



Exchange Rate Volatility and Its Effect on Trade Export Performance in Kenya

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Abstract

The relationship between exchange rate volatility and economic growth has received relatively little attention from both theoretical and empirical perspectives. This is because, the exchange rate is considered as nominal variable and not related to the long-term real growth performance. Kenya has faced massive blows like the terms of trade becoming worse mainly due to fluctuation in internal product prices, oil prices and fluctuation in a flow of capital which have led to challenges in microeconomic management policy. Empirical evidence offers mixed findings regarding the impact of exchange rate volatility on growth. It argued that pegged regimes increases investment and volatility of growth and employment but reduces productivity growth and inflation. Depreciation of Kenya's currency implies that the incomes of their trading partners increase and will tend to import few goods, and this places Kenya's exports at disadvantaged position in international markets. Further, exchange rate volatility in developing countries is characterized by changes in, changes in global demand for goods policies and changes prices of goods. This article investigated the exchange rate fluctuation in Kenya. investigation found that Kenya's exchange rate has been volatile with major structural breaks in 1994 and 2012. Devaluation of Kenya's currency implies that the incomes of their trading partners increase and will tend to import few goods, and this places Kenya's exports at disadvantaged position in international markets. Further, exchange rate volatility in developing countries is characterized by changes in, changes in global demand for goods policies and changes prices of goods.

Keywords: Exchange rate, Volatility, ARCH, GARCH models

1. Introduction

The country's level of international trade is an important ingredient of economic growth. Exchange rates determine a country's level of international trade. With increasing globalization, all open economies have become critically dependent. The implementation of financial liberalization has exposed free market economies to international fluctuations which are transmitted across countries. For this purpose, it is therefore critically important to monitor movements in the exchange rate. This is performed in all open economies worldwide. The exchange rate volatility in Kenya has depicted wide fluctuations (Stiglitz & Charlton, 2005).

This is very detrimental to the economic stability of the country and costly to the monetary authority. The exchange rate also affects capital flows between economies. Concerns over exchange rate volatility began in the year 1970s in most countries of the world and attracted a lot of interest due to its effect on the international flow of capital, goods and also services, that is commodities in general (Aghion et al., 2009). Even if the firms can protect themselves against short-term foreign exchange risk through hedging, they are exposed to medium and long-term exchange rate volatility (Brookes et al., 2000). Such exposure to foreign exchange risk could affect the investment decision of the firm and therefore distorts the optimal allocation of resources. Knowing the forecast through estimating the movements in exchange rate volatility will have a significant implication on problems underlying exchange rate (Love & Payne, 2008).

The exchange rate is just one of the issues of monetary policy carried out by the Central Bank of Kenya, which is very vital in the financial management of public funds by the Government of Kenya. The exchange rate also plays a key role in macroeconomic stability through stabilization and the adjustment policies as a control measure of inflation encourages free trade to increase commodities business through imports and exports in Kenya. The Kenya government legislated the floating exchange rate regime in the year 1990s, which was expected to lead the country to benefit from the introduction of this regime. These were as follows, the adjustment of the exchange rates which shifted the demand for foreign exchange and also the supply of foreign exchange.

There were three regimes according to IMF (2008) International Financial statistics. These are: fixed exchange rate, managed float and free float. The exchange rate volatility occurred across the three regimes in Kenya, Crawling peg 1973-1982, managed float of 1982-1990 and the free float of 1993-2005. Regarding

this episode in the Kenya economy referring to IMF statistics, it showed that free float regime as highly volatile immediately after absorption, but volatility declines with time. The managed float is relatively less volatile compared to the free float regime and fixed exchange rate is less volatile of all the three regimes of the exchange rate. As part of the effort to bring the economy, which was in recession under control, some economic adjustments were initiated (Husain et al., 2005). These include relaxation of controls of foreign exchange transactions and switching to floating exchange rate as liberalization (Sokolov et al., 2011).

Kenya has faced massive blows like the terms of trade becoming worse mainly due to fluctuation in internal product prices, oil prices and fluctuation in a flow of capital which have led to challenges in microeconomic management policy. According to the conclusions made by Otieno and Mudaki, (2011) in this study, movements in the exchange rate account for the results attained as export earnings of the country in question. In the recent past, exchange rate volatility has been on the rise, and the volatility poses a challenge for macro economists.

Kenya having concentrated on the agricultural exports has made itself vulnerable to external shocks which expose the economy to fluctuations in the prices of global commodities. To curb the external shocks, the country requires appropriate policies both fiscal and monetary, it also requires implementation of an exchange rate system that is flexible to curb surfacing deficits in current account that cannot be sustained debt that is ever growing, current account deficits that cannot be sustained, increasing burden of foreign debt and constant losses of competitive advantage internationally (Otieno & Mudaki, 2011). The appreciation of exchange rates has got policy makers and exporters often busy. There is need for a shift in the focus from these movements in exchange rates to measures that shield exporters against risks occasioned by these movements. For example, policy makers should focus towards developing futures and forward markets. As a short-term measure on the other hand appropriate monetary and fiscal policies geared towards smoothening short-term capital inflows should be able to reduce the effects of the movements of the local currency (Fritz & Prates, 2014).

According to (Monitor & Outlook, 2004), fluctuations in exchange have adverse consequences on trade internationally. This can either be through adjustment costs and uncertainty. In the case where movements in exchange rates are not fully expected, the agents who shy away from risk may cut down their business dealings if the currency value fluctuations increase. Those who support fixed exchange rates often use the

belief of the existence of an undesirable affiliation between the rate of exchange movements and export trade. In the instituting of the European Monetary Union, the argument put forth that there is a negative association between exchange rates vis- a- vis international trade is reflected as part of the main reason of existence of the European Monetary Union (Dell'Araccia, 1999).

The exchange rate is a relative price. It is the channel through which international prices pass through to domestic prices. It may be described as the nation-wide relative price. In an economy like Kenya with a policy of floating exchange rate and a capital account of balance of payment (BOP) that is liberal, the exchange rate and reserves generated from foreign trade are ancillary tools of fiscal strategy. Given such a policy framework, the central bank is concerned about exchange rate volatility. This concern exudes from the fact that the nominal exchange rate moves sharply in the short-term and can impact inflation via the import prices pass-through effects (CBK, 2015). Different researchers have come up with varying conclusions regarding effects of exchange rate movements on export performance for instance, Thursby and Thursby (1987) concluded that exchange rate have negative effects on exports, while Lothian and Taylor (1997) noted they have positive impacts. In their later studies established that there could exist both negative and positive impacts. In a survey conducted by McKenzie (1999), it is concluded that exchange rate movements might behave differently in different markets directs that more tests need to be done using data that is particular to the market under study.

2. Empirical Literature Review

Musyoki et al., (2012) examined the influence of real exchange rate volatility on the growth of economy in Kenya. The study used the time series monthly data that were collected from the year 1993 to 2009. The source of the data was Kenya National Bureau of Statistics (KNBS), Central Bank of Kenya (CBK) and the database of the International Monetary Fund. The study used the generalized autoregressive conditional heteroscedasticity to measure volatility. The study results showed that real exchange rate was highly volatile during the entire study period. The coefficient for exchange rate was negative and statistically significant. This implied that the highly volatile real exchange rate caused a great decline of Kenya's economic growth.

Otieno and Mudaki, (2011) in their study stated that the effects of actual exchange rate remain more probable to be long-term as opposed to short-term. The findings indicated that the exchange rate

fluctuations have moved only in acceptable margins and have not affected growth in exports and therefore the earnings generated from that place. Questions have however been raised regarding the determinants of a country's exports owing to the positive relationship deduced between the performance of the country's exports and the depreciation of Kenya's shilling.

Serenis, et al., (2011) investigated the impact of volatility of exchange rate on exports for eleven European Union (EU) member countries for sectoral exports for four sectors during the period of 1973-2004 using panel data obtained from Eurostat and international financial statistics (IFS). Standard deviation of the moving average of the logarithm of real exchange rate as a measure of exchange rate volatility was utilized. The study concluded that there is mixed relationship between exchange rate volatility and trade exports in EU sectoral exports performance. It recommended that policies should be geared towards a specific sector of a country for which there is a negative effect from volatility to exports at a specific sector and products. From the findings it is shown that the findings were sector specific, and it failed to find out the effect of exchange rate volatility on the overall trade exports performance.

In Ghana, Bhattara and Armah, (2005) in their study, examined the impact of exchange rate fluctuations on exports in South African they concluded there is a steady long-run relationship between exports, imports, and the exchange rate. They found out also that when the domestic currency weakens, that is devaluation; there is an impact on both imports and exports that is contractionary. Khosa, et al., (2015) investigated the effect of real exchange rate volatility and its effect on trade flows for nine emerging countries using panel data approach for the period 1995 – 2010 using GARCH model and standard deviation as a measure of volatility has influence on the relationship between exchange rate volatility and trade exports performance. It established robust proof that actual exchange rate movements have an undesirable influence on South Africa exports. The findings outcomes suggest a supplementary proof of the harmful impact of real exchange rate variability on trade flows. One inference of the discoveries originates from the substantial affirmative effects of the exchange rate on exports. This outcome adds to the view that devaluation of the Rand will kindle exports and thus economic development. Therefore, there is a chance for improvement to the attractiveness of South African goods abroad. It's important to note however that the exchange rate needs to be prudently managed to safeguard a stable non-volatile performance that could impede export growth.

The influence of actual exchange rate variability on Kenya's horticultural exports, coffee and tea looked at in an export demand context was investigated by Kiptui (2008) who postulated that in the long run there is a relationship between exports, external economic activity, comparative prices, and exchange rate variability. Cointegration techniques together with error rectification formulation were applied to Kenya's monthly data over the period 1997 to 2007 that was obtained from IFS and IMF. Moving average standard deviation (MASD) as a measure of the exchange rate volatility. The shortcoming of this study is that it focused only two sub sectors of the economy and it failed to capture overall effect of exchange rate volatility on trade exports performance.

Wanjohi, M. M. (2016) investigated the degree to which volatile exchange rate affects the performance of tea exports. The specific objectives of the study were to determine the influence of exchange rate volatility on tea exports, the contribution of tea exports earning and make informed policy recommendations originating from empirical results for improving tea exports in Kenya. To meet the stated objectives, the study used time series data that were collected since the year 1970 to 2008. These data were obtained from the central bank of Kenya, Tea board of Kenya, Kenya National Bureau of Statistics, and the international monetary fund. The study utilized the Johansen and Julius Multivariate cointegration method to identify the short run and long run behavior of the variables in the study. Cointegration and error correction model method was engaged during data analysis. The findings of the study showed that exchange rate volatility causes a negative effect on trade exports performance of tea exports in the country. Finally, the study recommended that regular monitoring of the exchange rate to reduce its negative impact and drawing of fiscal and monetary policy that will ensure that exchange rate is controllable.

(Mustafa et al., 2004) investigated empirically the effect of volatile exchange rate on exports growth amongst Pakistan and her major partners. The data used in the study was quarterly time series data collected since 1991 to 2004. The countries that were selected to determine the bilateral relationship between Pakistan and the rest of the countries which are under various economic blocks to establish the empirical relationship between the growth of export and exchange rate volatility. From the analysis, the study found out that volatile exchange rate significantly and negatively affect trade between Pakistan with her trading partners in both the short-run and long-run respectively. The connection between the growth of exports and exchange rate volatility for India and Pakistan is only observed in the long-run perspective.

Nevertheless, countries like New Zealand and Malaysia, the study found out that there is no empirical link between exports and exchange rate volatility.

Taslim & Haque (2011) reconnoitered the effects of rate of volatility on the capacity of exports from Bangladesh to United States. This study used the monthly cross-sectional data from the year 1991 to 2012. The study engaged comprehensive variety of econometric techniques during the analysis including stochastic frontier gravity model approach. The study revealed an unwavering and substantial correlation in the long run between the study variables. The cointegration modus operandi results confirmed that in the long run, one percent rise in the rate of exchange leading to an increase of about two percent in volume of exports. The estimated error correction coefficient indicated that 36 percent deviation of export data was improved in the short run. Impulse reaction purpose of the study correspondingly asserts the positive association among the variables. In conclusion, causality examination put forward the presence of a unidirectional causation running from the rate of exchange to export volume.

Arize et al., (2000) used a Johansen's multivariate method for long-run and error correction model to scrutinize the short-run changes to inspect actual rate of currency fluctuation on the exports of thirteen less technologically advanced economies using quarterly time series data from the year 1973 to 1996. The study outcomes publicized a negative but significant influence of instability on trade movements. While examining the impact of exchange rate volatility for East Asian countries, McKinnon & Schnabl (2004); McKinnon & Ohno (1997); and Mckinnon (1963), argued that before the Asian crisis of 1997/98 the exchange rate stability contributed significantly to low inflation, sound fiscal position, high investment and boosted long-term growth.

Investigation of the impact of exchange rate volatility on economic growth on small open economies at the European Monetary Unity (EMU) periphery was conducted by Schnabl (2008). The study estimated a panel data of 41 countries in the EMU periphery from 1994 to 2005. Volatility was captured as a yearly average of monthly percentage exchange rate. The study applied both GLS and GMM and the results provided evidence that exchange rate volatility has a negative impact on economic growth. The study concludes that a stable exchange rate creates a stable milieu for the adjustment of asset and labor market, hence fostering growth.

Senadza et al., (2017) studied the effect of exchange rate volatility on trade in countries of Sub-Saharan Africa. Unpredictability of exchange rate countries began to focus settling this issue. The study used the pooled estimation mean-group of dynamic heterogeneous panel method. The study utilized the data from 1993-2014. The study findings revealed that there is no significant influence of volatile rate of currency conversion on imports. For the case of exports, the study discovered that exchange rate volatility negatively influences trade exports performance in the short run.

Anderson (2017) analyzed the empirical affiliation amid monthly prices of spot copper and monthly Zambian currency against the US dollar spot conversion rate. The study used the time series data for a period spanning for ten years from 2005 - 2015. Autoregressive determinant lag method was utilized in the study. The short run results discovered negative and positive coefficient link of copper prices on the exchange rate respectively in the short run. Despite all these, the general influence of values of copper on the rate of currency conversion was not statistically in the short run. The study revealed that the GDP of Zambia has a negative influence on exchange rate in the short run and a significant positive influence in the long run.

Musonda (2008) studied the influence of exchange rate volatility and non-traditional export performance in Zambia using the data for the period from 1965 - 1999. The study used the error correction method to estimate the impact of real volatile exchange rate on the performance of exports for Zambia. The study used the general autoregressive conditional heteroscedasticity model (GARCH) to measure volatility. The results revealed that volatile exchange rate decreases exports in short run and long run respectively. The study therefore recommended that supportive macroeconomic policies should be formulated in order to promote exports.

Mwangi et al., (2014) studied the effects of exchange rate volatility on exports of trade exports of French beans in Kenya to the European partners. The study used the monthly time series from 1990 - 2011 and employed the generalized autoregressive conditional heteroscedasticity method to measure volatility. The study outcomes discovered a significant negative influence of exchange of exchange rate volatility on exportation of French beans in both the short and the long run. Therefore, the study findings imply that for a unit increase in volatile exchange rate leads to a decrease in the exportation of French beans from Kenya.

Similarly, this study was sector specific and failed to show the overall effect exchange rate of trade exports performance in Kenya.

Mensah (2019) conducted a study on the influence of exchange rate volatility on agricultural trade exports performance in Ghana. Agricultural sector in Ghana is the backbone of the economy and its currency had been fluctuating. The data for the study was gathered from 1980 - 2016. The study used the autoregressive distributed lag in the analysis and the GARCH model to measure fluctuations or unpredictability of exchange rate. From the analysis, the study found that exchange rate volatility had a negative coefficient meaning that exports in Ghana was distracted by the oscillating Cedi (Ghanaian currency). The study recommended that farmers in Ghana should form cooperative societies in order to have a higher bargaining power and also obtain loans with an ease.

Bahmani-Oskooe et al., (2018) carried out a study on exchange rate volatility and international trade performance in the 12 African countries used a panel or longitudinal data spanning from 1984 - 2014. The Hausman regression results indicated that fixed effect model is appropriate for analysis. In order to differentiate the influence of the real volatile exchange rate on their exportations and what is imported, in short run and long run respectively. The study used the bound testing technique and showed that oscillating exchange rate affect the trade movements for five countries and affect imports of one country alone.

(Hall et al., 2010) conducted a study of exchanges volatility and the performance of the exports between emerging market economies together with other developing nations. The study used the panel data sets that were gathered quarterly from the first quarter of 1980 to the fourth quarter of 2006. The study used two estimation techniques – the generalized method of moments and time-varying-coefficient methods. The time varying technique was used purposely to remove biases of coefficients, showing the basic stable parameter of concern. The study found that volatile exchange rate positively affects exports of the countries under investigation.

Aftab et al., (2012) investigated the influence of volatile exchange rate at sectoral level on the exports trade of Pakistan. All other sectors that are part and parcel of exports trade were also included in the study. The study used the quarterly time series data that was collected from 2003-2016. The study employed bounds testing to determine the connection between sectoral exports and volatility of exchange rate. Conventional

unit root test for checking stationarity of Augmented Dickey Fuller and Philip Perron were used in the study. In order to measure exchange rate volatility, the study used the GARCH model which was proposed by Bollerslev. The study findings showed that volatile exchange rate affects the exports negatively, but it affects the foreign income positively. For all sectors included in the study, the bounds testing model found out the presence of a long run relationship.

(Arize, et al., 2008) examined real exchange rate volatility on the exports of thirteen less developed countries with quarterly data series for the period 1973 - 1996 using Johansen's multivariate method for long-run and error correlation model to investigate short-run dynamics and found that increased exchange rate volatility induces exporters to increase their exports thus increasing their revenues. The study noted that exports activities respond faster to activities in the foreign market than to relative prices. In the study, it is further noted that exchange rate volatility has the effect on trade depending on the period and may have the greater effect on resource allocation in the market as traders try to minimize the effect of the risks associated with an exchange rate.

Epaphra (2016) examined the factors affecting export performance in Tanzania during the 1966-2015 period by employing Johansen cointegration and Granger causality approach. The Error Correction Modeling was employed to estimate the model. Based on the findings of cointegration approach the study revealed that there is a stable long-run relationship between the series. The study results suggested that economic real per capita GDP, trade liberalization, and exchange rate have a positive impact on export performance in Tanzania. The results also revealed that exports and official development assistance are negatively associated in the economy of Tanzania. Furthermore, the study established the direction of causality between exports and economic growth. The results on this causal relationship suggested that real per capita GDP causes exports and not otherwise.

3. Research Methodology

To investigate the impact of real exchange rate volatility on trade export performance, the model developed by Savvides (1992) was adopted. This model was utilized by Musonda (2008) to investigate how exchange rate volatility impacts non-traditional exports in Zambia. This model is based on a two-country foreign trade hypothesis, where a country's supply of exports was determined by both demand and supply factors. Demand for exports in this model is explained by foreign income and foreign prices. Therefore,

$$(DEx)_t = g_1\{(fy)_t, (fpx)_t\} \dots\dots\dots 1$$

Where: DEX is the demand for exports, fy is foreign income, fpx represents relative prices for exports, and t, represents time.

According to this model, export supply is determined by relative domestic prices, and volatility in the exchange rate as shown:

$$(SEx)_t = f_2(rdp_x)_t, (exvol)_t \dots\dots\dots 2$$

Where: SE_x, is the export supply, rdp_x is the domestic prices for exports, and exvol represents exchange rate volatility. The relative price for exports abroad is given as:

$$px_t = \frac{fpx_t}{rer_t} \dots\dots\dots 3$$

3.1. Clemente-Montañés-Reyes Unit Root Test with Two Structural Breaks

Stationary is an important property for time series data. This article employed the Clemente-Montañés-Reyes (1998) unit root test which incorporates for than one structural break unlike the Zivot Andrews test which only considers one major structural break.

3.2. Measurement of Volatility by Moving Average

Sometimes time series data may fluctuate, and it is therefore necessary to remove the short run volatilities as suggested by Denny (2018). The main goal of removing the short run volatilities and trends is to transform the data into mean-zero covariance stationary processes stochastic process. There are various methods that are used to construct exchange rate volatility and it includes simple historical measures of exchange rate volatility ARCH and GARCH models the exchange rate volatility is constructed as the moving simple standard deviation of the growth rate of the real exchange which can be derived as.

$$EXRV_t = \frac{1}{2} \left[\frac{1}{M} \sum (\ln ER_{t+i-1} + \ln ER_{t+i-2})^4 \right] \dots\dots\dots 4$$

M = is the order of moving average, which is four in this research study, typically because it is one-period ahead and has a window of one or four years therefore is often referred to as short term exchange rate volatility, EXRV_t is the exchange rate volatility at the current year and ER is exchange rate. A look back period long enough to signal a potential reversal in exchange rate volatility in Kenya.

However, some studies have extended the time horizon from shorter to longer period to construct long term measures of exchange rate volatility this is because international transactions are long term in nature and firms are uncertain about magnitude and time of their foreign transactions. Therefore, this formula is constructed to take care for the long-term nature of these transactions.

$$V_t = \frac{\max R_{t-k}^t - \min R_{t-k}^t}{\min R_{t-k}^t} + \left[1 + \frac{|R_t - R_t^p|}{R_t^p} \right]^2 \dots\dots\dots 5$$

Where R_t is real exchange rate, $\max R_{t-k}^t$ and $\min R_{t-k}^t$ are the maximum and the minimum values of exchange rates over a given time interval of k to t and R_t^p is the equilibrium exchange rate.

3.3. Measurement of Volatility Using GARCH Model

Conditional variance depends not only on lagged disturbances, but also on its own lagged values. Our point of departure is the following GARCH (p, q) model to obtain the exchange rate volatility. The condition for using this model is to estimate the presence of ARCH impact on exchange rates volatility. In this case, first-order autoregressive (AR) processes of order one (1) was applied. GARCH model was applied as it identifies and tracks volatility clusters that are reaching higher peaks or lower peaks by modelling volatility clusters (Kumar, & Patil, 2016). The estimate time series data from GARCH model will give good prediction of effective exchange rate volatility under study.

As suggested by (Liu & Morley, 2009) autoregressive models can also be used to model volatilities. It as stochastic process that makes assumption that the past values of a variables have effect on the current values which is similar to moving averages (MA) but the only difference is that the moving averages will take into account the last shock while autoregressive (AR) will take into the effect of the previous shocks (Liu & Morley, 2009). The GARCH models are more robust and its instinctive suits estimation volatility and forecasting than the historical volatility models (Costa, 2017). ARCH (m) models the variance of regression model as a function of lagged values of the squared regression of disturbances and yields conditional mean and conditional variance.

$$y_t = X_t \beta + \epsilon_t \dots\dots\dots 6$$

(Conditional mean).

$$\sigma_t^2 = \gamma_0 + \gamma_1 \epsilon_{t-1}^2 + \gamma_2 \epsilon_{t-2}^2 + \dots + \gamma_n \epsilon_{t-m}^2 \dots\dots\dots 7$$

(Conditional variance). ϵ_t^2 are the squared residuals and γ_t are the ARCH parameters.

4. Results and Interpretations

From figure 1, It is observed that from the graph that exchange rate volatility exhibited two significant structural breaks in 1994 and 2002. The 1994 structural break roughly coincides with soaring rates of inflation emanating from influx of money supply shocks from 1992 general election that saw a lot of money being pumped into the economy and inflation rate soared to around 50 percent. The 2002 structural change is closely associated with impending of election of 2013 and change of regime and the bedevilling macro-economic challenges that rocked the country at the end of 2011 that resulted in depreciation of Kenyan Shilling and exchanged with US dollar at Kshs 107 (per US \$) and the Central Bank of Kenya sharply increased interest rates

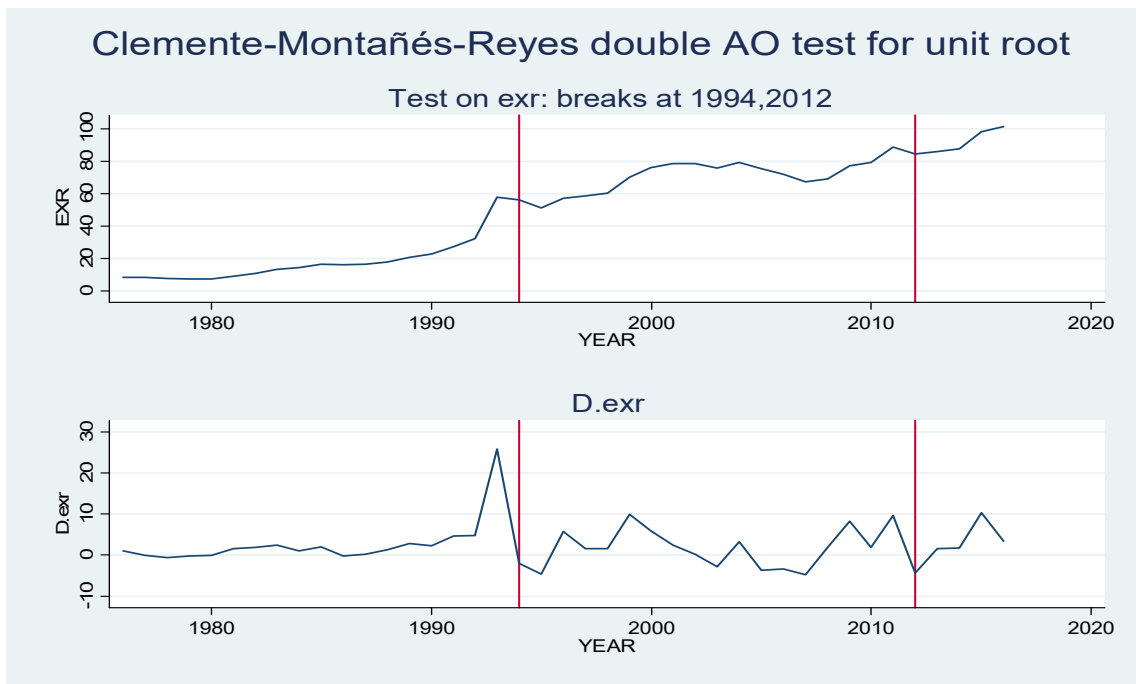


Figure 1. Structural breaks for exchange rate volatility in Kenya

Source: Research Analysis, 2022

4.1. Modelling Exchange Rate Volatility

Financial time-series such as exchange rates may show volatility which varies over time. In some instances, exchanges rates volatilities may be caused by changes in country foreign policies. These changes suggest that variance is heteroscedastic and therefore the (G) ARCH have developed to gather for these empirical irregularities in time series (Shifera, 2019).

Table 1. Lagrange multiplier test for autoregressive conditional heteroscedasticity

Lag (p)	χ^2	Df	$prob > \chi^2$
3	26.018	3	0.0000

Note: H₀: No ARCH effects vs: H₁: ARCH (p) disturbance and Df is degrees of freedom

Source: Research Analysis, 2022

From the output in table 1 it is indicated that the p- value is less than 0.05 and therefore the null hypothesis of no ARCH effects was rejected, and alternative hypothesis of ARCH effects was adopted; that the variance is autoregressive conditionally heteroscedastic and thus ARCH (1) was modelled by specifying ARCH (1) as proposed by Bollerslev (1986).

The objective of the study was to investigate the effect of exchange rate volatility on trade exports performance in Kenya. This objective was accomplished by estimating the ARCH model using conditional variance and exchange rate of the first order ARCH models. ARCH model is commonly applied in modelling time series analysis that shows time varying volatility and volatility clustering those are the periods that are found to have swings interspersed with periods of relative calm (Al-Mahmood & Markovskaya, 2019). Exchange rate volatility was calculated based on the moving average of the standard deviation of exchange rate as applied by Kasman and Kasman (2005).

From the output in table 2, list of iterations is observed, and it indicates the non-linear optimization of log likelihood function. The log likelihood gets smaller as the iteration proceeds. The findings of the ARCH/GARCH model are shown in the table 2. The estimated the ARCH (1) parameter is -1.21282 and the GARCH (1) parameter is -0.1178. The results from the ARCH output, ARCH term t-ratio are statistically significant and is approximately -1.184425 (p-value 0.0240 < 0.05) and this indicates that the variance is autoregressive conditionally heteroscedastic therefore ARCH was further estimated.

Table 2. ARCH family regression

Sample: 1974 – 2018		Number of obs = 45		
Distribution: Gaussian		Wald Chi2 (.) = 73.25		
Log likelihood = -203.142		Prob > chi2 =0.000		
ERV	Coefficient	Std. err	Z	P> z
ERV	76.0518	1.6455	46.2200	0.0000
ARCH	-1.2128	0.8615	-1.4100	0.1590
GARCH	-0.1178	0.1289	-0.9100	0.3610
_cons	16.4164	15.9119	1.0300	0.3020

Source: Research Analysis, 2022

The estimated ARCH (1) and GARCH (1) parameters are -1.2128 and -0.1178 respectively and the fitted GARCH (1,1) model is.

$$y_t = 76.0518 + \epsilon_t$$

$$\sigma^2 = -1.2128 + \epsilon_t^2 - 0.1178 \sigma_{t-m}^2$$

5. Conclusion and Recommendation

The significant relationship between exchange rate volatility and exports is explained by risk averse nature of exporters as high exchange rate tend to depress exports and thus, this thus reduces the gains made from international trade occasioned by depreciation in domestic currency. Depreciation of Kenya’s currency implies that the incomes of their trading partners increase and will tend to import few goods, and this places Kenya’s exports at disadvantaged position in international markets. Further, exchange rate volatility in developing countries is characterized by changes in, changes in global demand for goods policies and changes prices of goods. It is evident that exchange rate volatility in Kenya was less volatile at the initial periods, however at 20 observations (1994) it is characterized by random and rapid changes that seems to vary over time but after 1994 the volatility is relatively sedate. It recommended that the government should reconsider exchange rate policies that curbs high exchange rate fluctuation in Kenya such policies include allowing the market to determine the value of exchange rate and have the Central Bank intervene when exchange rate is too high. By adopting and implementing these solutions, they will overcome fluctuating exchange rate that affects exports growth bottlenecks. The government should also develop policies to

achieve a stable exchange rate and maintain the stability of exchange rate and thus promoting overall export performance and the economic growth in the country. Equally, firms participating in international export trade need to adopt strategies such as long-term vision for risk analysis and future forecasting and adopt the use of risk hedging tools such as futures and options.

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