



EFFECT OF DETERMINANTS OF EXCHANGE RATE VOLATILITY ON PERFORMANCE OF HORTICULTURAL EXPORTS IN KENYA

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Abstract: *Just like many east African countries, Kenya has been active in promoting local industries that play major roles in exportation. However, despite the various legislations in the attempt to have various measures to enhance the implementation of international trade, steady foreign exchange rate unpredictability combined with cost changes have undermined these endeavors. This study therefore sought to investigate on the effect of exchange rate volatility on the performance of horticultural exports in Kenya. Specifically, the study sought to establish the effect of interest rates, inflation rates and public debt on the performance of horticultural exports in Kenya. This research study was quantitative and a descriptive research design was used. The population under study was all the 58 licensed horticultural produce exporters (Licensed by HCDA) in Kenya. Monthly export earnings for all the licensed horticultural produce exporters as provided by HCDA were analysed. This was a census study and hence no need of sampling. This study used secondary data, which was gathered from HCDA, KNBS, and CBK for the period of ten years (11 years) (2004 - 2014). Horticultural export earnings statistics data will be obtained from HCDA. Data on foreign exchange rate fluctuations was obtained from CBK while data on inflation was obtained from KNBS. This study generated quantitative data which was analysed by use of descriptive and inferential statistics. Descriptive statistics included mean and standard deviation. On the other hand, inferential statistics included multiple regression analysis. All statistical analysis was conducted with the help of Statistical Package for Social Sciences (SPSS version 21). The study found that there is a negative association between foreign exchange rate and the performance of horticultural exports in Kenya. In addition, the study established that inflation rates inversely and significantly influence the performance of horticultural exports in Kenya ($\beta=-0.178$, $p\text{-value}=0.021$). Further, the study established that interest rate inversely and significantly influences the performance of horticultural exports in Kenya ($\beta=-0.167$, $p\text{-value}=0.042$). In addition, the study established that inflation rates, interest rate and public debt inversely and significantly influence the performance of horticultural exports in Kenya ($\beta=-0.312$, $p\text{-value}=0.000$). The study recommends that inflation rate should be contained through sound policy measures as higher inflation rates may hurt the general export performance in Kenya. The study also recommends that the Central Bank of Kenya should set base lending rates that can help the banks profitable while at the same time not punitive to the borrowers.*

Key Words: Interest Rates, Inflation Rates, Public Debt, Horticultural Exports

Introduction

The Kenyan horticulture story began more than 60 years ago. During World War II the colonial administration launched an experiment with irrigated smallholder vegetable production to provide dehydrated vegetables for the Kenyan army and Allied troops. Shortly thereafter a canned pineapple export project was begun, first relying on European settler farmers but eventually including many African smallholders (Ksoll, Macchiavello & Morjaria, 2009). Some fresh vegetables were also exported to Djibouti, Somalia, Yemen, and

the United Kingdom. A few carnations and orchids were exported before independence, in 1963.

The 10-year period following independence witnessed a gradual expansion in all three segments of the industry. A British company initiated a new vegetable dehydration project for export, modelled largely on its wartime precursor (Muthoka & Ogutu, 2014). The pineapple cannery brought in Del Monte to manage the operation in order to exploit its international marketing expertise. A Swiss company developed a passion fruit juice export business, and a Danish firm (Dansk Chrysanthemum and Kultur) made a multimillion dollar investment in chrysanthemums. By 1973 there were 36 registered exporters of fresh fruits and vegetables, drawn from domestic wholesalers and retailers and medium-size farmers. An important component was the sale of “Asian vegetables” (okra, capsicums, dudhi, zucchini, brinjals, and karella) to the rapidly growing South Asian immigrant community of London, where Kenyan Asians put family connections to good use (Gichuki, 2013).

Export horticulture represents an opportunity for reducing poverty by generating income by smallholders, rural labourers on larger farms, and unskilled or semiskilled workers in processing factories (Ongeri, 2014). The business of horticultural exports can be complex, with the sophistication required to compete at the high-value end of the market rivalling that of many manufactured products. Changing consumer demands, rising standards, and just-in-time delivery necessitate careful supply chain management and close cooperation with the overseas client (Gichuki, 2013).

The industry’s development now spans more than 50 years, during which time countless problems have been surmounted. None of the Kenyan exporters had an easy time in the early stages. The sector has increasingly been faced by many challenges even as the global economic fortunes seem to be getting better. Poor infrastructure, unpredictable weather, high costs of farm inputs, obsolete technology and stringent international standards are some of the challenges the sector continues to face (Ongeri, 2014). Competition from Ethiopia’s fledging cut flower industry has also threatened Kenya’s dominance in Africa. The low participation of the smallholder farmers in the export markets is due to stringent consumer demands for high quality and safer production laid down by the market demands. Higher power costs, rising fuel prices, cost of inputs, foreign currency exchange rates, high transportation cost and poor infrastructure such as roads and water threatens the country’s stronghold in the market (Muthoka & Ogutu, 2014).

In a study on the impact of the Kenyan post-election on flower exporting firms, Ksoll, Macchiavello and Morjaria (2009) established that the conflict reduced Kenyan flowers exports by 24% overall. The study also found that the conflict reduced exports by 38% for the firms located in conflict areas, mainly through displacing workers. The displacement of semi-skilled workers is also shown to have had impacts substantially beyond the duration of the conflict.

In addition, the fire that was experienced at the Jomo Kenyatta International Airport in August 2013, highly affected the export of horticultural products in Kenya. Jomo Kenyatta International Airport (JKIA) is considered the regional hub for air transport and a number of carriers call on Nairobi for passenger and cargo traffic. Further, unreliable rains and harsh weather conditions also pose a major threat to the horticulture sector development in Kenya. The country has experienced extreme weather patterns, away from the usual rainfall patterns. There is less rain in a season and frequent floods. Further, depleting soil fertility is a major challenge in horticultural farms. Use of inorganic fertilizers many times is advocated but

these are expensive and unaffordable to many smallholder farmers (Gichuki, 2013). In addition, capital and funds for managing production costs is usually a major challenge as it affects the choice of inputs farmers use to mitigate the production problems. Kenya currently boasts of high numbers of micro finance enterprises and commercial banks that exist and provide farmers with loans, which are repayable on negotiated terms (Muthoka & Ogutu, 2014).

The horticultural export industry has been identified as an important area to generate income, foreign exchange and to move farmers out of poverty in developing countries (Vergil, 2002). Kenya's horticultural sector has received a great deal of attention over the past decade due to the rapid and sustained growth of its exports to Europe (Rutto & Ondiek, 2014). The potential for expansion of horticultural business in developing countries, including production for domestic and export sales of cut flowers and plants is unlimited provided the country expands the production of existing products as well as the product range. The horticultural exports in Kenya has been increasing where a total Value horticulture exports is Sh43.5 billion, compared to Sh40.5 billion in 2012 (Mwangi, Mbatia & Nzuma, 2014).

Though 38% of export earning still accrue from export of horticultural products, there has been a decline in the value of domestic horticultural products export from Kenya, since the year 2000, despite aggressive market campaigns by horticultural firms (Musyoki, Ganesh & Pundo, 2012). This is attributed mainly to the strength of Kenyan shilling against the US Dollar. In other words, the appreciation of the Kenyan shilling will lead to low horticultural earnings from exports. Low foreign exchange earnings constrains importation of vital raw materials which affects horticultural products quality. In such a situation, and given that horticultural products are key to the Kenyan economy, an increase in horticultural products earnings is expected to contribute significantly to the alleviation of economic problems (Otieno, Korir & Mudaki, 2013).

In Kenya, horticultural farmers feel underpaid hence turning to alternative economic activities such as dairy and macadamia farming among other investments hence proofing a threat to Kenya's exports despite the high importation rate of goods that are locally produced (Rutto & Ondiek, 2014).

Various studies have been conducted in Kenya on foreign exchange volatility. For instance, Furukha (2014) did a study on the Relationship between foreign exchange rate volatility and value of multinational firms listed at Nairobi Securities Exchange and found that an increase in the variance of the permanent (transitory) component in the exchange rate process leads to greater variability in the growth rate of the firm's profits, thus establishing affecting the value leading to the conclusion that exchange rate volatility matters in firms' value variations. Otieno, Korir and Mudaki (2013) conducted a study on the factors influencing real exchange rate and export sector performance in Kenya and found that foreign aid inflow lead to real exchange rate appreciation in Kenya and hence impacts on export volumes. Kiptui (2008) carried out a study on whether exchange rate volatility harm exports such as tea and horticulture exports and established that exchange rate volatility has significant negative effects in the short run and that the foreign income. In addition, Rutto and Ondiek (2014) carried out a study on the impact of exchange rate volatility on Kenya's tea exports and found that exchange rate volatility negatively affects performance of tea exports in the country. However, there was no empirical evidence of a study showing the effect of exchange rate volatility on the performance of horticultural products in Kenya. This study therefore sought to investigate on the impact of exchange rate volatility on horticultural exports in Kenya.

The following was the hypothesized relationships between the dependent variable and the independent variable.

- H₀₁ There is no significant relationship between interest rates and performance of horticultural exports in Kenya
- H₀₂ There is no significant relationship between inflation rates and performance of horticultural exports in Kenya
- H₀₃ There is no significant relationship between public debt and performance of horticultural exports in Kenya

Theoretical review

The theories that have been advanced in the study on foreign exchange rate volatility include the International Fisher Effect (IFE) and the purchasing power parity (PPP).

International Fisher Effect Theory

This model was developed by Fisher in his book *The Theory of Interest* (1930). It uses market interest rates rather than inflation rates to explain why exchange rates change over time. The International Fisher effect states that exchange rates changes are balance out by interest rate changes. The Fisher theory simply argues that real interest rates across countries was equal due to the possibility of arbitrage opportunities between financial markets which generally occurs in the form of capital flows.

Real interest rate equality implies that the country with the higher interest rate should also have a higher inflation rate which, in turn, makes the real value of the country's currency decrease over time (Durcakova, Mandel & Tomsik, 2005). The relationship between relative interest rates and foreign exchange rates is explained within the interest rate theory of exchange rate expectations. Nominal interest rate differentials between two countries tend to reflect exchange rate volatility. Giddy (1977) called this the international Fisher effect, a close relationship to the Fisher effect, a phenomenon observed by Fisher. If the international Fisher effect holds, interest rates in appreciating currencies tend to be low enough, and in depreciating currencies high enough, to offset expected currency gains and losses.

The International Fisher Effect (IFE) theory suggests that foreign currencies with relatively high interest rates will tend to depreciate because the high nominal interest rates reflect expected rate of inflation (Madura, 2010). Does the interest rate differential actually help predict future currency movement? Available evidence is mixed as in the case of PPP theory. In the long-run, a relationship between interest rate differentials and subsequent changes in spot exchange rate seems to exist but with considerable deviations in the short run. The international Fisher effect is known not to be a good predictor of short-run changes in spot exchange rates.

Purchasing Power Parity

The Purchasing Power Parity (PPP) was first developed by the Swedish economist Cassel in 1920s to examine the relationship between the exchange rates of different countries. The starting point of exchange rate theory is purchasing power parity (PPP), which is also called the inflation theory of exchange rates (Arize, Malindretos & Ghosh, 2015). The PPP holds if and when exchange rates move to offset the inflation rate differentials between two countries. The PPP is also defined as the basis of the "law of one price" which asserts that the exchange rate between two currencies should be equal to the ratio of the price level of identical goods and services in the two countries.

The Purchasing Power Parity (PPP) theorem explains the relationship between relative prices of goods and exchange rates. PPP can be traced back to sixteen-century Spain and early seventeen century England, but Swedish economist Cassel was the first to name the theory PPP (Majumder, Ray & Sinha, 2015). Cassel once argued that without it, there would be no meaningful way to discuss over-or-under valuation of a currency. Absolute PPP theory was first presented to deal with the price relationship of goods with the value of different currencies. The theory requires very strong preconditions. Generally, Absolute PPP holds in an integrated, competitive product market with the implicit assumption of a risk-neutral world, in which the goods can be traded freely without transportation costs, tariffs, export quotas, and so on. However, it is unrealistic in a real society to assume that no costs are needed to transport goods from one place to another. In the real world, each economy produces and consumes tens of thousands of commodities and services, many of which have different prices from country to country because of transport costs, tariffs, and other trade barriers (Soon, Baharumshah & Ahn, 2015).

According to the PPP, increase in the price level of a country will cause depreciation of its exchange rate relative to other countries, thereby keeping the relative price of identical goods the same across countries. This theory suggests that exchange rate changes was offset by relative price indices/inflation since the Law of One Price should hold. PPP follows from the law of one price, which states that in competitive markets, identical goods will sell for identical prices when valued in the same currency (Soon, Baharumshah & Ahn, 2015). It relates to an individual product and its generalization is the absolute version of PPP. Relative PPP relates to changes in prices and exchange rates, rather than on absolute price levels. It states that change in exchange rates is proportional to the change in the ratio of the two nations' price levels, structural relationships remaining unchanged. The assumptions for PPP to hold are that goods are identical, all goods are tradable, there are no transportation costs, information gaps, taxes, tariffs, or restrictions of trade, and exchange rates are influenced only by relative inflation rates (Jiang, Bahmani-Oskooee & Chang, 2015). Due to these restrictive assumptions and empirical violation of the law of one price which is the building block of PPP, monetary models of exchange rate determination was adopted. Since currencies are considered assets, exchange rates are asset prices that adjust to equilibrate international trade in financial assets. Like other asset prices, exchange rates are determined by expectations about the future. Since currencies are treated as assets this approach is called the asset approach.

Empirical Review

Various studies have been conducted on foreign exchange rate volatility and exports both globally and locally. In the US, Sekantsi (2011) did a study to examine the impact of real exchange rate volatility on trade in the context of South Africa's exports to the US for the South Africa's floating period January 1995-February 2007. In measuring real exchange rate volatility, this study utilized GARCH. After establishing the existence of cointegration among the variables involved in our two-country export model, they estimated long-run coefficients by means of ARDL bounds testing procedure. The results indicate that real exchange rate volatility exerts a significant and negative impact on South Africa's exports to the US. However, the findings of this study cannot be generalized to Kenya due to difference in economic, political, legal framework differences.

Furukha (2014) did a study on the Relationship between foreign exchange rate volatility and value of multinational firms listed at Nairobi Securities Exchange. As per multinational firms listed in the NSE's foreign exchange trading activities audit, the main drivers responsible for

the increase in the level of activities during this period were identified as “reverse carry” deals, shortening of the tenor of currency swaps, the preference by Kenyans to hold their wealth in foreign currency and the use of Electronic Brokerage System (EBS) for foreign exchange trading. The study findings showed that there was high volatility in foreign exchange rate within the first quarters. The volatility reduced, almost evened out between the second and third quarter of the year before increasing in the beginning of the third quarter. An increase in the variance of the permanent (transitory) component in the exchange rate process leads to greater variability in the growth rate of the firm’s profits, thus establishing affecting the value leading to the conclusion that exchange rate volatility matters in firms’ value variations. This study was limited to multinational firms listed at Nairobi Securities Exchange and hence its findings cannot be generalized to horticultural exports in Kenya.

Otieno, Korir and Mudaki (2013) conducted a study on the factors influencing real exchange rate and export sector performance in Kenya. The data comprised of annual time series data for Kenya over the sample period 1960 to 2010. The sources of data included World Bank world tables, Organization of Economic Co-operation and Development, Central Bank of Kenya and Kenya National Bureau of Statistics. The study adopted Error Correction Model, because of its ability to induce flexibility by combining the short run dynamic and long run equilibrium model in a unified system. Inferential statistics were applied using Micro fit and PC Give Ox-metrics, unit root, co integration and granger causality tests were done prior to estimation. The study found that, foreign aid inflow lead to real exchange rate appreciation in Kenya. This was depicted by the significance of aid in the long run co-integrated equilibrium results. Foreign aid inflows also had a positive impact on export volumes as shown by the significance of aid in the export performance model estimation. The results of short-run parsimonious real exchange rate model revealed that real exchange rate is influenced by domestic factors such as government expenditure, technological progress and commercial policy stance. External factors proxied by terms of trade also tend to play a critical role as they lead to real exchange rate depreciation this was shown by the positive co-efficient of terms of trade in the long run co-integrated equilibrium results. The study concluded that for foreign aid to be an effective investment, policy management need to focus on ensuring the prevalence of sound macroeconomic fundamentals, liberalizing trade, focusing on export-led growth strategy and promotion of tourism industry in Kenya. This study was limited to factors influencing real exchange rate and hence did not outline how foreign exchange volatility influence the performance of horticultural exports.

Kiptui (2008) did a study on whether exchange rate volatility harm exports such as tea and horticulture exports. The study applied cointegration techniques and error correction modeling to Kenyan monthly data over the post-liberalization period, from 1997 to 2007. The results indicate the existence of long-run relationships and show that real exchange rate volatility has negative effects both in the short-run and the long-run. In the long-run or cointegrating equations, the foreign income elasticities turn out to be around unity, that is, 1.19 for horticulture and 1.03 for tea while the relative price elasticities are -1.28 for horticulture and -0.53 for tea. The results demonstrate the important role played by exchange rate volatility as it is shown to have adverse effects on horticulture and tea in the long-run with elasticities of -0.02 for tea and -0.33 for horticulture. Results from the long-run estimations are corroborated by the short-run dynamics derived from the error correction models, showing that exchange rate volatility has significant negative effects in the short-run and that the foreign income and relative price variables remain highly significant. Therefore, there is need to pay greater attention to exchange rate volatility by effectively monitoring movements in the exchange rate. This study was conducted between 1997 and 2007. Since

the horticultural industry as well as exchange rates has changed, these findings cannot apply in the current horticultural industry.

Cherop and Changwony (2014) did a survey of exchange rate fluctuation on tea export earnings among smallholder tea factories in Kenya. Tea Export Trade at Mombasa Tea Auction is conducted in US dollar being the official hard currency in accordance with Kenya Government Policy as per Exchange Control Circular No. 5/92/13 of 15/10/92 (EATTA, 2010). The dollar being the official hard currency at Mombasa Tea Auction could affect earnings among tea exporters in Kenya. This study set out on a survey to establish how earnings among smallholder tea factories are affected by this arrangement. The smallholder tea factories are managed by KTDA Ltd on behalf of smallholder tea growers. The study revealed that KTDA Ltd does not have in place any measures for intervention against adverse foreign exchange rate fluctuations among smallholder tea factories. There is need for large scale exporters such as those in the tea industry to employ the services of experts in order to maximize returns from depreciating Kenya shilling or minimize losses arising from a strong Kenya shilling. This study was limited to tea exports and hence its findings cannot be generalized to all exports in Kenya.

Rutto and Ondiek (2014) did a study on the impact of exchange rate volatility on Kenya's tea exports. Johansen and Julius Multivariate cointegration technique was applied to annual time series data for the period of 1970-2008 in order to recognize the short run and long run behavior of the variables in the study. Cointegration and error correction technique (ECM) developed by Engle and Granger was used. Dickey fuller (DF) and Augmented Dickey Fuller (ADF) unit root test for stationarity was employed in this study. Phillips Perron (pp) on first difference was adopted to test stationarity in their first difference and testing cointegration feasibility. The data was sourced from central bank of Kenya, Kenya National Bureau of Statistics, Tea Board of Kenya and the International financial statistics of International Monetary Fund (IMF). The results indicate that exchange rate volatility negatively affects performance of tea exports in the country. This study was limited to tea exports and hence its findings cannot be generalized to all exports in Kenya.

Musyoki, Ganesh and Pundo (2012) conducted a study on the impact of real exchange rate volatility on economic growth. The study employed the Generalized Autoregressive Condition of Heteroscedasticity (GARCH) and computation of the unconditional standard deviation of the changes to measure volatility and Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth for the period January 1993 to December 2009. Data for the study was collected from Kenya National Bureau of Statistics, Central Bank of Kenya and International Monetary Fund Data Base by taking monthly frequency. The study found that RER was very volatility for the entire study period. Kenya's RER generally exhibited a appreciating and volatility trend, implying that in general, the country's international competitiveness deteriorated over the study period. The RER Volatility reflected a negative impact on economic growth of Kenya. The dependent variable in this study was economic growth, which is different from horticultural exports.

Mwangi, Mbatia and Nzuma (2014) conducted a study on the effects of exchange rate liberalization in Kenya on French beans exports. Monthly data for a fixed exchange regime represented by the period from 1990-1993 and a flexible regime represented by the period from 1994-2011 was used in the estimation of an export demand model. The empirical results show that the liberalization of the exchange rate led to an increase in the French beans export volumes from Kenya to the European Union. This study was limited to French beans exports and hence its findings cannot be generalized to the horticultural sector in Kenya.

Conceptual Framework

This study sought to investigate on the impact of determinants of foreign exchange volatility on horticultural exports in Kenya. The dependent variable in this study was the performance of horticultural exports in Kenya and the independent variables were interest rates, inflation rates and public debt.

Independent Variables

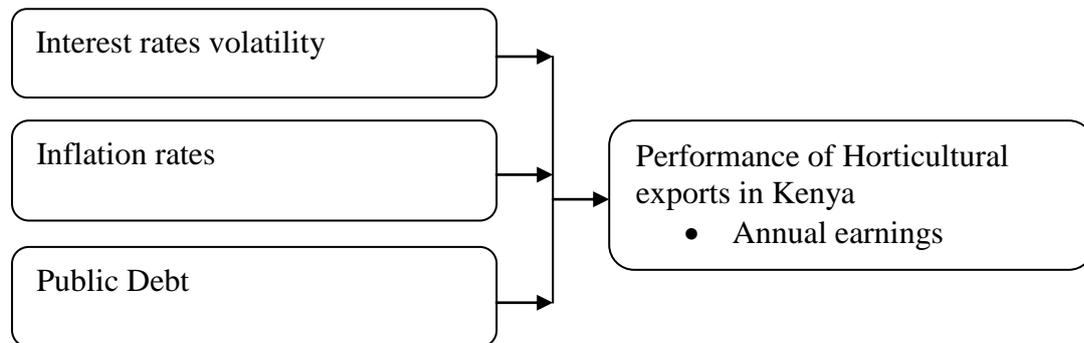


Figure 1: Conceptual Framework

Source: Research (2015)

Fixed exchange rates are frequently devalued or revalued, implying that they can change over time and may also be volatile. There are a wide variety of factors that influence the exchange rate, such as interest rates, inflation, and the state of politics and the economy in each country (Otieno, Korir & Mudaki, 2013).

Inflation Rates

Inflation means a sustained increase in the aggregate or general price level in an economy. Inflation means there is an increase in the cost of living. There is widespread agreement that high and volatile inflation can be damaging both to individual businesses and consumers and also to the economy as a whole (Rutto & Ondiek, 2014). Aside from factors such as interest rates and inflation, the exchange rate is one of the most important determinants of a country's relative level of economic health. Exchange rates play a vital role in a country's level of trade, which is critical to most every free market economy in the world. For this reason, exchange rates are among the most watched analysed and governmentally manipulated economic measures (Sekantsi, 2011). But exchange rates matter on a smaller scale as well: they impact the real return of an investor's portfolio. Generally, the inflation rate is used to measure the price stability in the economy. A low inflation rate scenario will exhibit a rising currency rate, as the purchasing power of the currency will increase as compared to other currencies (Soon, Baharumshah, & Ahn, 2015).

Changes in market inflation cause changes in currency exchange rates. A country with a lower inflation rate than another's will see an appreciation in the value of its currency. The prices of goods and services increase at a slower rate where the inflation is low. A country with a consistently lower inflation rate exhibits a rising currency value while a country with higher inflation typically sees depreciation in its currency and is usually accompanied by higher interest rates (Vergil, 2002).

Interest Rates

Interest rate is defined as fee charged by a lender to a borrower for the use of borrowed money, usually expressed as an annual percentage of the principal, the rate is dependent upon the time value of money, the credit risk of the borrower, inflation rate among others. Changes in interest rate affect currency value and dollar exchange rate. Forex rates, interest rates, and inflation are all correlated. Increases in interest rates cause a country's currency to appreciate because higher interest rates provide higher rates to lenders, thereby attracting more foreign capital, which causes a rise in exchange rates (Soon, Baharumshah & Ahn, 2015).

Interest rates are major economic factors that influence the economic growth in an economy. The rationale behind the need to control the interest charged on credit or any other financial instrument is based on the need to control economic patterns that has great effects to the society (Sekantsi, 2011). Poor decisions on the rates can directly affect the economic performance in all industry but greatly on the financial sectors. Interest has indirect impact on financial performance through impacting economy, high interest rate to borrowers discourages borrowing this result to shrank investment through multiplier effects savings are reduced and this will have negative impact on exports performance (Rutto & Ondiek, 2014).

Government Debt

Government debt is public debt or national debt owned by the central government. A country with government debt is less likely to acquire foreign capital, leading to inflation. Foreign investors will sell their bonds in the open market if the market predicts government debt within a certain country (Musyoki, Ganesh & Pundo, 2012). If a country is perceived to have a high national debt, without a credible plan for dealing with it, that can have a negative impact on the value of its currency.

Through various channels, the amount and structure of public debt can have a significant influence on a central bank's foreign exchange reserve management (Musonda, 2008). On the one hand, the issuance of foreign currency-denominated debt can boost international reserves. On the other hand, repayment of public foreign currency debt not only reduces the level of foreign exchange reserves but can cause transient problems in liquidity management. Furthermore, the dynamics of public debt influences not only reserve accumulation but may affect the central bank's reserve adequacy targets, as an increased level of foreign debt can push up the reserves, requirement, depending mainly on the maturity structure of public assets held by non-residents (Majumder, Ray & Sinha, 2015).

Research Methodology

This study used a descriptive research design used. The population under study was the aggregate of licensed horticultural produce exporters (Licensed by HCDA) in Kenya. Monthly export earnings for all the licensed horticultural produce exporters as provided by HCDA were analyzed. This was a census study and hence no need of sampling. This study used secondary data, which was gathered from HCDA, KNBS, and CBK for the period of 11 years (2004-2014), to try and derive a whole-some understanding that helped the researcher achieve the research objective stated. Horticultural export earnings statistics data was obtained from HCDA. Data on foreign exchange rate fluctuations was obtained from CBK while data on inflation was obtained from KNBS.

This study generated quantitative data which was analyzed by use of descriptive and inferential statistics. Descriptive statistics included mean and standard deviation. On the other

hand, inferential statistics included multivariate regression analysis. All statistical analysis were conducted with the help of Statistical Package for Social Sciences (SPSS version 21). In determining the influence of the independent variables (interest rates, inflation rates, and public debt) on the dependent variable (performance of horticultural exports), the study used a multiple linear regression analysis.

The multiple regression model was;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Whereby; Y= performance of horticultural exports

B_0 = Constant

β_1 - β_3 =Coefficients of determination

X_1 = Interest rates

X_2 = inflation rates

X_3 = public debt

ε = Error term

The study used tests of significance tools mainly Analysis of variance (ANOVA), Coefficient of determination (R^2), Correlation coefficient (R) and the F statistic to better understand the different relationships between the variables in the study. Through ANOVA, the researcher established a statistical test of whether or not the means of the groups under study was equal. In measuring how well the regression model fits the data in the study, the study employed the use of the goodness of fit statistic R^2 . The R^2 was used to examine how close the data was to the fitted regression line. The R test was used to measure the strength and the direction of the linear relationship between variables. R is defined as the covariance of the variables divided by the product of their standard deviations. The F statistic was used to measure variances in the population under study. The significance of the regression results was tested using the F test statistic which is basically a ratio that compares the explained sum of squares and the unexplained sum of squares.

Results and Discussions

The general objective of this study was to investigate on the effect of determinants of exchange rate volatility on the performance of horticultural exports in Kenya. The study also sought to establish the effect of interest rates, inflation rates and public debt on the performance of horticultural exports in Kenya. The findings were presented in two subsections: descriptive statistics and inferential statistics.

The descriptive statistics comprise of mean and standard deviation on the dependent (performance of horticultural exports) and the independent variables (interest rates, inflation rates and public debt).

Table 1: Mean and Standard deviation of the Dependent and the Independent Variables

	Minimum	Maximum	Mean	Std. Deviation
Inflation (%)	4.27	15.10	8.4055	3.62310
Interest rate (%)	2.54	18.30	11.5109	4.41524
Public debt (Percent of the GDP)	38.37	53.79	44.4209	4.34044
Performance of horticultural exports (Ksh in millions)	41600.00	92400.00	66681.818	16962.3594

From the findings, the average inflation for a period ranging from 2004 to 2014 was 8.4055% and had a standard deviation of 3.62310%. The minimum inflation in the same period was 4.27% and the maximum inflation was 15.10%. Further, the average interest rate for the period ranging between 2004 and 2014 was 11.5109% and had a standard deviation of 4.41524%. The minimum interest rate within the period was 2.54% and the maximum interest rate was 18.30%. Within the same period, the average public debt (percent of the GDP) was 44.4209% and had a standard deviation of 4.34044%. The minimum public debt was 38.37 and the maximum value was 53.79. In addition, the average revenue of horticultural products was Ksh 66,681 million for the period ranging from the year 2004 to 2014. The minimum revenue obtained within the same period was Ksh. 41,600 million and had a standard deviation of Ksh. 92,400 million.

Inferential Statistics

The study used inferential statistics to test the study hypothesis and to investigate on the relationship between the independent variables (inflation, interest rate and public debt) and the dependent variable (Performance of horticultural exports). Inferential statistics included correlatin analysis and multivariate regression analysis.

Correlation Analysis

From the findings, as indicated in table 4.2, there are negative significant associations between all the independent variables and performance of horticultural exports.

Table 1: Correlations Coefficients

		Performance of horticultural exports	Inflation	Interest rate	Public debt
Performance of horticultural exports	Pearson Correlation	1			
	Sig. (2-tailed)				
Inflation	Pearson Correlation	-.137	1		
	Sig. (2-tailed)	.038			
Interest rate	Pearson Correlation	-.235	.326	1	
	Sig. (2-tailed)	.018	.328		
Public debt	Pearson Correlation	-.335	.012	-.718*	1
	Sig. (2-tailed)	.000	.972	.013	

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

From the findings, there is a positive significant association between inflation and performance of horticultural exports as shown by a correlation coefficient of -0.137 and a p-value of 0.038. The findings also show that there is an inverse significant relationship between interest rate and performance of horticultural exports as indicated by a correlation coefficient of -0.235 and a p-value of 0.018. The findings further show that there is an inverse association between public debt and performance of horticultural exports as shown by a correlation coefficient of -0.335 and a p-value of 0.000.

Test for Normality

Multiple regression analysis assumes that variables have normal distributions. Non-normally distributed variables can distort relationships and significance tests. In this study normal distribution of data was tested by use of Shapiro Wilk Test.

Table 2: Shapiro Wilk Test

	Statistic	Sig.
Performance of horticultural exports	.921	.228
Inflation	.946	.234
Interest rate	.928	.432
Public debt	.940	.523

From the findings as indicated in table 4.3, the data for all the four variables was normally distributed. The findings show that performance of horticultural exports (p-value=0.228), inflation (p-value =0.234), interest rate (p-value=0.432) and public debt (p-value=0.523) were normally distributed. This shows that the four variables were normally distributed.

Multicollinearity Test

When there is a perfect linear relationship among the predictors, the estimates for a regression model cannot be uniquely computed. The term collinearity implies that two variables near perfect, linear combinations of one another. When more than two variables are involved it is often called multicollinearity, although the two terms are often used interchangeably. The primary concern is that as the degree of multicollinearity increases, the regression model estimates of the coefficients become unstable and the standard errors for the coefficients can get wildly inflated. The "tolerance" is an indication of the percent of variance in the predictor that cannot be accounted for by the other predictors, hence very small values indicate that a predictor is redundant, and values that are less than 10 may merit further investigation (Creswell, 2006). The VIF, which stands for variance inflation factor, is (1 / tolerance) and as a rule of thumb, a variable whose VIF values is greater than 10 may merit further investigation.

Table 3: Collinearity Statistics

	Tolerance	VIF
Inflation rate	.152	9.813
Interest rate	.139	7.277
Public Debt	.137	6.863

From the findings, the variable inflation rate had a tolerance of 0.152 and a VIF of 9.813, interest rate had a tolerance of 0.139 and a VIF of 7.277, public debt had a tolerance of 0.137 and a VIF of 6.863. Since the tolerance for all the variables was more than 0.1 and the VIF was not more than 10 there is no need of further investigations.

Regression Analysis

Regression analysis involves identifying the relationship between a dependent variable and one or more independent variables. A multivariate regression analysis was used to determine the relationship between the dependent and the independent variables. The multivariate regression model was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Whereby; Y= performance of horticultural exports; B_0 = Constant; β_1 - β_3 =Coefficients of determination; X_1 = Interest rates; X_2 = inflation rates; X_3 = public debt; ε = Error term

Table 4: Model Summary

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	0.719	.517	.452	0.81835	1.541

a. Predictors: (Constant), Public debt, Inflation, Interest rate

The R-Squared is the proportion of variance in the dependent variable which can be explained by the independent variables. The R-squared in this study was 0.517, which shows that the three independent variables (inflation, interest rate and public debt) can explain 51.7% of the dependent variable. This shows that the other factors not studied in this study explain 47.3% of the dependent variable (performance of horticultural exports). The Durbin-Watson $d = 1.541$, which is between the two critical values of $1.22 < d < 1.73$ and therefore we can assume that there is no first order linear auto-correlation in the multiple linear regression data (Bryman & Bell, 2007).

Table 5: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13022.927	3	4340.976	29.883	0.000
	Residual	1016.862	7	145.266		
	Total	14039.789	10			

a. Dependent Variable: Performance of horticultural exports

b. Predictors: (Constant), Public debt, Inflation, Interest rate

The analysis of variance in this study was used to determine whether the model is a good fit for the data. From the findings, the p-value was 0.000 which is less than 0.05 and hence the model is good in predicting how the three independent variables (inflation, interest rate and public debt) influence the performance of horticultural exports in Kenya. Further, the F-calculated (29.883) was more than the F-critical (4.35) which shows that the model was fit in predicting the influence of the independent variables on the dependent variable.

Table 6: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.583	1.147		3.123	.000
	Inflation	-0.272	0.091	-.178	-2.998	.021
	Interest rate	-0.192	0.067	-.167	-2.857	.042
	Public debt	-0.323	0.102	-.312	-3.154	.000

a. Dependent Variable: Performance of horticultural exports

Based on this table, the equation for the regression line is:

$$Y = 3.583 - 0.178X_1 - 0.167X_2 - 0.312X_3$$

According to the intercept (β_0), when the three independent variables are held constant, the performance of horticultural exports will be 0.825. The findings show that there is an inverse significant relationship between inflation and performance of horticultural exports as shown by a regression coefficient of -0.178. This shows that a unit increase in inflation would lead to a 0.178 decrease in performance of horticultural exports. The p-value (0.021) was less than the significance level (0.05) and hence the relationship was significant. The findings agree

with Rutto and Ondiek (2014) argument that exchange rates play a vital role in a country's level of trade and significantly influence exports. The findings also show that there is an inverse significant relationship between interest rate and the performance of horticultural exports as indicated by a regression coefficient of -0.167 . This shows that a unit increase in interest rate would lead to a 0.167 decrease in performance of horticultural exports. The relationship was significant as the p-value (0.042) was less than the significance level (0.05). These findings agree with Sekantsi (2011) findings that interest rate influences exports performance negatively. In addition, the study found that there is an inverse relationship between public debt and the performance of horticultural exports as indicated by a regression coefficient of -0.312 . This indicates that a unit increase in public debt would lead to 0.312 decreases in the performance of horticultural exports. These findings agree with Majumder, Ray and Sinha (2015) argument that public debt influences exports performance significantly.

Conclusions

The study concludes that there is an inverse significant relationship between inflation rates and significantly influence the performance of horticultural exports in Kenya. A country with a consistently high inflation rate exhibits a decreasing currency value, as its purchasing power decreases relative to other currencies, which leads to an decrease in horticultural export performance.

The study also concludes that there is an inverse significant relationship between interest rate and the performance of horticultural exports in Kenya. Changes in interest rate affect currency value and dollar exchange rate. Increases in interest rates cause a country's currency to appreciate because higher interest rates provide higher rates to lenders, thereby attracting more foreign capital, which causes a rise in exchange rates. An increase in interest rates will therefore lead to a decrease in the performance of horticultural exports in Kenya.

The study further concludes that there is an inverse relationship between public debt and the performance of horticultural exports in Kenya. If a country is perceived to have a high national debt, without a credible plan for dealing with it, that can have a negative impact on the value of its currency, which in turn negatively influences the performance of horticultural exports.

Recommendations

The government needs to come up with structures to support horticultural export performance which will in effect lead to job opportunities. Creation of employment opportunities leads to increased production and this therefore leads to improved export performance.

The study found that inflation rates inversely influence horticultural export performance. Secondly, the study recommends that inflation rate should be contained through sound policy measures as higher inflation rates may hurt the general export performance in Kenya.

The study also found that central bank interest rates have an inverse influence on the performance of horticultural exports in Kenya. The study therefore recommends that the Central bank of Kenya should reduce its lending interest rates. The study recommends that the Central Bank of Kenya should set base lending rates that can help the banks profitable while at the same time not punitive to the borrowers. This will help grow the credit market in Kenya and hence develop the economy.

The study established that public debt inversely influences the performance of horticultural exports in Kenya. The study recommends that it is important that the Government addresses

the issue of burgeoning external debt as higher external debts hurt the performance of horticultural exports in Kenya

Areas for Further Research

This study found that the three independent variables (inflation, interest rate and public debt) could explain 51.7% of the performance of horticultural exports. The study therefore suggests further studies on other factors that influence the performance of horticultural exports in Kenya. The study also suggests further studies to investigate on the challenges facing the performance of horticultural exports in Kenya.

This study was carried out on the horticultural industry in Kenya; further research could be carried out on other economic sectors of the country and even the broader East African region to establish the effect of foreign exchange rate fluctuations on export earnings from the different sectors under study and across the east African region.

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References

- Arize, A. C., Malindretos, J., & Ghosh, D. (2015). Purchasing power parity-symmetry and proportionality: Evidence from 116 countries. *International Review Of Economics & Finance*, 37, 69-85.
- Bryman, A., & Bell, E., (2007). *Business Research Methods*. 2nd ed. Oxford: Oxford University Press.
- Cherop, C.K. & Changwony, J.R. (2014). A Survey of Exchange Rate Fluctuation on Tea Export Earnings among Smallholder Tea Factories in Kenya. *Research Journal of Finance and Accounting*, 5(18), 1-10.
- Durcakova, J., Mandel, M., & Tomsik, V. (2005). Puzzle in the Theory of Uncovered Interest Rate Parity-Empirical Verification for Transitive Countries. *Finance India*, 19(2), 449-464.
- Furukha, B.S. (2014). *The Relationship Between Foreign Exchange Rate Volatility And Value Of Multinational Firms Listed At Nairobi Securities Exchange*. Retrieved from <http://erepository.uonbi.ac.ke/>
- Gichuki, I. N. (2013). *The challenges facing horticulture farming among the youths in youths groups in Kieni West District Nyeri County, Kenya*. Retrieved from <http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/9284>
- Giddy, I. H. (1977). Exchange Risk: Whose View?, What is Exchange risk. *Financial Management*, 6(2), 34-42
- Jiang, C., Bahmani-Oskooee, M., & Chang, T. (2015). Revisiting Purchasing Power Parity in OECD. *Applied Economics*, 47(40), 4323-4334.
- Kiptui, M.C. (2008). Does Exchange Rate Volatility Harm Exports? Empirical Evidence from Kenya's Tea and Horticulture Exports. *Prepared for presentation at the CSAE Conference at Oxford University*.

- Ksoll, C., Macchiavello, R. & Morjaria, A. (2009). *Guns and roses: The impact of the Kenyan Post-Election on flower exporting firms*. Retrieved from <http://www.csae.ox.ac.uk/workingpapers/pdfs/2009-06text.pdf>
- Madura, J. (2010). *International Financial Management*. New York: South-Western College Publishing.
- Majumder, A., Ray, R., & Sinha, K. (2015). Estimating Purchasing Power Parities from Household Expenditure Data Using Complete Demand Systems with Application to Living Standards Comparison: India and Vietnam. *Review Of Income & Wealth*, 61(2), 302-328.
- Musonda, A. (2008). Exchange Rate Volatility and Non-Traditional Exports Performance: Zambia, 1965–1999. *Research Paper 185 African Economic Research Consortium*, Nairobi, Kenya.
- Musyoki, D., Ganesh, P., & Pundo, M. (2012). The impact of real exchange rate volatility on economic growth: Kenyan evidence. *Journal of Economics*, 7(1), 59-75
- Muthoka, M.N. & Ogutu, M. (2014). Challenges Facing the Horticultural Sector in Nairobi County, Kenya. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 19(2), 121-124
- Mwangi, S.C., Mbatia, O.L. & Nzuma, J.M. (2014). The Effects Of Exchange Rate Liberalization In Kenya On French Beans Exports. *International Journal of Business, Economics and Management*, 1(4), 39-56
- Ongeri, B.O. (2014). Small Scale Horticultural farming along the Kenyan Highways and Local economic development: Exploring the effect of factor prices. *An Online International Research Journal*, 1(3), 102-115.
- Otieno, B.A., Korir, M.K. & Mudaki, J.S. (2013). Factors Influencing Real Exchange Rate and Export Sector Performance In Kenya. *The International Journal of Sciences: Basic and Applied Research*, 1(1), 23-29
- Rutto, R. & Ondiek, A. (2014). Impact of Exchange Rate Volatility on Kenya's Tea Exports. *International Journal of Economics, Commerce and Management*, 2(12), 76-87.
- Sekantsi, L. (2011). *The impact of real exchange rate volatility on south African exports to the united states (US): a bounds test approach*. Retrieved from <https://ideas.repec.org/a/aic/revebs/y2011i8sekantsil.html>
- Soon, S., Baharumshah, A. Z., & Ahn, S. K. (2015). Real Exchange Rate Dynamics in the Asian Economies: Can Regime Shifts Explain Purchasing Power Parity Puzzles?. *Global Economic Review*, 44(2), 219-236.
- Vergil, H. (2002) "Exchange Rate Volatility in Turkey and its Effect on Trade Flows", *Journal of Economic and Social Research*, 4(1), 83-89.