSH/USD)
- $\mathbf{B_0 ... \beta_3}$ =coefficient of the variables
- $\mathbf{X_1}$ = average monthly inflation rates as measured by CPI
- $\mathbf{X_2}$ = average monthly interest rates as measured by bank rates
- $\mathbf{X_3}$ = Level of aggregation of trade flows as measured by balance of payment divided by gross domestic product

- **ε** = Error Term

Results and Discussions

Table 1 below presents the descriptive statistics for all the variables. It shows the numbers of observation for all the variables, their average values and their standard deviation. It also shows the minimum and maximum values.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Exchange Rates	120	61.899	105.275	81.07531	9.902325
Inflation Rates	120	3.18	31.50	10.6818	6.89727
Interest Rate	120	1.60	21.65	8.2562	3.54035
Trade flows	120	-0.81	-0.16	-0.55	0.22
Valid N (listwise)	120				

Table 1 above shows the descriptive statistics for the variables applied in the study. An analysis of all the variables was obtained using SPSS 21 software for the period of ten years (2006 to 2015). The exchange rate had a mean of 81.07 with a standard deviation of 9.90. The interest rate recorded a mean of 8.25 with a standard deviation of 3.54. Inflation rate resulted to a mean of 10.68 with a standard deviation of 6.89. The Level of aggregation of trade flows as measured by balance of payment divided by gross domestic product had a mean of -0.55 and standard deviation of 0.22.

Diagnostic Tests

The statistical methods applied assumed that variables were normally distributed. Multivariate statistics were adopted with the assumption that the combination of variables follows a multivariate normal distribution. Since there was direct test for multivariate normality, the study tested each variable individually and assumed that they are multivariate normal if they are individually normal. Normality test were undertaken and the results were as shown in the table 2 below.

Table 2: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Exchange rates	.094	120	.200*	.973	120	.479
Inflation rates	.089	120	.200*	.963	120	.241
Interest rates	.102	120	.200*	.949	120	.082
Trade flows	.235	120	.000	.874	120	.001

This is a lower bound of the true significance.*
Lilliefors Significance Correction$_a$

From table 2 above, exchange rates were normally distributed. The p value of the Shapiro-Wilk Test was 0.479 which is greater than 0.05. From the normal Q-Q Plot of exchange rates it was noted that exchange rates was normally distributed and close to the expected values. The study also noted that inflation rate was normally distributed. The p value of the Shapiro-Wilk Test was 0.241 which is greater than 0.05. From the normal Q-Q Plot of inflation rate, it was noted that inflation rate was normally distributed and close to the expected values. Inflation rate was normally distributed. The p value of the Shapiro-Wilk Test was .082 which is greater than 0.05. From the normal Q-Q Plot of interest rates it was noted that the interest rate was normally distributed and close to the expected values. The aggregation of trade flows was not normally distributed. The p value of the Shapiro-Wilk test was 0.001 which is less than 0.05. From the normal Q-Q Plot of trade flows, it was noted that the trade flows were not normally distributed and were not close to the expected values.

The assumption of the regression model adopted was that the error term was independent and normally distributed, with a mean zero and a constant variance. To test for the independence of the variables, Durbin-Watson statistical analysis was undertaken. This analysis was used to test for the presence of auto correlation among the residuals. Residual was the difference between the observed value and the predicted value of the

variables. Table 3 below shows the results of Durbin-Watson analysis.

Table: 3 Durbin-Watson test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.863[a]	.745	.739	5.060697	1.718
a. Predictors: (Constant), inflation, interest, trade flows					
b. Dependent Variable: exchange rates					

From table 3 above, the Durbin-Watson value was 1.718 meaning the residuals' values were uncorrelated since it falls within the acceptable range of 1.50 and 2.50. This means the size of the residual for one variable has no impact on the size of the residual for the next variable.

Correlation Analysis

The Correlation Analysis indicated the relationship between the variables in the model. The correlation showed the direction of the relationship between selected macro-economic variables as the independent variables and exchange rates as the dependent variable. The correlation further indicated the strength of the linear relationship between the variables as shown in the table 4 below.

Table 4: Correlations

	Exchange Rates	Inflation Rates	Interest Rate	Trade flows
Exchange Rates	1			
Inflation Rates	-.395**	1		
Interest Rate	.446**	.187*	1	
Trade flows	.829**	.294**	.411**	1

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

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

From the correlation matrix in table 4 above, there was a correlation of all the predictor

variables to the response variable. From the table, the interest rate showed a positive correlation coefficient of 0.446 with exchange rate. The inflation rate and exchange rate had a correlation coefficient of negative 0.395. The Level of aggregation of trade flows had a correlation coefficient of 0.829 to the exchange rate. This is similar to what Razin and Collins (2007) previously posited that lenders will be offered a higher return relative to other countries in an economy with higher interest rates. Therefore, the exchange rate will rise as a result of higher interest rates that attract foreign capital. The effect of higher interest rates can be resolved if inflation in that country's economy is much higher than in other country's economy, or if additional factors do drive the currency down. Youngblood (2004) noted that there exist a positive relationship between the spot rate of exchange and the nominal rate of interest differential at the longest time scales where prices are flexible.

Kempa (2005) notes that net inflows to a country are responsible for the strengthening of the home currency as compared to other currencies. This is due to the fact that supply of foreign currency will be higher than demand. The balance of payments is used to ascertain this fact. A positive balance of payments shows an increase in foreign reserve and thus the home currency will be much stronger. A ratio of comparison of export to import prices, the terms of trade has a relationship with current accounts and the balance of payments. If prices of exports in a country rise greater than imports, the terms of trade are deemed favorable, and hence demand for exports increase this is in turn responsible increasing revenues from which this causes the demand of a country's currency to increase (and its value to increase too). If export prices rise by a smaller margin compared to imports, currency value will decrease.

According to Elbadawi and Sato (2005) exchange rates move relative to the compensation required for relative rates of inflation. For instance, in the case of an already overvalued currency, to offset this position, depreciation must occur to correct the position and vice versa. Exchange rate is a relative price and as a result it weighs all relative factors in relative terms. The reason for this conclusion is that high inflation will reduce a country's competitive edge and will weaken its ability to market its products

internationally. The domestic currency will thus depreciate due to decreased demand for it relative to the increased demand for foreign currency. In general, countries that experience lower rates of inflation will have their currency increase in value due to increased purchasing power as compared to currencies of other countries. In the last period of the twentieth century, countries that experienced low inflation levels included Japan, Germany and Switzerland, while a decrease in the level of inflation in the U.S. and Canada was felt much later. Countries that experience higher inflation levels experience currency devaluation relative to their trading partners and consequently face higher rates of interest.

The results of this correlation analysis are in agreement with MacDonald (2014) who constructed a simplification of the real rate of exchange in the determination of real rates of exchange in the long run. In his model, he selected the determinants to be the differentials of productivity, effects of trade terms, fiscal balances, net assets in foreign countries and real rate of interest differentials. He employed multivariate co integration methods and used the model for determining the effective real rate of exchange rates from 2004 to 2007. The result outcome showed that the fundamental determinants impacted the real rates of exchange. All the variables showed a positive correlation to the real rate of exchange. This meant that any increases in the variables caused the real rate of exchange to appreciate.

The results of correlation analysis also concur with Jattani (2013) who studied the correlation between a selected sample of macroeconomic variables and exchange rates in Kenya. The Macro economic variables considered were interest rates, inflation rates, balance of payment and political factor. Linear regression was used and the findings were that exchange rates in Kenya had a significant positive correlation with interest rates and balance of payments. The correlation between exchange rates and inflation rates was found to be negative.

From the Table 5 below, using the Adjusted R Square, it can be noted that 73.9% of the variability in exchange rates can be explained by variability in interest rates, inflation

rates and trade flows. It also follows that 26.1% of the changes in exchange rates in Kenya cannot be explained by the changes in the model variables hence the error term.

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.863[a]	.745	.739	5.060697

Table 6 below, indicates a good result for a multiple linear relationship between the selected macro-economic variables and the exchange rates. It was noted that selected macro-economic variables influence exchange rates significantly. The analysis indicated an F statistics of 113.206 with a P value of 0.000 which is less than 0.05. This confirmed that the model's goodness is fit to explain the variations as well as validate the independent variables effect on the dependent variable. It can be concluded that all variables; interest rates, inflation rates and trade flows have a significant combined effect on exchange rates and therefore these independent variables can be used to predict exchange rates in Kenya.

Table 6: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	8697.834	3	2899.278	113.206	.000[b]
	Residual	2970.836	116	25.611		
	Total	11668.670	119			

The coefficients explained the relationships between variables as shown in the Table 7 below. The coefficients looked at the change in the dependent (exchange rate) variable, when independent variables (interest rate, inflation rate and trade flows) increase by one unit.

Table 7: Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.

1	(Constant)	62.916	1.709		36.813	.000
	Inflation Rate	-.342	.075	-.239	-4.553	.000
	Interest Rate	.602	.154	.215	3.920	.000
	Trade flows	30.372	2.559	.670	11.870	.000

a. Dependent Variable: Exchange Rate

The relationship between the dependent and independent variables was therefore summarized with a linear equation as follows:

$$\mathbf{Y = 62.916 - 0.342X_1 + 0.602X_2 + 30.372X_3 + \acute{\varepsilon}}$$

From the regression equation above, it was determined that having the interest rate, inflation rate and trade flows as a constant zero, the KSH/USD exchange rate would stand at 62.916. It is widely referred that rates of exchange tend to move in the direction required to cover for relative inflation rates (Elbadawi & Sato, 2005). For example, if a currency is already overvalued, meaning it is stronger compared to the relative inflation rates, then a depreciation or loss of value enough to correct that position can be expected and vice versa. Consistent with these earlier studies, the coefficient of monthly inflation rates for this study was -0.342 which was significant; the findings show that exchange rates in Kenya were significantly and directly sensitive to the rates of inflation. Higher rates of inflation resulted into greater the changes in the rates of exchange.

Interest rates among major currencies have been an important factor for exchange rate movements in recent years. The coefficient of monthly interest rate was 0.602 which was significant, indicating existence of a positive and significant relationship between changes in rates of exchange and monthly interest rates. This is similar to what Razin and Collins (2007) previously posited that lenders will be offered a higher return relative to other countries in an economy with higher interest rates. Therefore, the exchange rate will rise as a result of higher interest rates that attract foreign capital. The effect of higher interest rates can be resolved if inflation in that country's economy is much higher than in other country's economy, or if additional factors do drive the currency down.

Youngblood (2004) noted that there exist a positive relationship between the spot rate of exchange and the nominal rate of interest differential at the longest time scales where prices are flexible.

The coefficient of level of aggregation of trade flows as measured by balance of payment divided by gross domestic product was 30.372 and was significant. This indicated that there was a significant relationship between changes in exchange rates and level of aggregation of trade flows as measured by balance of payment divided by gross domestic product. This concurs with Kempa (2005) who observed that the home currency can be strengthened by a net inflow of foreign currency vis-à-vis other currencies because of the excess demand over the supply of the foreign currency. A deficit in the current account which means a negative balance of payment indicates that the country is importing or has high expenditure on foreign trade than it is exporting or receiving revenues from abroad. This therefore shows that the country is more in need of foreign currency than what it receives from its exports. As a result of the excess demand for the foreign currency, the country's exchange rate will reduce (Taylor, 2001).This implies that a negative balance of payment depreciates the local currency.

Conclusions

From the study findings, the study concludes that exchange rates in Kenya are significantly affected by monthly inflation rates, monthly interest rates and trade flows. The study found that interest rate had a positive effect on exchange rate. The study therefore concludes that higher interest rate in Kenya in relation to the trading partners lead to appreciation of the domestic currency. The study found that inflation rate had a negative effect on exchange rate and therefore it is concluded that higher levels of inflation result in depreciation of the domestic currency. The study found that trade flows had a positive effect on exchange rate and therefore it can be concluded that an increase in aggregation of trade flows leads to appreciation of the domestic currency.

This study concludes that independent variables selected for this study inflation rate, interest rates and aggregation of trade flows influence to a large extent exchange rate in

Kenya. It is therefore sufficient to conclude that these variables significantly influence the value of the Kenyan currency. The fact that the three independent variables explain 74.5% of changes in exchange rates implies that the variables not included in the model only explain 25.5% of changes in exchange rates.

This finding concurs with Kempa (2005) who observed that the home currency can be strengthened by a net inflow of foreign currency vis-à-vis other currencies because of the excess demand over the supply of the foreign currency. The findings of this study are also similar to what Razin and Collins (2007) previously posited that lenders will be offered a higher return relative to other countries in an economy with higher interest rates. Therefore, the exchange rate will rise as a result of higher interest rates that attract foreign capital. The findings of Elbadawi and Sato (2005) that exchange rates tends to move in the direction required to cover for relative inflation rates are also confirmed by this study.

Recommendations

The Kenyan shilling has been depreciating in value over the years implying a weakening of its purchasing power in the international markets. This study therefore recommends that the policy makers should come up with policies that will contribute to lowering the exchange rates in Kenya and contribute to reversing this trend. The study recommends that policy makers should enact policies that will lower inflation rates in Kenya as found out in the study that inflation rates are high and that they contribute towards increasing the exchange rates in Kenya.

The study also recommends that central bank of Kenya should set the treasury bill rate that can help attract foreign investment in the country as it was found that high interest rate leads to an appreciation of the local currency. The study further recommends that the government should enact policies that encourage production of goods and services with the aim of increasing the exports and decreasing the imports which in turn improves the balance of payment and the terms of trade which further strengthens the Kenyan currency against foreign currency.

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African development finance journal http://journals.uonbi.ac.ke/index.php/adfj
November Vol1 No.2, 2017 PP 162-177 ISSN 2522-3186