

DETERMINANTS OF EXCHANGE RATES IN UGANDA (1994-2019)

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ABSTRACT

The rate of fluctuation of Exchange rate in Uganda has been on a rise and this prompted research (study) to examine the major determinants of nominal effective Exchange rate and how those factors influence the exchange rates in Uganda. The study focused on four specific objectives namely; inflation, money supply, external debt and exports. To examine the relationship, an OLS method was employed to examine the relationship and influence of variables for the period of 26 years. Some variables such as money supply, external debt and exports were transformed into logarithmic variables to allow normal distribution of error variance and homoscedasticity. The study involved the use of a quantitative research approach using secondary data for the period 1994-2019. Main findings indicate that trade log exports have a negative significant relationship and low on nominal exchange rate, log external debt has a negative insignificant relationship and low influence on nominal exchange rate while log money supply has a positive significant relationship and high influence on nominal exchange rate and inflation has a positive insignificant relationship and also high influence on nominal exchange rate. Several diagnostic tests were conducted to determine the econometric properties of the variables such as Multicollinearity, Autocorrelation, heteroscedasticity, normality and stationarity. Cointegration test were also carried out using ARDL Bound test and it was found out that there is cointegration equation (long-run relationship exists). Exchange rates also may be affected by some other factors that have not been in this

study, so this study recommends that central bank of Uganda should enact policies that regulate the monetary factors (such as inflation, money supply, external debt) to contribute towards gaining value of the Uganda shilling

Key words: *inflation, money supply, external debt and exports*

BACKGROUND OF THE STUDY

The price of one country's currency in relation to another country's currency is known as the exchange rate. The currency rate between two countries is an important consideration when conducting business worldwide. Following the failure of the Bretton Woods Agreement, the IMF gave each nation the flexibility to select their own exchange rate regime, with the remaining regimes falling in between. These regimes range from freely floating agreements at one extreme to fixed systems at the other extreme. Therefore, selecting an appropriate exchange rate regime (with no issues with the fixed exchange rate regime) is crucial since it will have diverse implications for national and global economic policy. The unsolved problem of the century, however, is modeling and predicting exchange rate behavior (Jayasuriya D.P.S.H., 2016). With an 87% market share as of 2018, the US dollar is still by far the most widely used currency worldwide. Nearly a quarter of the forex market is devoted to trading between the US dollar and the euro. On the worldwide market, buying and selling foreign currencies is reasonably simple, especially if done on a large scale. Online marketplaces make it simple to undertake exchange operations at real-time spot rates with minimal transaction costs.

The actions on the foreign exchange market have a significant impact on commerce and investment in African countries. In other words, a stable exchange rate is probably going to have a good effect on incomes for households, utilization, investment by

businesses, imports, governmental fiscal, debt, and monetary policies, trade balance, and employment decisions. The relationship between a nation and the rest of the world is impacted by the exchange rate in both the financial and products sectors. It has an impact on the stock of foreign debt in terms of domestic currency, as well as the volume of both imports and exports (by altering their relative pricing) (Rao P.N., 2016). Because of this, it is crucial for policymakers and scholars to understand the causes of fluctuations in exchange rates so they may better understand how to address some of the implications of exchange rate changeability (Mpofu.R.T, 2016). Simply said, the level and fluctuations of an exchange rate have been a primary policy concern for the central banks of most nations as unanticipated changes in the exchange rate not only undermine the goal of price stability but also lower real output, trade, and other factors that contribute to economic growth. Due to economic recovery policy, the exchange rate in Uganda was liberalized in the early 1990s as part of broader economic reforms hence exchange rates are now determined by entirely demand and supply forces. On the demand side, foreign exchange is used for funding import invoices, and pay foreign debts while on the supply side, foreign exchange inflows are determined through exports, capita; inflows, remittances and official development assistance.

Problem statement

The question of exchange rate determination has been just in the core of academic debates. Even though many exchange rate determination models and their amendments have been developed, scholars/writers still cannot agree on which model best describes behavior of exchange rate. Exchange rate is an essential element of the macro- economic variables that needs to be address in Uganda since the shilling is constantly losing its value and it is necessary to know the factors affecting, in order to analysis the determinate factors, to see which of those possible factors need to be taken care to control the exchange rate.

According to Simeneh Almaw, carried out a study in Ethiopia and the determinants of exchange rate were; government spending, broad money supply, inflation level, economic growth, interest rate, trade balance and current account balance where he employed a correlation and trend analysis for the 18 (2000-2017 G.C) year data obtained from National bank of Ethiopia Quarterly Bulletin (Almaw, 2020). Mohamed Isse Ibrahim and his fellow researcher also studied the determinants of exchange rate affecting Somalia economy where they used monetary approach model under Ordinary least square method. Inflation, foreign debt, the supply of cash, the trade balance, gross domestic product per person, and lack of governance were all factors considered in the model when determining the exchange rate (Mohamed Isse Ibrahim, 2017). Consequently, this study closes the gap. It looks into how the money supply, exports, external debt, and inflation all interact to affect the nominal exchange rate, which has fluctuated since the majority of the scientific panel literature that has been published thus far has examined which factors most strongly influence nominal exchange rates using the OLS method and determined whether there are long-term or short-term dynamics/relationships (cointegration) with these factors. As a result of the economy's significant nominal fluctuation in exchange rates, the paper looks at potential solutions.

Specific objectives of the study.

- 1. To investigate the effect of inflation on exchange rate in Uganda.*
- 2. To examine the impact of money supply on exchange rate in Uganda.*
- 3. To determine the effect of external debt on exchange rate in Uganda.*
- 4. To investigate the effect of exports on exchange rate in Uganda.*

Hypothesis of the Study

1. *There is no significant effect of inflation on exchange rate.*
2. *There is no significant effect of money supply on exchange rate.*
3. *There is no significant effect of external debt on exchange rate.*
4. *There is no significant effect of exports on exchange rate.*

Methodology

Research design

The study involved the use of quantitative research approach. Quantitative methods of data collection were used to collected secondary data on the real effective exchange rate from Bank of Uganda for the period (1994-2019). The data collected was categorized into years and then used to carry out data analysis and diagnostic checks.

Data analysis (Econometric Model)

For data analysis, the Ordinary Least Square (OLS) estimators was applied since it shows econometric features of the regression model analyzed and as such it is best linear unbiased estimator and it is the simplest method for running this regression as compared to other econometric techniques.

Microsoft EXCEL will be used to capture data for cleaning and then exported to STATA which will be used for analysis. Following the results from the diagnostic tests, a multiple linear regression model will be fitted to establish a cause and effect relationship basing on the specified model below;

$$Y_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 \ln X_2 + \alpha_3 \ln X_3 + \alpha_4 \ln X_4 + u_i \dots \dots \dots (1)$$

Where, Y_t is the Nominal exchange rate which is the dependent variable,

And explanatory variables are;

X_1 are the inflation (consumer prices)

X_2 is the money supply

X_3 is the external debt

X_4 are the exports

u_i is the stochastic error term

$\ln$ is a logarithmic transformation of the selected variables in the model.

Descriptive Analysis:

It deals with the presentation of numerical facts or data, in either tables or graphs form, and with the methodology of analyzing the data. The data for this study was descriptively analyzed in terms of central tendency and variability. A measure of central tendency includes the mean, median and mode while a measure of variability includes standard deviation, skewness and kurtosis. Descriptive analysis of data is necessary as it helps to determine the normality of the distribution.

Correlation Analysis:

It refers to the analysis of two or more variables to determine relationships between them, this analysis is conducted to determine whether a statistical association exists between the variables, the degree of association if one does exist, and whether one variable may be predicted from another. The study was guided by the following specific objectives: exports, interest rates, inflation and exchange rate. This was determined by establishing whether a correlation of any nature exists and to examine the strength of the relationship, if any.

Test for stationarity

This occurs when it appears about the same on average irrespective of when it was observed. This shall be carried out using the augmented dickey fuller test. A statistic was generated to decide with the following hypothesis;

Ho: The series is not stationary

Ha: The series is stationary

If the ADF Test statistic $Z(t) < \text{critical value at 5\% in absolute terms}$, fail to reject the Ho and conclude that the series is non stationary otherwise it is stationary.

Cointegration test

After running unit root tests on all variables, choosing between Johansen cointegration test and Augmented Restricted lag test algorithm (ARDL) of analysis to be used for testing cointegration will depend on whether the variables will be stationary at the same level (i.e. $I(0)$, $I(1)$) or different levels. Co-integration test was used to identify scenarios where two or more non-stationary time series are integrated together in a way that they cannot deviate from equilibrium in the long term. Vector Error Correction Model was performed to rectify and correct the disequilibrium of the model after finding co- integrating Equations.

Ho: there is no cointegration between variables

Ha: there is cointegration between variables

Diagnostic tests

Heteroscedasticity test

A Breusch-pagan test was carried out by estimating the model by OLS assuming no heteroscedasticity to find out if there is a constant variance in the series using the regression equation.

The null hypothesis shall be rejected if $\widehat{BP} = BP$ critical or $p\text{-value} < \text{significance level}$.

Multi-collinearity test

This refers to the existence of a perfect and not a perfect relationship between the independent variables in this case exports, inflation rate and interest rate and usually happens when economic variables tend to move together. The variance inflation factor (VIF) will be used to diagnose the presence of Multicollinearity in the model. It is stated that if VIF is greater than ten (10) and tolerance less than 0.10, then there is an existence of severe Multicollinearity in the model estimate.

Autocorrelation test

This is done using Durbin Watson test is used to measure the linear associations between adjacent residuals from a regression model. The Breusch-Godfrey LM test for autocorrelation will also be used.

The hypothesis test for Durbin Watson;

Ho: There is no autocorrelation

Ha: There is autocorrelation

An OLS shall be run and $\widehat{DW}$ will be computed using STATA and a significant level shall be chosen DW upper d_U and DW lower d_L

Normality test

Jarque-Bera Normality Test will be performed to find out whether the model errors will be normally distributed.

Ho: the variables are normally distributed

Ha: the variables are not normally distributed

RESULTS

Descriptive statistics

Table 1 present Descriptive analysis which show that the maximum, minimum and mean average and standard deviation.

Table 1: Summary statistics of variables

Variable	Mean	Standard deviation	Min	Max
<i>Neer-exchange rate</i>	<i>157.87875</i>	<i>42.18109</i>	<i>83.68</i>	<i>212.55</i>
<i>Inflation</i>	<i>8.376538</i>	<i>16.17153</i>	<i>-3.17</i>	<i>85.35</i>
<i>Log exports</i>	<i>7.012752</i>	<i>0.7443634</i>	<i>6.065644</i>	<i>8.178577</i>
<i>Log Money supply</i>	<i>29.08311</i>	<i>1.237005</i>	<i>27.0512</i>	<i>30.93088</i>
<i>Log external debt</i>	<i>18.62067</i>	<i>0.6692886</i>	<i>17.74633</i>	<i>20.554119</i>

Source: Author's computation, STATA output (2023)

Table 1 descriptive results shows the dependent and independent variables. Result indicates that average of dependent variable of nominal exchange rate is (157.879), and its standard deviation is (42.181) with a maximum and minimum value of (212.55) and (83.68) respectively. With the independent variables include inflation, log exports, log money supply and log external debt.

The average of inflation is (8.377), and its standard deviation is (16.172) with a maximum and minimum value of (85.35) and (-3.17) respectively. The average of log exports is (7.013), and its standard deviation is (0.744) with a maximum and minimum value of (8.179) and (6.066) respectively. The average of log money supply is (29.083), and its standard deviation is (1.237) with a maximum and minimum value of (30.931) and (27.051) respectively. The average of log external debt is (18.621), and its standard deviation is (0.669) with a maximum and minimum value of (20.554) and (17.746) respectively. Basing on standard deviation, there were no wide variations among the data evidenced by the relatively small standard deviations.

Correlation Analysis.

Correlation tests are carried out to determine the relationship between the dependent and independent variables. Table 2 presents the correlation matrix for the variables of this study with nominal exchange rate as the dependent variable.

Table 2 Correlation matrix of variables

Variables	Neer- exchange rate	Inflation	Log exports	Log Money supply	Log external debt
Neer-exchange rate	1				
Inflation	0.1330 (0.5171)	1			
Log exports	0.7132	0.0649	1		

	(0.000)	(0.7529)			
Log Money supply	0.8554	0.0453	0.9466	1	
	(0.000)	(0.8259)	(0.000)		
Log external debt	0.0871	-0.1918	0.3269	0.2713	1
	(0.6723)	(0.3480)	(0.1031)	(0.1801)	

Level of significance in parenthesis

Source: Author's computation, STATA output (2023)

Table 2 reveals that there exists a very weak positive relationship between inflation and nominal exchange rate as the correlation coefficient is 0.133. This is statistically insignificant since the P-value (0.5171) > 0.05 and therefore we fail to reject the null hypothesis and conclude that there is insignificant relationship between nominal exchange rate and inflation.

It also reveals that there exists a moderate positive relationship between log exports and log nominal exchange rate as the correlation coefficient is 0.7132. This is statistically significant since the P-value (0.000) < 0.05 and therefore we reject the null hypothesis and conclude that there is a significant relationship between nominal exchange rate and log exports.

It further reveals that there is a very strong positive relationship between log money supply and log nominal exchange rate as the correlation coefficient is 0.8554. This is statistically significant since the P-value (0.000) < 0.05 and therefore we reject the null hypothesis and conclude that there is a significant relationship between nominal exchange rate and log money supply.

It is also evident that there exists a very weak positive relationship between log external debt and log nominal exchange rate as the correlation coefficient is 0.0871. This is statistically insignificant since the P-value (0.6723) > 0.05 and therefore we fail to reject the null hypothesis and conclude that there is insignificant relationship between nominal exchange rate and log external debt.

Regression analysis

Table 3 OLS results of leveled variables with log Nominal Exchange rate as a dependent variable

Neer exchange rate	coefficients	Standard error	t	P-value
Inflation	0.2631405	0.263105	1.11	0.278
Log exports	58.84895	9.384387	6.27	0.000
Log Money supply	-4.144585	6.068024	-0.27	0.502
Log external debt	-51.311191	15.94986	-3.22	0.004
Constant	-1118.823	211.5893	-5.29	0.000
R-squared	0.8382			
Adjusted R-squared	0.8074			

$F(4, 21)$	27.20
$Prob>F$	0.000

Dependent variable: Neer exchange rate

Source: Author's computation, STATA output (2023)

From the equation, $Y_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 \ln X_2 + \alpha_3 \ln X_3 + \alpha_4 \ln X_4 + u_i$

We now as the model as;

$$Y_i = -1118.823 + 0.263X_1 + 58.848\ln X_2 - 4.145\ln X_3 - 51.312\ln X_4 + u_i$$

Where; X_1 is the inflation, X_2 is the money supply, X_3 is the external debt, X_4 are the exports and Y_i is nominal exchange rate

Interpretation of results

The R-squared value of 0.8382 in the model implies that 83.82% of the variations in the dependent variable nominal exchange rate is explained by the independent variables inflation, money supply, external debt and exports. Only 16.18% percent is explained by other variables contained in the error term thus not included in the model. The R-Squared is high which implies that the data is fitted well thus a good fit.

Keeping other factors constant, a 1% increase in inflation rate will on average lead to a 0.263% increase in nominal exchange rate. The findings show that inflation has a positive relationship and statistically insignificant effect on nominal exchange rate (P -value (0.278) > 0.05). This appreciates exchange rate in nominal terms and results are similar to those of (Muço. M, 2004)

Keeping other factors constant, a 1% increase in log money supply will on average lead to a 58.849% increase in nominal exchange rate. The findings show that log money supply has a positive relationship and statistically significant effect on nominal exchange rate (P-value (0.000) < 0.05). This appreciates exchange rate in nominal terms and results are similar to those of (Patrick Alexander, 2022).

Keeping other factors constant, a 1% increase in log external debt will on average lead to a 4.145% decrease in nominal exchange rate. The findings show that log external debt has an inverse relationship and statistically insignificant effect on nominal exchange rate (P-value (0.502) > 0.05) This depreciates exchange rate in nominal terms and results are similar to those of (Mohamed Isse Ibrahim, 2017).

Keeping other factors constant, a 1% increase in log exports will on average lead to a 51.312% decrease in nominal exchange rate. The findings show that log exports have an a negative relationship and statistically significant effect on nominal exchange rate (P-value (0.004) < 0.05) This depreciates exchange rate in nominal terms.

The F statistic shows that all variables jointly have a significant effect on the nominal exchange rate, Prob(F),0.000<0.05.

Determining variable influence in the model.

Table 4 Shows standardized beta coefficients of independent variables

<i>Neer exchange rate</i>	<i>Standardized Beta</i>
<i>Inflation</i>	<i>0.1008837</i>
<i>Log exports</i>	<i>1.725807</i>
<i>Log Money supply</i>	<i>-0.0657623</i>

Log external debt	-0.9054937
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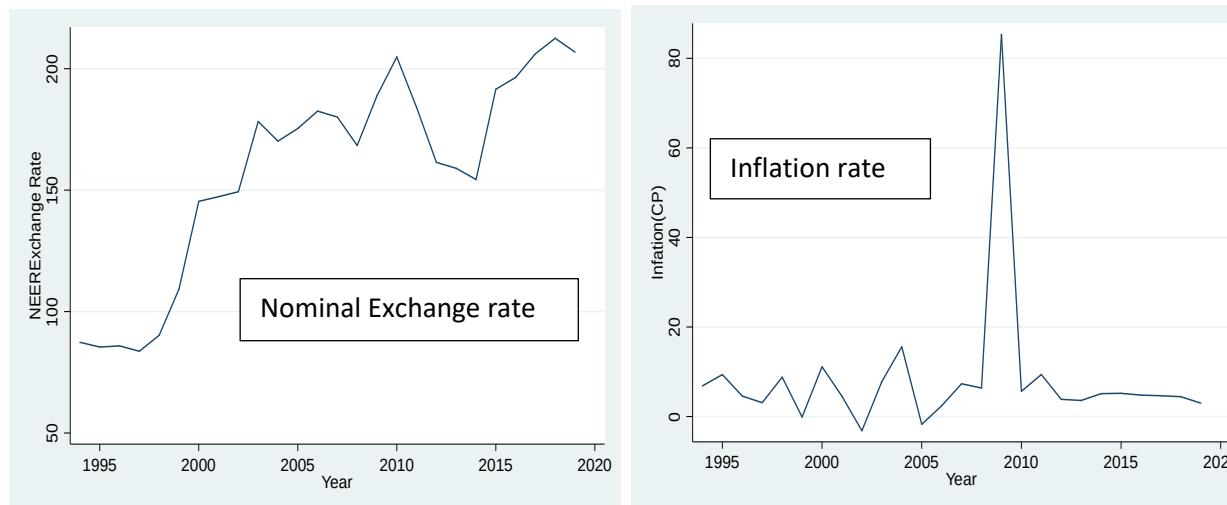
Dependent variable: Neer exchange rate

Source: Author's computation, STATA output (2023)

Table 4 reveals that log money supply has highest influence followed by inflation on nominal exchange rate depicted with their standardized beta values of 1.72581 and 0.100884 respectively. This is because both variables are regulated by the central bank and financial institutions. Log external debt and log exports have low influence on nominal exchange rate depicted with their standardized beta values of 0.06576 and 0.90549 respectively.

Unit root/stationary test using Augmented Dickey-Fuller (ADF) Test Results

Graphical representation



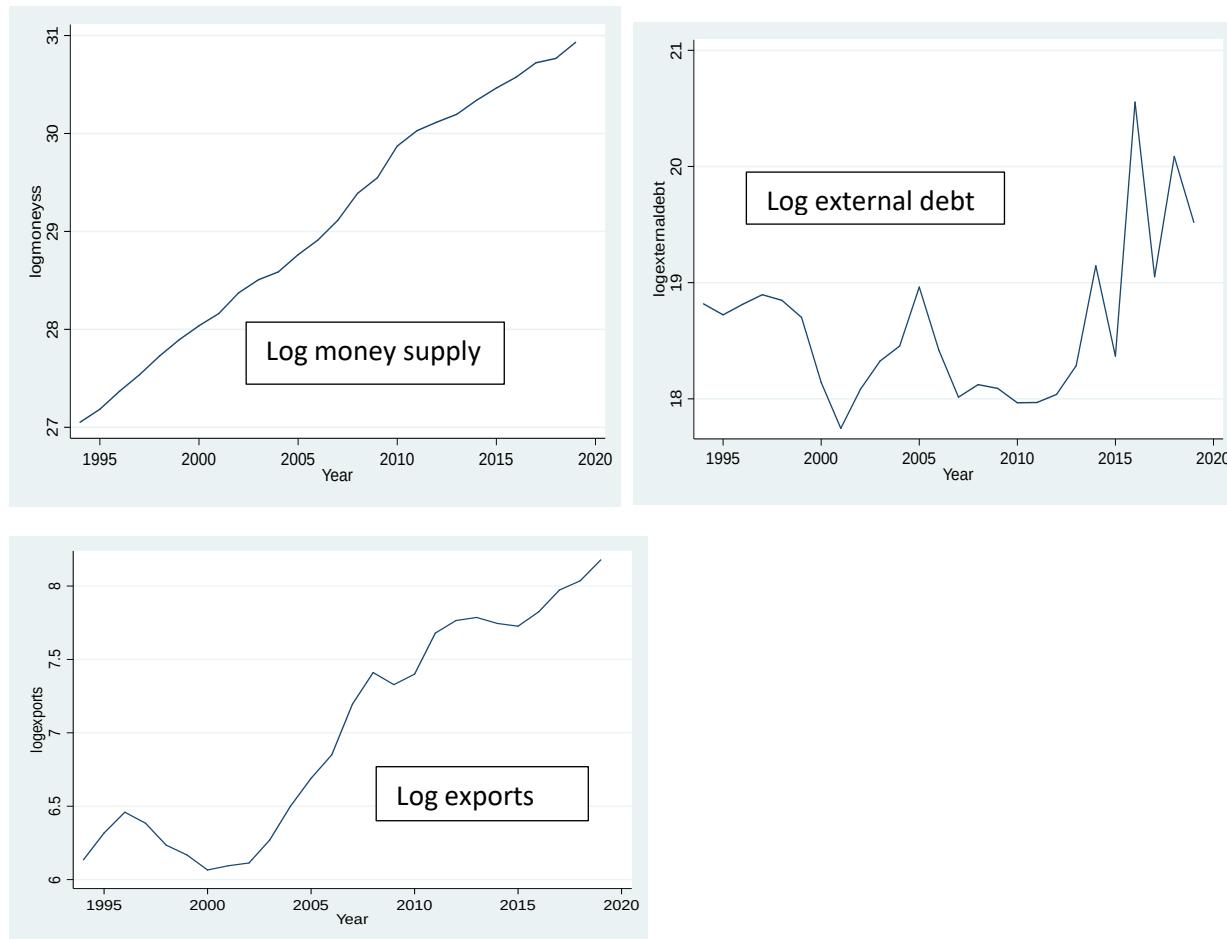


Figure 2: Graphical representation of unit root test

Source: Author's computation, STATA output (2023)

Figure 2 reveals that only one of the variables was found not to have a unit root at level while four of the variables were found to have a unit root at level but are differenced for stationarity. This implies inflation was integrated of order zero $I(0)$ and Exchange rate, log money supply, log external debt and log exports were integrated of order one $I(1)$.

Augmented Dickey-Fuller (ADF) unit root Test Results

Ho: The series is not stationary

Ha: The series is stationary

Table 5 Augmented Dickey-Fuller (ADF) unit root Test of variables

	AT LEVEL				AT FIRST DIFFERENCE1(1)			
	Test statistics	Critical value at 5%	MacKinnon value Z(t)	P-	Test statistics	Critical value at 5%	MacKinnon value Z(t)	P-
VARIABLES								

<i>Nominal exchange rate</i>	-1.339	-3.000	0.6110	-4.294	-3.000	0.0005
<i>Inflation</i>	-4.971	-3.000	0.0000	-	-	-
<i>Log money supply</i>	-1.194	-3.000	0.6761	-4.055	-3.000	0.0012
<i>Log external debt</i>	-2.658	-3.000	0.0817	-10.343	-3.000	0.000
<i>Log exports</i>	0.240	-3.000	0.9744	-2.781	-3.000	0.0611
				<i>Test statistics</i>	<i>Critical at 10 %</i>	<i>MacKinnon P-value Z(t)</i>
<i>Log exports</i>				-2.781	-2.630	0.0611

Source: Author's computation, (2023)

Results in table 5 reveals that the tau test statistic (-1.339) of nominal exchange rate in absolute terms is less than the 5% critical value (-3.000) in absolute terms thus we fail to reject the null hypothesis that Nominal exchange rate has unit root (Mackinnon P-value $Z(t)$, $0.611 > 0.05$) therefore, it is non-stationary at level hence not $I(0)$. At difference, nominal exchange rate is stationary since the tau test statistic (-4.294) in absolute terms is greater than the critical value at 5% (-3.000) in absolute terms (Mackinnon P-value $Z(t)$, $0.0005 < 0.05$) hence we reject the null hypothesis and conclude that nominal exchange rate is stationary at first difference thus $I(1)$.

The tau test statistic (-4.971) of inflation in absolute terms is less than the 5% critical value (-3.000) in absolute terms thus we reject the null hypothesis (Mackinnon P-value $Z(t)$, $0.000 < 0.05$) and conclude that inflation does not have unit root therefore, it is stationary at level $I(0)$.

The tau test statistic (-1.194) of log money supply in absolute terms is less than the 5% critical value (-3.000) in absolute terms thus we fail to reject the null hypothesis that log money supply has unit root (Mackinnon P-value $Z(t)$, $0.6761 > 0.05$) therefore, it is non-stationary at level hence not $I(0)$. At first difference, log money supply is stationary since the tau test statistic (-4.055) in absolute terms is greater than the critical value at 5% (-3.000) in absolute terms (Mackinnon P-value $Z(t)$, $0.0012 < 0.05$) hence we reject the null hypothesis and conclude that log money supply is stationary at first difference thus $I(1)$.

The tau test statistic (-2.658) of log external debt in absolute terms is less than the 5% critical value (-3.000) in absolute terms thus we fail to reject the null hypothesis that log money supply has unit root (Mackinnon P-value $Z(t)$, $0.0817 > 0.05$) therefore, it is non-stationary at level hence not $I(0)$. At first difference, log external debt is stationary since the tau test statistic (-10.343)

in absolute terms is greater than the critical value at 5% (-3.000) in absolute terms (Mackinnon P-value $Z(t)$, $0.000 < 0.05$) hence we reject the null hypothesis and conclude that log external debt is stationary at first difference thus $I(1)$.

The tau test statistic (0.240) of log exports is less than the 5% critical value (-3.000) in absolute terms thus we fail to reject the null hypothesis that log exports has unit root (Mackinnon P-value $Z(t)$, $0.9744 > 0.05$) therefore, it is non-stationary at level hence not $I(0)$. At first difference, log exports is non stationary since the tau test statistic (-2.781) in absolute terms is greater than the critical value at 5% (-3.000) in absolute terms (Mackinnon P-value $Z(t)$, $0.0611 > 0.05$) therefore, it is non-stationary at first difference hence not $I(1)$. Further we observe that at first difference, log exports is stationary since the tau test statistic (-2.781) in absolute terms is greater than the critical value at 10% (-2.630) in absolute terms (Mackinnon P-value $Z(t)$, $0.0611 < 0.01$) hence we reject the null hypothesis and conclude that log external debt is stationary at first difference thus $I(1)$. Hence inflation was integrated of order zero $I(0)$ and Exchange rate, log money supply, log external debt and log exports were integrated of order one $I(1)$.

Normality Test

Ho: the variables are normally distributed

Ha: the variables are not normally distributed

Table 6 Jarque-Bera Normality Test

Variable	Jarque-Bera	Probability
Residuals	0.7047	0.703

Source: Author's computation

Results in table 4.6 reveals that the series are normally distributed since the probability of Jarque-Bera (0.703) greater than 0.05. This depicted with a normal histogram and normal probability plot shown in figure 3.

Graphical representation

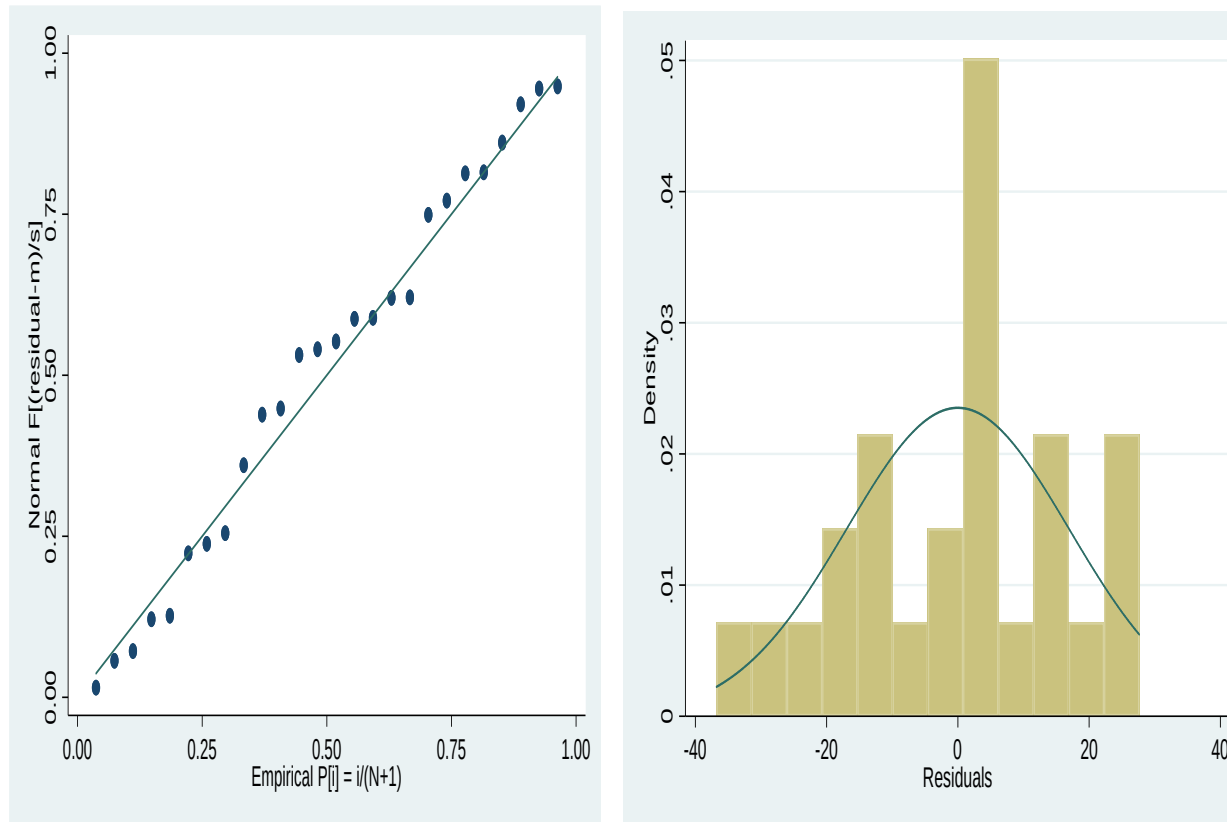


Figure 3: Graphical representation of normality test of error terms

Source: Author's computation, STATA output (2023)

Multicollinearity.

Table 7 Variance Inflation Factors (VIF)

Variable	vif	1/vif
Log exports	10.28	0.097233
Log Money supply	9.83	0.101705
Log external debt	1.20	0.830951
Inflation	1.07	0.938835
Mean VIF	5.60	

Source: Author's computation, STATA output (2023)

Results in table 7 shows that the mean variance inflation factors (VIF) of the regressors (5.60) is below 10 implying that there is no perfect and severe Multicollinearity among the explanatory variables.

Heteroskedasticity

H0: There is no heteroskedasticity (there is constant variance)

Ha: There is heteroskedasticity (there is no constant variance)

Table 8 Test for heteroskedasticity

Source	Chi2	df	P-value
Heteroskedasticity	15.69	14	0.3325

Skewness	3.50	4	0.4772
Kurtosis	0.85	1	0.3577
Total	20.04	19	0.3921
Chi2(14)	15.69		
Prob > chi2	0.3325		

Source: Author's computation, STATA output (2023)

The results show that the observed probability Chi-Square value (0.3325) > 0.05 critical value. Therefore, the null hypothesis of constant variance is not reject hence there is no heteroskedacticity.

Autocorrelation

Table 9 Test for Autocorrelation

Ho: There is no autocorrelation

Ha: There is autocorrelation

Test		
Breusch Godfrey LM test	Prob > chi2	0.0002
Durbin Watson D-statistics (5, 26)		0.6360306

Source: Author's computation, STATA output (2023)

The rule of thumb says that if the DW statistic is greater than 2 then there is no evidence of autocorrelation in the residuals. But since the DW statistic (0.6360306) is less than 2. There is evidence of serial correlations in the residuals (DW statistic <2). It is further evidenced with Breusch Godfrey LM test for auto correlation since the probability of chi2 (0.0002) < 0.05.

Cointegration Test

Ho: there is no cointegration between variables (no cointegration equation)

Ha: there is cointegration between variables (presence cointegration equation)

After running unit root tests, we identified that some variables are stationary at level (inflation) $I(0)$, others became stationary after first difference (log money supply, log external debt (dependent variable), nominal exchange rate and log exports) $I(1)$. Therefore, an Augmented Restricted lag (ARDL) Bound test of analysis is used for testing cointegration.

Table 10 Cointegration test using Augmented Restricted lag (ARDL) Bound test

<i>Critical values (0.1-0.05), F-statistics</i>				
	<i>(I,0)</i> <i>L_1</i>	<i>(I,0)</i> <i>L_1</i>	<i>(I,0)</i> <i>L_05</i>	<i>(I,0)</i> <i>L_05</i>
<i>K=4</i>	2.45	3.52	2.86	4.01

F= 6.148				
Accept if $F < \text{critical value for } I(0) \text{ regressors}$				
Accept if $F > \text{critical value for } I(1) \text{ regressors}$				

Source: Author's computation, STATA output (2023)

Results in table 10 shows that the computed F-statistics (6.148) is greater than the critical value for the upper bound $I(1)$ at 5%. In this case, we reject the null hypothesis and conclude that there is cointegration, that is there is a long-run relationship. Therefore, we estimate the long-run model which is the error correction model.

Table 11 Vector Error Correction Model-VECM Model

D.	Neer coefficients	Standard error	t	P-value
exchange rate				
Adjusted. Neer				
exchange rate				
L1	-1.141933	0.257613	-4.43	0.001
Long Run				
Inflation	0.9235666	0.1724088	5.36	0.000

<i>Log</i>	<i>Money</i>	73.99755	6.341002	11.67	0.000
<i>supply</i>					
<i>Log</i>	<i>external</i>	12.78797	4.035609	3.17	0.007
<i>debt</i>					
<i>Log exports</i>		-83.45118	10.71242	-7.79	0.000
<i>R-squared</i>		0.8192			
<i>Adjusted</i>	<i>R-</i>	0.6802			
<i>squared</i>					
<i>Observations</i>		24			

Source: Author's computation, STATA output (2023)

Results table 11 shows ARDL regression output of long run relationships. The model is a good fit since the R squared value of 0.8192 shows that 81.92% of the variations in the dependent variable is explained by the variations in the explanatory variables and only 18.08 is induced by the error term.

Basing on LR MODEL, all the independent coefficients were significant since their P-values are greater than 0.05. A 1% increase in inflation on average leads to 0.924% significant increase in nominal exchange rate. A 1% increase in log money supply on average leads to 73.998% significant increase in nominal exchange rate. A 1% increase in log external debt on average leads to 12.788% significant increase in nominal exchange rate. This means that these variables appreciate exchange rate in nominal terms. A 1% increase in log exports on average leads to 83.451% significant decrease in nominal exchange rate. It implies that log exports depreciate exchange rate in nominal terms.

Conclusions

The study revealed that the OLS estimates of the variables have strong and consistent evidence. External debt and exports have negative impact on nominal exchange rate. Our findings seem to support (Mohamed Isse Ibrahim, 2017) thus appreciates the nominal exchange rate. Also inflation and money supply have a positive impact on nominal exchange rate and the findings seem to support (Muço. M, 2004) and (Patrick Alexander, 2022) respectively thus depreciates the nominal exchange rate. Therefore, the government should set up policies that can help stabilize exchange rates, improve on exports, lower the rate of inflation, regulate money supply and lower borrowing as to reduce external debt servicing.

Recommendations

Government should develop appropriate trade policies in order to encourage exports and raise the value of the exchange rate. These include reduction in export duties and excise duties, including the value added tax (VAT).

Government should ensure that the political system is deepened further and intensify the war against corruption, in order to encourage both domestic and foreign investment, as well as raise productivity. All of these should check the continuous depreciation of the exchange rate and over a long term leads to its stability

References

- Abebe.D. (n.d). Exchange Market Pressure and Monetary Policy in Ethiopia. National Bank Of Ethiopia.*
- Ademola, O. (2011). Exchange Rate Volatility. An analysis of the relationship. Gotland University.*
- Alan Whitworth, T. W. (2010). Uganda's Economic Reforms: insider accounts. January 2010. doi:10.1093/acprof:oso/9780199556229.001.0001*
- Almaw, S. (2020). Determinants of Exchange Rate in Ethiopia: A Graphical Approach. Debre Markos University, Department of Accounting and Finance, Debre Markos, Ethiopia .*
- Arslaner. F, K. D. (2014). The relationship between inflation targeting and exchange rate pass- through in turkey with a model averaging approach. Central bank of the republic of turkey working paper .*
- Atingi-Ego. M, S. (2003). Measuring efficiency of a market in transition: the Ugandan foreign exchange market. Bank of Uganda, Research Department, . , Kampala, Uganda.*
- Awan.A, N. H. (2011). The impact of exchange rate, fiscal deficit and terms of trade on external debt of Pakistan. Australian Journal of Business and Management Research, 1(3): 10-24.*
- Bhattarai.K. (2011). Impact of exchange rate and money supply on growth, inflation and interest rates in the UK. International Journal of Monetary Economics and Finance, 4(4): 355-371.*

Chamunorwa, W. .. (2015). Exchange rate volatility and export performance in south Africa:(2000-2014). Asian Economic and financial review, 5(10), 1174-1186.

Daria, T. (2012). Exchange rates and the extensive margin of exports. World Bank.

IMF. (1984). Retrieved from www.IMF.com

Jacob Opolot, A. J. (2020). Long-Run Exchange Rates Dynamics in Uganda: Evidence from the Sticky Price Monetary Model .

Jayasuriya D.P.S.H, P. S. (2016). Analysis of Factors Affecting USD/LKR Exchange Rate, Symposium on Statistical & Computational Modeling with Applications-.

Kimberly, A. (2019). New deal summary, programs, Policies and its success. New York.

Levin.J.H. (1997). Money supply growth and exchange rate dynamics. Journal of Economic Integration, 12(3): 344-358.

Mohamed Isse Ibrahim, A. I. (2017). DETERMINANTS OF EXCHANGE RATES IN SOMALIA. Asian Journal of Economic Modelling, Vol. 5, No. 3, 233.244 . doi:10.18488/journal.8.2017.53.233.244

Mpofu.R.T. (2016). The Determinants of Exchange Rate Volatility in South Africa. University of Cape Town.

Muço. M, P. S. (2004). Inflation, exchange rates and the role of monetary policy in Albania. Working Paper 88, London. Retrieved from

https://scholar.google.com.tr/scholar?q=Marta%2C+M.%2C+S.+Peter+and+T.+Anita%2C+2004.+Inflation%2C+exchange+rates+and+the+role+of+European+bank+for+reconstruction+and+development&btnG=&hl=en&as_sdt=0%2C5

Patrick Alexander, A. R. (2022). Exports and the Exchange Rate: A General Equilibrium Perspective by. Bank of Canada, international Economic Analysis Department. doi: <https://doi.org/10.34989/swp-2022-18> | ISSN 1701-9397

- Rao P.N, T. T. (2016). Determinants of real exchange rate in Ethiopia. nternational Journal of Research, Vol. 4, No. 6 183-210 .*
- Saheed.Z.S. (2015). Impact of public external debt on exchange rate in Nigeria. International Finance and Banking:15-26.*
- Uddin K.M.K, Q. N. (2013). factors affecting the fluctuation in exchange rate of the Bangladesh: a co-integration approach. international journal of social science, Vol 18, No 1 .*