MACROECONOMICS FACTORS AFFECTING THE LEVELS OF FOREIGN EXCHANGE RESERVES IN KENYA

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ABSTRACT

The general objective of this study was to investigate the factors that affect the levels of foreign exchange reserves in Kenya. The real inspiration of the study was based on the fact that the continuous high appetite for external loans to finance budget deficit/mega infrastructures in the country has been of concern to economists in the Kenyan economy. To achieve the objectives of the study a methodology framework of autoregressive distributed-lag (ARDL) was undertaken to investigate on year period from 1995 to 2019. Descriptive statistic research design was used. Secondary data collected from the World Bank website, CBK website and WDI website was employed. Data analysis was done using the E-views 11 software and results presented in form of tables. The findings revealed a long-run relationship among all the variables. Moreover, log of BOP, external debt, remittance and debt servicing in the long run have significant impact on the stock of foreign reserves while GDP and nominal exchange rate are insignificant. Time series properties were tested such as the presence of unit roots and co-integration of the variables to ensure that spurious results would not result. Before interpreting the results, the estimated models were subjected to pre and post diagnostic test. Some of the diagnostic tests conducted were residual normality test, multicollinearity test, serial correlation test, regression specification error test, model stability and normality tests. The study concluded that reserve build-up in Kenya is mainly a function of growth in GDP, remittances in the short-run and external debt. In addition, the long-run coefficients showed that remittances, Lag of BOP, nominal exchange rate (NEXCR), external debt and debt servicing exhibits negative significant effects on the foreign reserves stocks in the long run, with growth in GDP exhibiting a positive though insignificant effect on foreign reserves stocks. Nominal Exchange rate (NEXCR), have a negative sign showing an inverse relationship with reserves holdings, although statistically insignificant. The insignificance of nominal exchange rate was taken to indicate Kenya's exchange rate is somehow managed by the CBK for some period. External debt and debt servicing having a negative effect on the stocks of foreign reserves affirms the position Kenya find herself due to accumulation of too much foreign dominated debt. Debt servicing eats into the foreign reserves stocks since the external debt is repaid in foreign currency thus putting a constraint on the stock of Kenya's foreign reserves in the long run.

Keyword: Debt Servicing, External Debt, Remittances (from abroad), Current Account, GDP, Foreign Reserves

INTRODUCTION

The role and the importance of international reserve holdings, also known as foreign exchange reserves, has been documented in both theoretical and empirical literature. Foreign reserves are believed to play significant roles in the stability of exchange rate, and in ameliorating or reducing the impact of unanticipated emergencies and economic shocks (Mishkin, 1999; Aizenman & Marion, 2002; Frenkel, 2005). Foreign reserves holdings can be defined as stocks of all international financial assets and instruments kept and maintained by a country to finance and carry out all international obligations and transactions (Dominguez, Hashimoto & Ito, 2012). Meanwhile, reserve holdings have also been seen as a means by which the apex bank secure and maintain the external competitiveness of an economy (Dooley, Folkerts-Landau & Garber, 2004). Other significant merits from holding reserves include among other things: intertemporal smoothening of the tax burden which is most important during adverse productivity shocks; an important investment scheme if foreign currency assets are negatively correlated with that of domestic investments; and improved or favourable political perceptions (Aizenman & Marion, 2002; Aizenman & Marion, 2004; Choi, Sharma & Stromqvist, 2009). Both theoretical and empirical evidence indicate that countries with fixed or managed floating exchange rate systems ought to have accumulated adequate and more reserves when compared with the economies adopting floating exchange rate systems (Park, Chung & Wang, 2001; Williamson, 2002; Buiter & Grafe, 2002; Czech & Wasikowska, 2012). This, of course, is a dilemma, otherwise referred to as the 'impossible trinity' in international macroeconomics and finance. The tri-lemma confronts the emerging economies of Asia, Latin America while those of Sub-Saharan countries are also not left out.

Statement of the Problem

Kenya has had a checkered history with the dollar, the world's primary reserve currency. From the exchange control days when being found with the greenback would land you in jail, to the liberalization-era that coincided with the devaluation of the local currency, the greenback has been at the heart of Kenya's ups and downs and now, the country seems to be swimming in dollars. It is clear that Kenya has had low stocks of foreign reserves in the 90s with less than a billion dollars reserve stocks pile per annum throughout the 90s but it's worth noting there was steady gradual growth in the stock reserves hitting past 1 billion marks in 2001. Since then, there has been a constant rise in the foreign reserve largely due to the high borrowing appetite by the GOK as well as an improvement in the BOP accounts and huge remittance from Kenyan abroad.

But beneath the glitter, is untold gloom. Since a chunk of these dollars is not earned through the sweat of tea farmers, local mining firms, or manufacturers but through borrowing. Without adequate dollars of its own and with Kenya's export earnings remaining dismal for decades, forcing the country to borrow more dollars to repay maturing debts, a situation that has seen it stuck in a rut.

In 2018/2019 financial year, Kenyan treasury position on the country's ability to repay its external debt swung from bullish to cautious as manifested in the Exchequer's Medium-Term Debt Management Strategy for years 2018 and 2019. In February 2018, Treasury said Kenya's risk of defaulting on its debts was low, and that its public debt was sustainable and would remain so in the near future.

A year later, in February 2019, the country's risk of debt distress had fluctuated from low to moderate. In other words, debt burden indicators were not blinking red; they could easily be breached in case of "external shocks" such as a sudden increase in the global prices of crude oil or if civil servants suddenly demanded high wages and the State ceded to their demands, leaving Treasury with little to pay its debts.

Much of the existing work on external reserves focuses on reserve accumulation and utilization, the

demand for international reserves, the impact of reserve holding, implications for investment, inflation, and so on, without assessing the plausible interplay between public debt and external reserve. Thus, the role of public debt as a determinant of external reserve has been underemphasized; this research study aims at filling the gap in this area. Much of the earlier literature, summarized for example in IMF (1984), focused on individual countries or small groups of mainly advanced countries. More recent studies, which have either included a wider range of both advanced and developing countries or have approached the issue with greater statistical sophistication, have tended to find adverse effects of foreign exchange reserves accumulation, mainly in developing countries but also in advanced countries. The work of Fischer (2001), Aizenmann and Marion (2003), Benediktsson and Palsson (2005), Dash and Narayanan (2011) and Chowdhury, Uddin, and Islam (2014) are considered to analyze the determinants of foreign exchange reserves, which suggest that foreign reserves held by a country's central bank depends on the balance of payment, scope of international trade (average propensity to import), exchange rate, public debt, money supply, inflation rate, GDP and call money rate.

To the research knowledge, there is limited empirical evidence on the factors affecting the levels of foreign exchange reserves in Kenya. The research study that came close but fell short of addressing this issue in Kenya was the work of Duncan Ouma (2020) on his study topic Exchange Rate Stability, Foreign Exchange Reserves, Monetary Policy and Expectations: The Case of Kenya. This research study intended to address this research gap as well.

Objectives of the Study

The main objective of this study was to examine the Macroeconomics factors affecting the levels of foreign reserves stock in Kenya. The specific objectives were;

- To determine the effect of external debt on external reserves.

- To determine the effect of BOP on external reserves.
- To determine the effect of nominal exchange rates on external reserves.
- To determine the effect of remittances on external reserves.
- To determine the effect of GDP on external reserves.
- To determine the effect of debt servicing on external reserves.

The study focused to answer the following research questions;

- What is the effect of public debt on foreign exchange reserves?
- What is the effect of broad BOP on foreign exchange reserves?
- What is the effect of nominal exchange rates on foreign exchange reserves?
- What is the effect of remittances on foreign exchange reserves?
- What is the effect of GDP growth on external reserves?
- What is the effect of debt servicing on external reserves?

This study hypothesized that a large sum of accumulated debt will negatively affect the stock of a country's foreign reserves in the long run through debt servicing.

LITERATURE REVIEW

Theoretical Review

In the last couple of decades there has been a significant increase in international reserves around the world. This rise in reserves – mainly concentrated in the holding of U.S. dollars – has been sharp, with estimates by the International Monetary Fund (IMF) indicating that they have tripled in the last ten years, placing it at 13 percent of global GDP in 2009 (IMF (2010)). This trend is expected to continue, as many emerging economies take into consideration that a stronger position in reserves can allow them to reduce the impact of fluctuations in capital flows, like those experienced during the recent economic crisis. The behavior of

international reserves closely reflects fluctuations in the balance of payments, and incorporates the recent restructuring of capital flows. While governments would like to claim that such increases in international reserves are the result of their policies, the influence of external factors in the determination of reserves is equally important. In particular, remittance of private resources from emigrants to their families and relatives, interest rate differentials arising from relative changes in interest rates in world markets, and fluctuations in commodity prices arising from changes in world demand lead to flows of foreign currency that can alter the reserve position of a country Assessing the plausible interplay between public debt and external reserve will be the concern of this study since the role of public debt as a determinant of external reserve has been underemphasized if the available empirical studies are anything to go by. Some of the theories related to this study include; Modern mercantilism theory, The theory of self-insurance, Thirlwall theory Debt overhang theory and Optimum reserves theory.

Modern mercantilism theory

Mercantilism is an economic theory by French Controller General of Finance Jean-Baptiste Colbert (1619-1683); where the government seeks to regulate the economy and trade in order to promote domestic industry – often at the expense of other countries. Mercantilism is associated with policies which restrict imports, increase stocks of gold and protect domestic industries. Mercantilism stands in contrast to the theory of free trade – which argues countries economic well-being can be best improved through the reduction of tariffs and fair free trade. Modern mercantilism perspective, the hoarding of international reserves is a part of a deliberate development strategy, i.e., an outward-oriented growth strategy, which facilitates growth by maintaining an undervalued real exchange rate to maintain a country's export competitiveness. This theory is relevant to the study in that it highlights how various countries adopt inward looking policies in order to gain unfair advantage over others in the internal trade thus accumulating

massive foreign reserves through cheap exports from their respective domestic countries to other open global economies. This is a phenomenon that has been so common in the emerging markets predominantly in the Asian countries.

The theory of self-insurance

An alternative explanation for the hoarding of international reserves is the self-insurance/ precautionary motive, explained as the view that as output stabilizers, international reserves can reduce sovereign risk by Ehrlich and Becker [1972]. International reserves can bring down the probability of an output drop induced by capital flight and/or can decrease the depth of the output collapse when the sudden stop happens. Similar views have been presented by using more elaborate models. These studies concluded that some of the large increase in international reserves were consistent with self-insurance motives for the sudden-stop risks. Among others, Aizenman and Marion (2012) explored the interpretation of the relatively high demand for international reserves in the Far East countries and the relatively low demand in other developing countries. This theory is critical to this study in that it identifies and explains why countries have high affinity for retaining or holding foreign reserves. It reveals how countries hold foreign reserves as a shield or insulating tool in case of unforeseen future financial/economic contingencies such as the 2008/09 global financial crises or the Asian crises.

Thirlwall theory

Balance of Payment constraint model formulated in 1986 by Thirlwall adopted a Keynesian view of aggregate demand and output but fundamentally incorporates the neoclassical elasticity approach in its formulation. This model otherwise known as Thirlwall theory has gained a lot of popularity. According to this theory, export is the only components of national output that provides foreign reserves which consequently allows the growth of other demand components in an open economy (Bahmani and Ratha, 20k04). BOP constraint model explains that if an economy's rate

of imports exceeds the rate of exports, then current account deteriorates which in turn impedes economic growth.. According to this theory the relationship between export and growth is circular and cumulative to the extent that export led growth increases productivity which further increases competitiveness and revenue growth from exports (Bahmani and Ratha, 2004). The focus of the monetary approach to the balance of payments is on the balance of payments as a whole (the current and the capital account) so that a balance-of-payments disequilibrium is equivalent to a change in the level of international reserves. The essence of the argument is that balance-of-payments disequilibrium must be considered as the outcome of stock disequilibrium between the supply of and demand for money. This theory is critical to the study in the sense that it highlights the merits and demerits of having a negative balance of payment to any particular country; a phenomenon so commonly experienced in less developed and developing country thus explaining the importance of having an export oriented-economy.

Debt overhang theory

The debt overhang theory first discussed by Myers in 1977 depends on the fact that if debt will surpass the nation's repayment ability with some likelihood in the future, then the expected debt service is likely to be increasing as the country's output level increases. In this manner a portion of returns from investing in the domestic economy will be taxed away to pay the existing creditors and this will discourage new foreign investors (Claessens, Derogate and Kanbur, 1996). The borrower country will therefore use only partially of any increase in output and exports since a good portion of that increase will be used to service the existing external debt. This creates a problem because if a country has a new investment project which may generate positive net present value, the country will not invest due to an existing debt position hence the country's level of investment will start decreasing. The presence of this stock of external debt changes the incentive of either the creditor or the debtor.
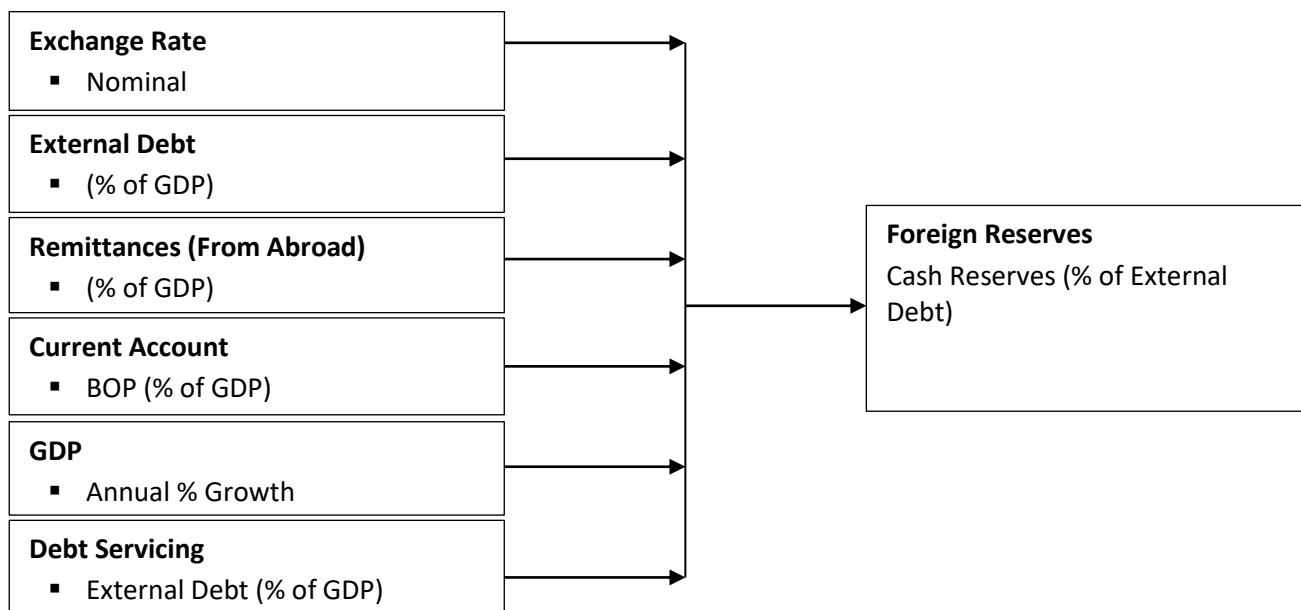
External debt relief may therefore benefit either of them. The creditor could have an incentive to keep on lending in order to avoid a loss thinking that the debtor will improve its economic conditions and will be in a position to repay the debt in the near future. On the other hand, the debtor has disincentive to invest because of the assumption that all the gains will be taxed away to pay the lender. This theory implies that a decrease in the amount of external debt will lead to increase in domestic investment and a reduction in government spending.

Optimum reserves theory

Rollover risk faced by the government in an economy is a major reason for the theory of optimum reserves. This elementary model spreads to a dynamic structure to provide a theory for the rise in external reserves and the pattern of abrupt stops in developing economies as pointed by Hur and Kondo. It postulates that while short-term reserves, short term liquidation, and the interest rate are functions of the aggregate liquidity shock, the rollover policy is a function of both the aggregate state and the individual liquidity shock of an investor. A debt contract is resource feasible. In other words, initial reserves and invested capital cannot exceed the loan amount; and interim reserves and interim payments cannot exceed initial reserves and interim output. Obviously, the main friction here is that the government cannot lend the interim against the future output from the initial investment. Hence, liquidation and reserves are the only resources available to make interim payments. Similarly, final output and residual reserves are the only resources available to make final payments. The theory suggests a condition which requires that the interim rollover policy is to roll over the loan if and only if rolling over yields a higher payment than calling the loan in the interim.

This theory is critical to the study in that it identifies the structures within countries that give rise to competitive advantage. It reveals how structures and systems can be redesigned to increase operational efficiency hence increased foreign reserves holdings.

Conceptual Framework

Independent Variables	
Exchange Rate ▪ Nominal	
External Debt ▪ (% of GDP)	
Remittances (From Abroad) ▪ (% of GDP)	**Foreign Reserves** Cash Reserves (% of External Debt)
Current Account ▪ BOP (% of GDP)	
GDP ▪ Annual % Growth	
Debt Servicing ▪ External Debt (% of GDP)	

Independent Variables   Dependent Variables

Figure 1: Conceptual Framework

METHODOLOGY

Research Design: A cross sectional research design was applied. The cross sectional research design was used due to its ability to depict the actual nature of the variables under study in their present environments.

Target Population: The target population for this study was the entire economic performance data for the variables under study. The study captured the annual economic variable data for the period 1995 to 2019. In total 25 observations were captured for each of the six variables.

Sampling Design and Sampling Size: Gay (1992) describes sampling as a process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected.

Sampling Technique: In this study a non-probabilistic sampling technique was employed. A convenience non-probabilistic sampling was the most suitable considering the nature and time frame of the research. According to Mugenda and Mugenda (2003), purposive sampling allows a researcher to use cases that have the required

information with respect to the objectives of the study.

Research Data: In accordance with the study objective of examining the link between foreign exchange reserves and the factors affecting the levels of foreign reserves stock in Kenya, secondary data was sourced from World Development Indicators, CBK and ADI database. The data period was from 1995 to 2019 on annual basis. Variable wise, external debt is measured as a percentage of GDP, external reserves as a percentage of external debt, BOP as a percentage of GDP, remittances as a percentage of GDP, GDP on the percentage annual growth and NEXCR (nominal exchange rates).

Data Collection Methods: In this study, secondary data was collected to analyze and meet the requirements of the specific research objectives. The main method of collecting data was the desk study. A data collection sheet was designed to collect data for the study variables. The checklist structure particulars are; number of years, the variables and their corresponding data for each year as indicated on the appendices.

Data Processing: In order to obtain meaningful information collected data was cleaned, coded and

properly analysed. Secondary data gathered was organized in Ms Excel spread sheets for the purpose of analysis. The data was then analysed and models fitted using statistical data analysis software; E-views 11. Autoregressive Distributed Lag (ARDL) co-integration approach was employed, in other word, bounds test for the investigation of long-run relationships and dynamic connections among the variables of interest. The data analysis findings were then be organized in tables and graphs.

Data Analysis: The study tested for time series properties such as the presence of unit roots and co-integration before estimation so as to guarantee

meaningful regression results. For a significant and robust result of this study, econometric problems such as multicollinearity, heteroscedasticity and autocorrelation were be checked for and eliminated.

FINDINGS

This section presented the research findings on factors affecting the level of foreign exchange reserves in Kenya. The study conducted was on a 25- year period where secondary data for the period between 1995 and 2019 was analyzed.

Descriptive statistics of variables

Table 1: Descriptive statistics of variables

Variables	FERS	NEXCR	GDP	LNBOP	RMT	EXDEBT	DBTS
Mean	29.09940	79.24296	4.37280	1.81328	2.2540	37,5692	3.1676
Median	27.7220	78.5360	4.8000	2.04122	2.3350	34.6460	2.2470
Maximum	48.7890	103.4100	8.4000	2.9123	4.5350	83.7620	10.3650
Minimum	5.2570	51.4300	0.4700	-0.5108	0.3920	21.3840	1.0090
Std. Dev	13.86332	14.63014	2.12509	0.7519	1.1239	14.5800	2.2875
Skewness	-0.03434	0.06557	-0.4220	-1.31752	0.11421	1.26429	4.9600
Kurtosis	1.65834	2.29153	2.39724	4.84536	2.64879	4.94310	4.9600
J-Bera	1.87996	0.54075	1.12048	10.78011	0.18284	10.59311	11.9573
Probability	0.39063	0.76309	0.57107	0.00456	0.91263	0.00501	0.00253
Sum	727.4850	1981.074	109.3200	45.3320	56.3500	939.2310	79.1900
Sum sq D	4612.598	5136.987	108.3834	13.5698	30.3194	5101.88	125.5931

Table 1 presented the descriptive statistics of the variables of interest. It can be observed that the mean and median of virtually all the variables are close in values, which implies that their distributions are nearly symmetrical. This is an indication of low variability. The skewness statistics shows that four of the variables namely, nominal exchange rate, remittances, external debt and debt servicing, are positively skewed, while the remaining three namely, log of BOP, GDP and foreign exchange reserves are negatively skewed. The Jarque-Bera probability values for three variables namely, log of BOP, external debt and debt servicing are below the 0.05 critical level. This suggests a rejection of the null hypothesis of normal distribution for the three variables at 5 per cent level of significance. The absence of normality in their distribution may be as a result of the cross-

sectional and heterogeneous nature of the data employed in the study. However, such heterogeneities are corrected for in data analysis.

Lag Order Selection

Before estimating the ARDL model, the study determined the optimal lag length (K). This was to ensure that the model specified should have the "right" number of lags included. This is because including too many lags would lead to loss of degrees of freedom. If the included lags are too few then the model will be imprecise. The information criteria like Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Likelihood ratio (LR), and Final Prediction Error (FPE) were employed to choose and affirm the appropriate lag length. From the results on VAR Lag Order Selection Criteria, SC, AIC and LR selected 2 lags as the optimal.
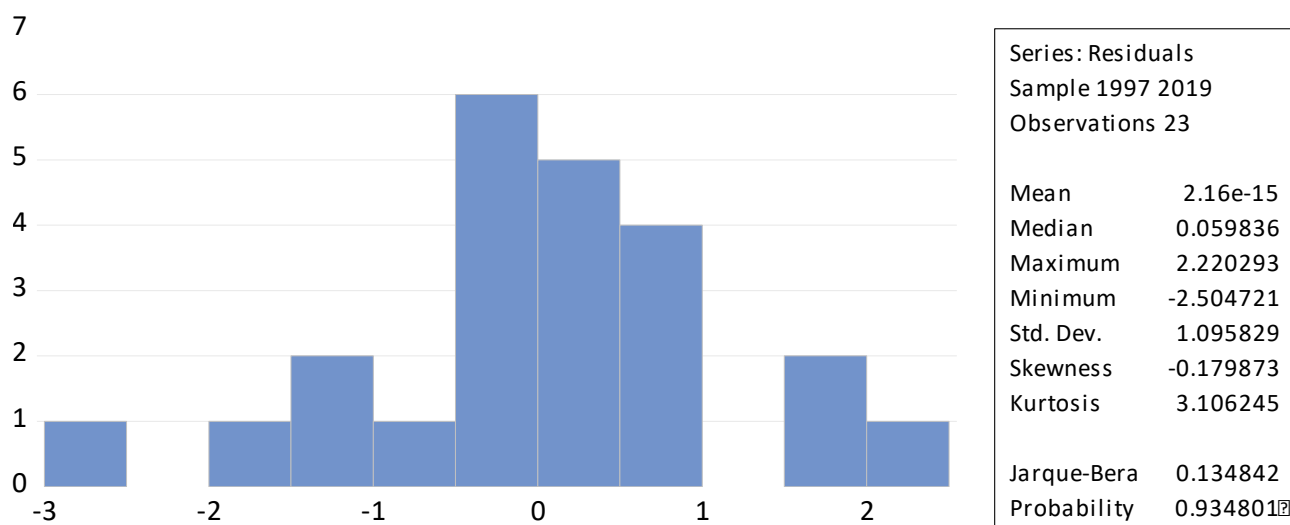
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Normality test

Series: Residuals	
Sample 1997 2019	
Observations 23	
Mean	2.16e-15
Median	0.059836
Maximum	2.220293
Minimum	-2.504721
Std. Dev.	1.095829
Skewness	-0.179873
Kurtosis	3.106245
Jarque-Bera	0.134842
Probability	0.934801

Figure 2: Hypothesis

H_0: Error term is normally distributed. '

H_1: Error term is not normally distributed.

Significance Level: α = 5% or 0.05

Decision Rule: Reject H_0 if p-value is less than α.

Multicollinearity test

Table 2: ML test

Variance Inflation Factors
Sample: 1995   2019
Included observations: 103

Variable	Coefficient Variance	Centred VIF
FERS	0.011379	1.182854
NEXCR	0.006812	1.324975
GDP	9.66E-09	1.20426
RMT	0.006546	1.530432
EXDEBT	0.001203	1.361815
DBTS	0.020137	1.401235

The research applied the Variance Inflation Factor to determine the level of collinearity between the predictor variables. All VIF factors that were between 1 and 10 were adopted since they indicated zero multicollinearity.

The findings above indicated that the VIF values for the variables; foreign exchange reserves *(VIF= 1.182)*, nominal exchange rate *(VIF= 1.325),* gross domestic product *(VIF= 1.204),* remittance *(VIF= 1.530)* external debt *(VIF= 1.362),* and debt servicing *(VIF= 1.401).* This indicated there was zero correlation problem in the research since all the VIF values were below 10.

Autocorrelation

Serial correlation is present if residuals of one period are related to the residuals of the previous period. Breusch-Godfrey Serial Correlation LM test was employed in the study to test for the presence of serial correlation. The null hypothesis for serial correlation test was stated as, H0: There is no serial

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correlation. If the probability value (p-value) is greater than 0.05, the null hypothesis is not rejected. The results on Breusch-Godfrey Serial Correlation LM Test are presented in table 3.

Table 3: LM-Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.074578	Prob. F(2,9)	0.9287
Obs*R-squared	0.374961	Prob. Chi-Square(2)	0.8290

Table 3 confirmed that there was no evidence of autocorrelation as the probability of the observed R-squared is greater than 0.05 hence the study accepts the null hypothesis of no serial correlation.

Heteroscedasticity

Heteroskedasticity transpires when the variance of the residuals in a model is not constant. Breusch-Pagan-Godfrey test was employed to test for the presence of heteroskedasticity. The null hypothesis for the test, H_0: Variance is constant (homoscedasticity). If the probability value (p-value) is greater than 5 percent, the null hypothesis is not rejected. The results are presented in table 4.

Table 4: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.492462	Prob. F(16,6)	0.8793
Obs*R-squared	13.05720	Prob. Chi-Square(16)	0.6686
Scaled explained SS	0.935784	Prob. Chi-Square(16)	1.0000

Since the probability value is greater than 5 percent, the null hypothesis of variance is constant is not rejected, concluding there is no problem of heteroskedasticity

Regression specification error test

The RESET test which was proposed by Ramsey (1969) was utilized to determine the departure from the classical linear regression assumptions. In classical normal linear regression, the disturbance vector is ventured to follow the multivariate normal distribution N (0, I). Specification error is an omnibus term which covers any take-off from the assumptions of the maintained model. Serial correlation, heteroskedasticity, or non-normality of all violate the assumption that the disturbances are distributed N (0, I). Ramsey and Alexander (1984) affirmed RESET as a test for correlation between independent variables and residuals, omitted variable problem and incorrect functional relationship in a model. In most cases the specification errors are due to measurement errors of the independent variables and expression of the independent variable as a function of lagged values in the model. The previous diagnostic test for normality, and heteroskedasticity proved that the estimated model satisfies all the OLS assumption hence desirable. Further, Ramsey RESET test was employed to examine the estimated equation. The results are presented in table 5.

Table 5: Specification error test

	Value	df	Probability
F-statistic	0.205576	(2, 4)	0.8223
Likelihood ratio	2.250351	2	0.3246

Unit root test

Table 6: Unit-Root Test (Augmented Dickey-Fuller)

ADF - Fisher Chi-square

Variables	Level (trend & intercept)			1st Difference(intercept)		
	Stats	Prob	Status	Stats	Prob	Status
FERS	0.3856	0.9821	Non-stationary	5.1728	0.002	Stationary
GDP	4.399	0.0099	Stationary			
NEXCR	2.6390	0.2682	Non-stationary	3.9647	0.025	Stationary
LNBOP	2.8437	0.1966	Non-Stationary	4.6321	0.006	Stationary
RMT	3.7883	0.037	Stationary			
EXDEBT	3.1507	0.1178	Non-stationary	6.1573	0.000	Stationary
DBTS	5.6983	0.0006	Stationary			

While the ARDL approach to co-integration is applicable whether the variables are all integrated of order zero or of order one, it is still necessary to carry out unit root tests on the variables in order to be sure that no I (2) variable is involved. In order to identify the stationarity and order of integration of the variables, Augmented Dickey-Fuller (ADF) unit root test was conducted as shown in Table 6. The tests were carried out in the level form and first difference of the series. The variables were assumed in level with a constant and linear trend, whereas assumed only a constant in first difference.

Moreover, the lag length of ADF test using Schwarz Information Criterion (SIC) with a maximum lag length of 2 was employed. The results in Table 6 show that GDP, remittances and debt servicing are stationary at level at 5% significance level. However, foreign exchange reserves, nominal exchange rate, log of BOP and external debt are stationary at first difference at 5% significance level. In conclusion, the stationarity of the variables is found in ADF tests, besides there is no I (2) variables in the test. Therefore, can proceed to the model estimation by using ARDL co-integration technique.

ARDL Bound Co-integration Test Model

Table 7: Bound Co-integration Test Model

F-Bounds Test		Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif.	I(0)	I(1)	
		Asymptotic: n=1000			
F-statistic	5.889647	10%	1.99	2.94	
k	6	5%	2.27	3.28	
		2.5%	2.55	3.61	
		1%	2.88	3.99	
Actual Sample Size	23	Finite Sample: n=35			
		10%	2.254	3.388	
		5%	2.685	3.96	
		1%	3.713	5.326	
		Finite Sample: n=30			
		10%	2.334	3.515	
		5%	2.794	4.148	
		1%	3.976	5.691	

In order to find out the long-run relationship among the variables, the Wald F-statistics bounds testing approach on the ARDL equation is carried out. The lag lengths selected to estimate ARDL model are based on what had been purposed by SIC. We assumed the variables with a constant and no linear trend.

Decision Rule: Reject H_0 if test statistic is greater than upper critical value, otherwise do not reject **Error Correction Estimates of the ARDL Model**

H_0. According to the result in Table 8, the calculated F-statistic (5.8896) is higher than the upper bound test critical value at 5% significance level (3.388). This shows that the null hypothesis of no co-integration is rejected at 5% significance level, thus we concluded that there is a long-run association among the variables. Based on this result, we can evaluate the long-run effect of each variable on foreign reserve stock.

Table 8: Error Correction Estimates

ECM Regression Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FERS(-1))	-0.313080	0.083387	-3.754522	0.0095
D(NEXCR)	-0.134020	0.068688	-1.951131	0.0989
D(GDP)	2.481670	0.229516	10.81261	0.0000
D(GDP(-1))	-2.069123	0.229847	-9.002178	0.0001
D(RMT)	1.154840	0.367003	3.146677	0.0199
D(RMT(-1))	-3.039008	0.381942	-7.956730	0.0002
D(EXDEBT)	-0.641791	0.129985	-4.937428	0.0026
D(EXDEBT(-1))	0.538290	0.097995	5.493042	0.0015
D(DBTS)	0.484867	0.206604	2.346844	0.0573
CointEq(-1)*	-0.645405	0.063877	-10.10382	0.0001
R-squared	0.953137	Mean dependent var		0.663174
Adjusted R-squared	0.920693	S.D. dependent var		5.062062
S.E. of regression	1.425549	Akaike info criterion		3.846012
Sum squared resid	26.41849	Schwarz criterion		4.339705
Log likelihood	-34.22914	Hannan-Quinn criter.		3.970175
Durbin-Watson stat	3.102445			

The value of error-correction term which is -0.6454 implies that the long-run relation model is a valid error-correction mechanism for any disequilibrium occurs in the short-run. According to the Granger representation theorem, when variables are co-integrated, there must also be an error correction model (ECM) that describes the short-run dynamics or adjustment of the co-integrated variables towards their equilibrium values. The result of the ECM is presented in Table 9. The lagged error term is negative and highly significant. The coefficient of -0.6454 indicates evidence of fast adjustment towards long-run equilibrium. Similarly, both the short run and long run results yielded the same sign for the selected variables except remittances and debt servicing, which takes positive sign in the short run. This underscores the fact that reserve build-up in Kenya is mainly a function of growth in GDP, remittances in the short-run and external debt. Other variables gain prominence only in the long-run. This also explains why the F-statistics lies above the upper bound of the critical value as tabulated in Pesaran et al (2001).

The Long-Run Relation of Foreign reserves and Its Determinants

Table 9: Long-Run Relation

Variables	Coefficient	Std. Error	T-Statistics	Probability
NEXCR	-0.593091	0.321697	-1.843631	0.1148
GDP	6.470499	3.557756	1.818702	0.1188
LNBOP	-7.150126	2.880186	-2.482522	0.0476
RMT	-1.064936	1.486744	0.716288	0.0107
EXDEBT	0.235955	0.425102	-0.555056	0.0189
DBTS	-1.996706	2.164116	-0.922643	0.0018
C	81.70448	16.57431	4.929586	0.0026

Long run equation;

$$FERS_{it} = 81.7045 - 0.5931NEXCR_{it}$$
$$+ 6.4705GDP_{it} - 7.150LnBOP_{it}$$
$$+ 1.0649RMT_{it} - 0.2360EXDEBT_{it}$$
$$- 1.9967DBTS_{it} - \varepsilon_t$$

The constant value which is known as the Y intercept, is 81.7044. The altitude of the regression line when it touches the Y axis is explained by the value of constant in a model. If all the regressors are assumed to be zero, it's the projected value of foreign reserves. The results show that the variables; log of BOP, external debt, remittance and debt servicing in the long run have significant impact on the stock of foreign reserves while' GDP and nominal exchange rate are insignificant.

The result indicates that the long run overall model is well fitted as the independent variable explained over 85% (R- squared) movement in the dependent variable. The p-value (0.0000414) of the F-statistic indicates that the overall model was significant in explaining the relationship between the current account balance and the selected macroeconomic variables. Durbin-Watson statistic (3.102) which is greater than 2 implies no serious autocorrelation problems. This is also supported by the serial correlation test.

The long-run coefficients show that remittances, Lag of BOP, nominal exchange rate (NEXCR), external debt and debt servicing exhibits negative significant effects on the foreign reserves stocks, with growth in GDP exhibiting a positive though insignificant effect on foreign reserves stocks. The

significant inverse effect on reserves by lag of BOP confirms reserves accumulation is negatively related to the level of imports. Thus, any 1 % increase in imports induces 7.15 % fall in reserves and vice versa. Nominal Exchange rate (NEXCR), have a negative sign showing an inverse relationship with reserves holdings, although statistically insignificant. The insignificance of nominal exchange rate may be taken to indicate, although Kenya's exchange rate is said to be market determined in real sense, it is somehow managed by the CBK for some period. External debt and debt servicing having a negative effect on the stocks of foreign reserves affirms the position Kenya find herself due to accumulation of too much foreign dominated debt. Debt servicing eats into the foreign reserves stocks since the external debt is repaid in foreign currency.

These findings are in concurrence with other studies such as (Heilmann (2006), Vacaflores (2011), Narayan et al. (2011), Nath and Vargas-Silva (2012)). While inflows of foreign currency (remittances) always result in the accumulation of international reserves, their full impact can be diminished by secondary effects, namely inflationary and "Dutch Disease" effects. A significant portion of these remittances are used to satisfy consumption needs, generating inflationary pressure – if they are not fully sterilized – through the stimulation of internal demand for imported goods can result in the reduction of the stocks of foreign reserves.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

The general objective of this study was to investigate the factors that affect the levels of foreign exchange reserves. The real inspiration of this study was based on the fact that the continuous high appetite for external borrowing to finance budget deficit/mega infrastructures in the country have been of concern to economists in the Kenyan economy. To achieve the objectives of the study a methodology framework of autoregressive distributed-lag (ARDL) is undertaken to investigate on year period from 1995 to 2019. The study is guided by the following research question: What are the effects of GDP growth on the stock of foreign reserves? What are the effects of remittances on the stock of foreign reserves? What are the effects of nominal exchange rate on the stock of foreign reserves? What are the effects of external debt on the stock of foreign reserves? What are the effects of debt servicing on the stock of foreign reserves? Descriptive statistic research design is used. Secondary data collected from the World Bank website, CBK website and WDI website is employed. Data analysis is done using the E-views 11 software and results presented in form of tables. The findings reveal a long-run relationship among all the variables. Moreover, log of BOP, external debt, remittance and debt servicing in the long run have significant impact on the stock of foreign reserves while GDP and nominal exchange rate are insignificant. Time series properties were tested such as the presence of unit roots and co-integration of the variables to ensure that spurious results would not result. GDP, remittances and debt servicing are stationary at level at 5% significance level. However, foreign exchange reserves, nominal exchange rate, log of BOP and external debt were non-stationary at level but became stationary at first difference hence integrated of order one I (1). The stationary series were included in analysis, whereas the non-stationary series were differenced once before their inclusion. Bound Co-integration test results confirmed that the variables were co-integrated and therefore the study estimated vector error correction model (ECM). ECM allowed the test causality in two different ways; first it allowed for short-run causality test, which was examined by lagged differences of the variables and second the long-run causality determined by the significance of the coefficient. Before interpreting the results, the estimated models were subjected to pre and post diagnostic test. Some of the diagnostic tests conducted were residual normality test, multicollinearity test, serial correlation test, regression specification error test, moqazdlel stability and normality tests.

In the first research question's finding, it is evident that the results of GDP though positive are insignificant to the foreign reserves stocks in the long-run. The findings of the study concur with the literature available such as; holding foreign exchange reserves results in costs, Rodrik (2012) estimated that the cost of accumulating foreign exchange reserves was approximately 1% of the GDP in developing countries. Gallagher and Shrestha (2015) reported that the figure was more than 1.8% of the GDP in developing countries and 3% in China. The yield on foreign exchange reserves is much lower than the government's financing costs for borrowing in local currency or dollars. However, policymakers and scholars argue that the economic cost of holding foreign reserves is lower than the financial impact of an economic crisis.

The second research question finding reveal existence of an inverse relationship between remittances and stock of foreign reserves. The value of -1.0649 implies that when the flow of remittances increases by 1 percentage point, on average, the estimated foreign reserves stock decreases by 106.49 percentage point in the long-run, holding other variables constant. This finding is consistent with other studies such as (Heilmann (2006), Vacaflores (2011), Narayan et al. (2011), Nath and Vargas-Silva (2012)). In their studies they conclude that while inflows of foreign currency (remittances) always result in the accumulation of

international reserves, their full impact can be diminished by secondary effects, namely inflationary and "Dutch Disease" effects. A significant portion of these remittances are used to satisfy consumption needs, generating inflationary pressure – if they are not fully sterilized – through the stimulation of internal demand for imported goods can result in the reduction of the stocks of foreign reserves.

The third research question finding reveal that nominal exchange rate has a statistically insignificant effect on the stock of foreign reserves. Nominal Exchange rate (NEXCR), have a negative sign showing an inverse relationship with reserves holdings, although statistically insignificant.

This finding is in line with the available literature such as, Romero (2011) carried out a study of causative factors of foreign reserves in China and India and found that these countries have increased demand for reserves over time. This is consequent upon the fact that exchange rate varies inversely with reserves. Abdullateef and Waheed (2010) extended the study by evaluating the determinant of foreign reserves with emphasis on change in external reserve (EXTR) positions of Nigeria relative to domestic investment, inflation rate, and EXR. With a battery of tests, it was discovered that change in external reserves influences Foreign Direct Investment and Exchange Rates.

The fourth and fifth research question finding reveal a positive, significant relationship and a negative significant relationship respectively between external debt and debt servicing on the stock of foreign reserves. The value of 0.2359 shows that holding other factors constant, when the external debt increases by 1 percentage point, on average, the estimated foreign reserves stock rises by 23.59 percentage point. Similarly, the value of -0.19967 shows that holding other factors constant, when the external debt servicing increase by 1 percentage point, on average, the estimated foreign reserves stock decreases by 19.69 percentage point. Debt servicing eats into the foreign reserves stocks since the external debt is repaid in foreign currency.

This finding is in line with other previous research findings such as, Ajayi and Jongmoo (1993) conducted research to confirm the effect of external debt on foreign reserves. The study adopted the model using financial and intangible concepts of exchange rates, including foreign debt, measuring the impact of external debt on monetary values. The study, which was based on a sample of less developed countries, showed a negative impact on 12 countries in the sample. Research has shown that external debt has a significant negative impact on foreign reserves through debt servicing.

The significant inverse effect on reserves by lag of BOP confirms reserves accumulation is negatively related to the level of imports. Thus, any 1 % increase in imports induces 7.15 % fall in reserves and vice versa. This finding is in line with other previous research findings such as, Aghevli and Khan in 1977 conducted research about foreign exchange reserves in 39 Developing Countries. The model used was the Reserve Flow Equation for the period 1957-1966. The dependent variable was the Foreign Exchange Reserves. The independent variables consist of national income, price level, interest rates, money supply and domestic credit. Conclusion partially supported propositions monetary approach to the balance of payments, but most did not

Conclusions

The study concluded that reserve build-up in Kenya is mainly a function of growth in GDP, remittances in the short-run and external debt. In addition, the long-run coefficients show that remittances, Lag of BOP, nominal exchange rate (NEXCR), external debt and debt servicing exhibits negative significant effects on the foreign reserves stocks in the long run, with growth in GDP exhibiting a positive though insignificant effect on foreign reserves stocks. The significant inverse effect on reserves by lag of BOP confirms reserves accumulation is negatively related to the level of imports confirming Kenya is a net importer country. Thus, any 1 % increase in imports induces 7.15 % fall in reserves and vice versa. Nominal Exchange rate (NEXCR),

have a negative sign showing an inverse relationship with reserves holdings, although statistically insignificant. The insignificance of nominal exchange rate may be taken to indicate, although Kenya's exchange rate is said to be market determined in real sense, it is somehow managed by the CBK for some period. External debt and debt servicing having a negative effect on the stocks of foreign reserves affirms the position Kenya find herself due to accumulation of too much foreign dominated debt. Debt servicing eats into the foreign reserves stocks since the external debt is repaid in foreign currency thus putting a constraint on the stock of Kenya's foreign reserves in the long run.

Recommendations

From the above analysis, the following recommendations were made;

Remittances have been found to exhibit a positive significant effect on the stocks of foreign reserves in Kenya in the short run but a negative effect on the long run. This calls for Central Bank of Kenya to constantly monitor and intervene through proper channels that would prevent adverse economic pressure such as 'Dutch disease' on the stock of foreign reserves that may arise as a result of uncontrolled accumulation of foreign currency inflows since the link between remittances and international reserves depends on its effect on international reserves but also on economic activity, both affected by the exchange rate regime in place.

Kenya's BOP has been found to exhibit negative and significant effect on the stock of foreign reserves this can be explained by the export earnings dismal performance over the years. This calls for concerted efforts by both levels government both national and county governments to strive to make Kenya a net exporter rather than a net importer through policies and investment initiates that promote export-oriented production industries as well as value addition of our primary raw materials through manufacturing for them to fetch better prices in the international markets. This would in turn bridge the foreign reserve gap in the country.

Though external debt has been bridging the foreign reserves gap through borrowing, for the last decade there has been an alarming external borrowing appetite by the GOK which in recent times puts the government in a debt rut consequently exerting pressure on the country's foreign reserves through debt servicing of both the principle amounts and the accumulated interest rates. To minimize the risk of defaults and other an intended adverse economic effect arising from excessive outflow of foreign reserves due to the country meeting its external obligation there is a need to restructure the existing debts as they become due in order to spread the repayment tenure and equally curb the government borrowing appetite.

Areas for Further Research

The main focus of the study was limited to the factors affecting the levels of foreign reserves stock in Kenya. The study proposes further investigation on the relationship between other macroeconomic variables and foreign reserves to determine their short term and long-term effect in Kenya. Further the study proposes a cross-country analysis for the eastern African countries or even the sub-Saharan countries to further understand the factors affecting the levels of foreign reserves stock between and among countries.

REFERENCES

A.O, & Oladunni, S. (2015). Determination of optimal foreign exchange reserves in Nigeria. Central Bank of Nigeria Working Paper Series CBN/WPS/01/2015/06.

Aizenman, J and N. Marion, (2015): Foreign Exchange Reserves in East Asia: *Why the High Demand, FRBSF Economic Letter, No. 2015-11, available at* ww.frbsf.org/publications/economics/letter/2003el2003-11.pdf.

Aizenmann, J., and N. Marion (2015). The high demand for international reserves in the Far   East: *what's going on? NBER Working Paper Series, No. 9266. Available at https://www.nber.org/papers/w9266.p*

Ben-Bassat, A. and D. Gottlieb, (2012): Optimal International Reserves and Sovereign Risk, *Journal of International Economics*

Bird, G. and R. Rajan, (2013): Too much of a Good Thing? The Adequacy of International Reserves   in   the Aftermath of Crises, *The World Economy, Vol. 26, No.6.*

Calvo, G. A. and Reinhart, C. M (2016): Fear of Floating, *Quarterly Journal of Economics 117(2)*

Carlos, B., C. Pierre, C. Joachim, X. D. Francis, and M. Simone, (2014): Risk Management for Central Bank Foreign Reserves, *European Central Bank, April.*

Collana, R. (2014): The buffer stock model redux? An analysis of the dynamics of foreign reserve accumulation, *Research Department, Intesa Sanpaolo S.P.A, February 2017*

Comelli, F., P. Georges, D. Ettore, and L. Angelika, (2016): Accumulation of Foreign Reserves, *Social Science Research Network.*

Disyatat, P & D. Mathieson, (2015): Currency Crises and the Demand for Foreign Reserves, *Mimeo, (April).*

ECB (2016): The Accumulation of Foreign Reserves", *Occasional Paper   Series, No.43, ECB, February 2016.*

ECB (2016): The Optimal Currency Shares in International Reserves: The Impact of Euro and the Prospects of the Dollar*, ECB Working Paper, No. 694, November 2016*

Engle, R.F. and C.W.J. Granger (2015): "Cointegration and Error-Correction: Representation, Estimation, and Testing", *Econometrical 55, March 2015*.

Fischer, S. (2011): Opening Remarks. IMF/World Bank International Reserves: *Policy Issues Forum, International Monetary Fund, Washington, DC. Available at: www.imf.org/external/np/speeches/2001/042801.htm, April 28.*

Flood, R.P and N.P. Marion, (2016): International Reserves in an Era of High Capital Mobility, *International Monetary Fund, Washington, DC, IMF Working Paper, No. WP/02/62.*

Frenkel, J. A and B. Jovanovic, (2015): Optimal International Reserves*, Economic Journal, Vol. 91, No. 362, pp.507-14.*

Garcia, P. and C. Soto, (2015): Large hoarding of international reserves: Are they worth it? *Central Bank of Chile Working Paper No 299.*

Greenspan, A. (1999): Currency Reserves and Debt, *paper presented at Remarks before the World Bank Conference on Recent Trend in Reserve Management, Washington, DC*.

Harris, R. and R. Sollis, (2013): Applied Time Series Modelling and Forecasting, *Wiley Applications.*

Heller, R. (2015): Optimal International Reserves, *Economic Journal, Vol. 76, No. 302.*

IMF (2014): Debt-and Reserves-Related Indicators of External Vulnerability, a paper prepared by the   *Policy Development and Review Department in Consultation with other Departments, March 2014.*

IMF (2015): Guidelines for Foreign Exchange Reserves Management, *International Monetary Fund, September.IMF (2015): "Reserve Management Guidelines" available at www.imf.org*

IMF (2015):*"International Monetary Fund, Annual Report"*, available at www.imf.org/external/pubs/ft/ar/2009/eng/pdf/a1.pdf

International, http://dx.doi.org/10.1155/2016/1957017 Suheyla, O., & Yaman, B., (2005). Optimal versus adequate level of international reserves: evidence for Turkey. Applied Economics, 37, 1557–1569.

IRC Task Force (2016): The Accumulation of Foreign Reserves, European Central Bank Occasional Paper No. 43, February.

Johansen, S. and K. Juselius, (2015): 'Maximum Likelihood Estimation and Inference on Cointegradon- with Applications to the Demand for Money*, Bulletin*

Lawrence, H. S. (2016): Reflections on Global Account imbalances and Emerging Markets Reserves Accumulation, *Paper presented at J. K. Jha Memorial Lecture, March*.

Marion, V. W. (2015): Foreign Exchange Reserves - How Much is enough? *Text of the Twentieth Adlith Brown Memorial Lecture delivered by Dr. Marion V Williams, Governor of the Central Bank of Barbados, at the Central Bank of the Bahamas, Nassau, November*.

Medhora, R. (2015): The Gains from Reserves Pooling in the West African Monetary Union. *Economia Internazionale*,

Olomola, P. & Ajayi, I, (2018). The determinants of international reserves in West African States. *Global Journal of Human-Social Science*, 18(4), 1-9.

Oputa N. C. & Oguleye T.S. (2010). External reserves accumulation and the estimation of the adequacy level for Nigeria, CBN Economic and Financial Review, 48/3(1), 1-30.

Oyeniran, I.W. & Maryam, W. T. (2015). Financial market integration and economic growth: an experience from Nigeria, Nigeria Deposit Insurance Corporation Quarterly Journal 26(1/2),31-35.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of long-run relationships. *Journal of Applied Econometrics*, 16(3), 289-326.

Prabheesh (2013). Optimum international reserves and sovereign risk: evidence from India, *Journal of Asian Economics,* 28, 76-86.

Rodr´ıguez, C. S. & Funk, K., (2012). Estimation of optimal international reserves for Costa Rica: a micro-founded approach. Research Document No. 01-2012, The Research Paper Series of the Economic Research Department from Central Bank of Costa Rica.

Sanusi, K.A., Meyer, D.F., & Hassan, A.S. (2019). An investigation of the determinants of foreign exchange reserves in Southern African countries. *Journal of International Studies*, 12(2), 201-212.

Senibi, V., Oduntan, E., Uzoma, O., Senibi, E. & Oluwaseun, A. (2016). Public Debt and External Reserve: The Nigerian Experience (1981–2013). Economics Research

Shijaku, G. (2012). Optimal level of reserve holding: an empirical investigation in the case of Albania. MPRA Paper 79091, University Library of Munich, Germany.

Triffin, R., (1960). Gold and the dollar crisis. Yale University Press, New Haven.

Tule M. K., Egbuna, E.N., Sagbamah, J.E.L., Abdusalam, S.A, Ogundele, O.S,. Oduyemi

Winjuholds, J., & Kapteyn, A. (2001), Reserve Adequacy in Emerging Market Economies.IMF Working Paper 01/143, Washington DC: *International Monetary Fund*