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**Research Article**

**ANALYSIS OF THE IMPACT OF INTEREST RATE ON BALANCE OF PAYMENTS IN NIGERIA**

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| **Abstract** |
| Existence of interest rates differences between home country and abroad leads to capital mobility. The relationship between interest rate and the balance of payment becomes more evident by looking at country’s capital account. Given that Nigerian economy has recorded unfavourable BOP positive in recent years, it becomes imperative to study the impact of interest rate on BOP in Nigeria. This study therefore sought to determine the impact of interest rate on BOP in Nigeria. This study used secondary data sourced from Central Bank of Nigeria Statistical Bulletin (2021) in its analysis. The study employed Autoregressive Distributed Lag (ARDL) to estimate the short run and long run impact of interest rate on BOP in Nigeria from 1981-2021. The ARDL bound co-integration showed a long run relationship between BOP and interest rate in the country. The empirical result further showed that interest rate has short run and long run positive and significant impact on BOP in Nigeria. The study recommends that the policies should be put in place to fund government plan of work for a period of time than public borrowing in the case of interest rate that has led to the increment on Balance of payment (BOP) deficit. |
| **Keywords:** Interest Rate, Balance of Payment, Loanable Funds, Liquidity Preference, Preferred Habitat, Classical Theory. |

**INTRODUCTION**

An interest rate is the amount of interest due per period, as a proportion of the amount lent, deposited, or borrowed. The interest rate is defined as the proportion of an amount loaned which a lender charges as interest to the borrower normally expressed as an annual percentage, (Oxford Dictionaries, 2018). It is the rate a bank or other lender charges to borrow its money, or the rate a bank pays its savers for keeping money in an account, (Cambridge English Dictionary, 2018). The annual interest rate is the rate over a period of one year. Other interest rates apply over different periods, such as a month or a day, but they are usually annualized. The interest rate has been characterized as an index of the preference for a Dollar of present (income) over a dollar of future income”. The borrower wants or needs to have money sooner rather than later, and is willing to pay a fee-the interest rate-for that privilege, (Caroline, Amy, Timothy, 2021).Interest rate is the cost or charge imputed on borrowed money. Arising from economic theory, higher interest rate discourages investment and investors from borrowing funds from the financial sector, thus, reducing the level of investment and productive activities in the economy. Capital account deals with monetary flows into and out of a nation's financial markets. The most important determinant of financial flows is interest rates, which determine the rate of return on savings/investments. The potential return on financial assets such as real estate and equities will have important effects in the capital market (Mundell 1963). The higher a country's interest rates, the more attractive its financial markets are to both domestic and foreign idle fund (Kenen, 1960). This leads to an increased inflow of money through the capital account and less money leaving a country in search of higher returns in the international market. Sustained inflow will lead to increased supply of foreign currency and a high demand for the domestic currency, consequently, the domestic currency will appreciate over time

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affecting both the exchange rate in the market and the country’s balance of payment (Suranovic, 2012). Interest rates has remained stable with continued implementation of the Nigeria Banks’ Reference Rate (NBRR) framework in the period facilitated a transparent credit pricing framework and enhanced the transmission of monetary policy signals through commercial banks’ lending rates (Fourteenth Monetary Policy Committee Report, April 2015).

**Objective of the Study**

The main objective of this study is to analyze the impact of Interest Rate on the balance of payment in Nigeria. The sub-objectives include:

1. To examine the impact of inflation rates on balance of payment in Nigeria.

**REVIEW OF RELATED LITERATURE**

**Keynes’s liquidity preference theory of interest rate**

Keynes defines the rate of interest as the reward of not hoarding but the reward for parting with liquidity for the specified period. It is not the price which brings into equilibrium the demand for resources to invest with the readiness to abstain from consumption. It is the price which equilibrates the desire to hold wealth in the form of cash with available quantity of cash. In order words, interest rate, in the Keynesian sense, is determined by the demand for and supply of money. This theory is, characterized as the monetary theory of interest, as distinct from the real theory of the classical.(Keynes 1935)

**The classical theory of interest**

According to classical theory, rate of interest is determined by the supply of and demand for capital. The supply of capital is governed by the time preference and the demand for capital by the expected productivity of capital. Both time preference and productivity of capital depend upon waiting or saving of thrift. The theory is therefore, also known as the supply and demand theory of saving, (Friedman 1956)

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**The loanable funds theory of interest**

The neo-classical or the loanable funds theory explains the determination of interest in terms of demand and supply of loanable funds or credit. According to this theory, the rate of interest is the price of credit, which is determined by the demand and supply for loanable funds. In the words of Prof. Learner, it is the price which equates the supply of credit, or saving plus net hoarding in the period, (Hansen 1979).

**Modern theory of interest**

We have seen above that no single theory of interest rate is adequate and determinate. An adequate theory to be determinate must take into consideration both the real and monetary factors that influence the interest rate. Hicks has utilized the Keynesian tools in a method of presentation which allows the productivity, thrift, liquidity preference and money supply are all necessary elements in a comprehensive and determinate interest theory. According to Hansen, an equilibrium condition is reached when desired volume of cash balances equal the quantity of money, when the marginal efficiency of capital is equal to the rate of interest and finally, when the volume of investment is equal to the normal or desired volume of saving, and these factors are inter-related. Therefore, Modern theory of interest rate, saving, investment, liquidity preference and quantity of money are integrated at various levels of income for a synthesis of the loanable funds theory with the liquidity preference theory, (Hansen 1979).

**The preferred habitat theory**

Modigliani and Utch have propounded the Preferred Habitat Theory of the term structure of interest rates. It combines the main features of both the expectations and segmented market theories. According to this theory, investors have a preference for securities of a given term and they want to choose them according to their expected yield. But they will be willing to purchase securities of some other term by substituting them for securities of preferred term. They will do so if they are compensated by the term premium. The term premium is compensation or an additional yield which induces investors to purchase securities with a different term to maturity than their preferred term (Modigliani and Sutch 1966)

**EMPIRICAL FRAMEWORK**

Different scholars and researchers have reviewed the determinants of balance of payments in different countries. Below are some of the international and local reviews carried out by researchers. Bergen (2010) is of the view that the high interest rate policy doesn’t defend currencies against speculative attacks; implying that there is a stinking lack of any systematic association between interest rates and the outcome of speculative attack. However, Utami and Inanga (2009) while examining the influence of interest rate differentials on exchange rate changes based on the IFE theory and the influence of inflation rate and interest rate differentials in Indonesia using quarterly and yearly data for the interest, inflation differentials and changes in exchange rate over a five year period, 2003-2008 used four foreign countries namely: the USA, Japan, Singapore and the UK and Indonesia as the home country, found that interest rate differentials have positive but no significant influence on changes in exchange rate for the USA, Singapore and the UK, relative to that of Indonesia. On the other hand, interest rate differentials have negative significant influence on changes in exchange rate for Japan. Also the results also that several inflation rate differentials have significant positive influence on interest rate differentials.

Furthermore, Umoru and Odjegba,(2013) and Duasa (2004) provided evidence on the long-term relationship between trade balance and income and money supply in the Malaysian economy. Eita and Gaomab (2012) stated that an increase in the interest rates has a positive impact on Nigeria’s current account. However, limited number of researchers has focused on the balance of payment in Nigeria. Another study by Ndungu (1997) states that interest rate differential will widen with real exchange rate appreciation, and this will trigger capital inflows. A thesis by Kiptoo (2007) found that the Real Exchange Rate (RER) is obtained by adjusting the Nominal Exchange Rate (NER) with inflation differential between the domestic economy, and foreign trading partner economies.

**METHODOLOGY**

**Model specifications**

Given that this study aims at analysing the impact of interest rate on balance of payments in Nigeria, the functional form of the model specification is specified as:

BOP = f (INTR) ……………………………………….. (1)

Where: BOP = Balance of payment, INTR = Interest rate

To estimate the above equation, we transformed the functional form into an estimated model as:

BOPt = αօ + α1INTRt + µt ………………………………………….(2)

The Auto Regressive Distributed Lag (ARDL) Model which uses a bounds test approach based on unrestricted error correction model (UECM) was employed here to estimate the effects of selected macroeconomic variables on balance of payment in Nigeria. The ARDL model was developed by Pesaran (1997) and used by Pesaran *et al.* (2001); Masron (2009); Owusu (2012), among others. The major advantage of this approach is based on the fact that it can be applied irrespective of whether the variables are I (0) or I (1). This approach also allows for the model to take a sufficient number of lags to capture the data generating process in a general-to-specific modelling framework. Although, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation, Banerjee *et al.* 1998 and Pesaran et al., 2001, have introduced bound testing as an alternative to test for the existence of co-integration among the variables. The bounds test procedure is merely based on an estimate of unrestricted error correction model (UECM) using ordinary least squares estimator. Tang (2003) argues that the UECM is a simple re-parameterization of a general ARDL model. The ARDL model is stated as:

BOPt = αo + $\sum\_{i-o}^{q}yiBOPt-i$ + $\sum\_{i-1}^{q}yiINTRt-i$ + µt …(3)

In order to obtain the co-integrating equation, equation 3.3 is transformed into 3.4 as follows:

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˄BOPt = αo + $\sum\_{i-o}^{p}yiBOPt-i$ + $\sum\_{i-1}^{q}B˄INTRt-i$ + ɸ1ECTt + µit …….. (4)

Where  …………………………... (5)

The Bound test procedure used equations 3.4 and 3.5 into 3.6 as:

 …….. (6)

Then we test the existence of level relationship as ρ = 0 and δ1 = δ2 = ... = δk = 0

Where= difference operator,  = white noise error term.

**Unit root and co-integration test results**

Since the validity of the ARDL approach relies on *I(0),I(1)* or a combination of both, it is important to first determine the time-series properties of individual variable that enter equation *(3.3)*.This is done to know whether the variables are integrated of order zero or one or even more. Given that unit root testing procedures have their own limitations. Two unit root tests were considered for this research. These are the non-parametric Philip-Perron (PP) test proposed by Phillips and Perron (1988) and the popular Augmented Dickey-Fuller (ADF) unit root test. Both the ADF and the PP test the null hypothesis that the series have unit root (variables not stationary).

**Data source and econometrics software**

The data used in this study obtained from Central Bank of Nigeria (CBN) statistical bulletin 2021, the bureau of statistics 2021. The E-views 10.0 software was used in analysing the data while the Ms-Excel was used to transport the data.

**Table 1. Summary of ADF test results at 1% and 5% critical value**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | ADF Statistics | ADF Critical Value | Optimum Lag Length | Order of Integration | Remark |
| Level | Ist Diff | 1% | 5% |
| BOP | -3.961400 |  | -3.605593 | -2.936942 | 0 | I (0) | Stationary |
| INTR | -2.613109 | -3.624995 | -3.605593 | -2.936942 | 3 | I (1) | Stationary |

Source: Computed by the Researcher with Eview 10

**Table 2. ARDL Bound Co-integration Test Result**

|  |  |  |  |
| --- | --- | --- | --- |
| F-Statistics | K | Significance level | Critical Bound Value |
| 10 (Lower Bound) | 11 (Upper Bound) |
| 6.580606 | 1 | 5%  | 3.62 | 4.16 |
| 1%  | 4.94  | 5.58 |

Source: Author’s computation

**DATA ANALYSIS, FINDINGS AND INTERPRETATION**

**Introduction**

This chapter presents analysis and findings of the study as set out in the research objective and research methodology. The study findings are presented on the effect of selected macroeconomic variables on balance of payment in Nigeria. The data was collected from secondary source, which included the records at Central Bank of Nigeria and Nigeria National Bureau of Statistics.

**Unit root test**

In this study, the Augmented Dickey-Fuller (ADF) unit root test was employed to test for the time series properties of the model variables. This is necessary as it helps to avoid spurious regression results. The ADF tests the null hypotheses that the series has a unit root (not stationary) as against the alternative that the variable has no unit root. The choice of lag length was based on Akaike and Schwartz-Bayesian information criteria and was selected automatically by E-views. The decision rule is to reject the null hypothesis if the ADF statistic value exceeds the critical value at a chosen level of significance (in absolute term). These results are presented in table 1 below.

From table 1 below, observe that the variables INTR was not stationary at level form but became stationary after first difference which implies that the variables are integrated of order one (I ~ (1)) whereas the variables BOP was integrated of order zero (I ~ (0)) as it was stationary at level form. The decision was based on the fact the ADF statistics was greater than the critical values at 5% significance level. Since the variables are integrated of order one and zero and none of the variables is integrated of order two. We therefore, applied the ARDL bound co-integration test. But before we apply the ARDL bound co-integration test, we first determined the optimum lag length using Akaike information criteria. The result is shown in figure 1 below.

**MODEL SELECTION**

After twenty (20) models automatically generated, ARDL (2, 3) model was chosen based on Akaike information criteria.



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**Figure 1. ARDL Optimum Lag Length Selection**

**ARDL bound cointegration test**

A necessary condition for testing ARDL bound co-integration test is that the variables be integrated of either of order one or zero or both (Pesaran, Shin and Smith, 2001). Since all the variables were integrated of order one and zero, we proceeded to estimate the ARDL bound test. The null hypothesis of ARDL bound co-integration is that the variables are not co-integrated as against the alternative that they are co-integrated. The decision rule is to reject the null hypothesis if the F-statistics is greater than the upper bound critical values at chosen level of significance. The result of the ARDL bound co-integration test is shown in table 2 above.

From table 2 the F-statistics is greater than the upper bound at 1% and 5% level of significance. Thus, we reject the null hypothesis and conclude that there exists a long run relationship between balance of payment (BOP) and selected macroeconomic variables in Nigeria. Therefore, we estimate the parsimonious result of the relationships between BOP and interest rate in the country.

**Autoregressive distributed lag (ARDL) result**

**Short Run Parsimonious ARDL Result:** The summary of Short Run Parsimonious ARDL result of the impact of selected macroeconomic variables on balance of payment in Nigeria is presented in table 3.

**Table 3. Summary of Short Run Parsimonious ARDL Result ARDL Model (2, 3)**

|  |  |
| --- | --- |
|  | Dependent Variable D(BOP) |
| Variables | Coefficient | Std. Error | t-statistics | Probability |
| D(BOP(-1)) | 0.364061\*\*\* | 0.188125 | 3.345391 | 0.0621 |
| D(INTR) | 8.977943\*\* | 8.249888 | 2.398778 | 0.2849 |
| D(INTR(-1)) | -1.099255\*\*\* | 7.292121 | -6.346248 | 0.1418 |
| D(INTR(-2)) | 1.324051\*\*\* | 7.272200 | 1.820702 | 0.0783 |
| ECT(-1) | -0.903495\*\*\* | 0.197086 | -4.584265 | 0.0001 |
|  | R-squared = 0.501779; Adj R-Squared = 0.441388 |

\*\*\*[\*\*] denotes significant of variable at 1% [5%] significance level respectively.

**Long Run ARDL Result:** The summary of Long Run ARDL result of the impact of interest rate on balance of payment in Nigeria is presented in table 4

**Table 4. Long Run ARDL Result**

|  |  |
| --- | --- |
|  | Dependent Variable BOP |
| Variables | Coefficient | Std. Error | t-statistics | Probability |
| Constant | -10060.60\*\*\* | 8869.899 | -1.134240 | 0.2654 |
| INTR | 1600.456\*\*\* | 725.2015 | 2.206913 | 0.0349 |

\*\*\*[\*\*] denotes significant of variable at 1% [5%] significance level respectively.

**Interpretation of Short Run Result**

The result in table 4 shows the short run parsimonious result. The lag value of BOP is positively and insignificantly influencing its current value which suggests that an increase in the immediate past state of BOP will bring disequilibrium in the present BOP in the country. Interest rate, as expected is positively and insignificantly related to BOP in the country. Specifically, the coefficient of interest rate suggests that an increase in interest rate by one per cent will bring disequilibrium BOP by about 8.98 units. The coefficient of determination and its adjusted R-Square are 0.502 and 0.441 respectively. This shows an average fit of the model and further suggests that about 50.2 % of the variations in BOP position are explained by changes in the interest rate included in the model while the remaining 49.8% of the variations is captured by the error term. The coefficient of error correction term which measures the speed of adjustment to the long run equilibrium is appropriately signed and significant. Specifically, the coefficient 0f-0.903 implies that about 90.3% of the disequilibrium in the country’s BOP is corrected every year. This further suggests that it takes one year and one month for any disequilibrium in BOP position to be corrected by the interest.

**Interpretation of Long Run Result**

The long run result in table 4 shows that interest rate has positive and significant influence on BOP position in Nigeria.

**Discussion of Test of Hypothesis**

**Hypothesis 1**

***HO: Interest has no statistical significant impact on balance of payment in Nigeria.***

From table 4 above, the probability value for interest rate (INTR) is less than 0.05. Given that the p-value (INTR) is less than 0.05, we reject Ho and conclude that at long run, interest rate has statistical significant impact on balance of payment in Nigeria.

**Evaluation of result based on econometric criteria (2nd order test)**

**Breusch-Godfrey Serial LM Test for Auto- Correlation:** The underlying assumption of autocorrelation is that the successive values of the random μiare temporally independent. The Breusch-Godfrey Serial Correlation statistics is used to test for the presence of autocorrelation of order q in the models.

**Table 5. Breusch-Godfrey tests**

|  |  |  |
| --- | --- | --- |
|  | F-Statistics | Probability |
| Breusch-Godfrey LM test for autocorrelation | 0.004393 | 0.9956 |

From table 5 above, the probability value of B-Q F-statistics is less than 0.05. Since the B-Q statistics is less than 0.05, we accept the alternative hypothesis and therefore conclude that there exists q order serial auto-correlation of stochastic error terms in the model.

**Test for Hetroscedasticity:** The primary reason to test for hetroscedasticity after running for OLS is to detect violation of assumption OLS:5, which is one of the assumptions needed for the usual statistics accompanying OLS regression to be valid. The F – statistics can be used to verify this assumption, and the hypothesis is formulated as follow:

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**Hypothesis**

Ho: (There is no hetroscedasticity, i.e. homoscedasticity)

H1: (There is hetroscedasticity)

Decision Rule; Reject Ho if the calculated F value is greater than the tabulated F value, otherwise accept H1. The hetroscedasticity result is as presented in table 11:

**Table 6: Breusch-Pagan-Godfrey Heteroskedasticity Test**

|  |  |  |  |
| --- | --- | --- | --- |
| F-statistic | 2.054452 | Probability | 0.0879 |
| Obs\*R-squared | 10.81123 | Probability | 0.0944 |

Following the above result, calculated F value = 2.054452 and its probability value = 0.0879. Therefore, since the calculated value of F is insignificant, we accept Hi of homoscedasticity and conclude that the conditional variances of the error terms are equal. However, on the basis of Observed R-Squared and Scaled explained SS, we conclude that the conditional variances of the terms are unequal.

**Normality Test:** This test is to enable us determine whether the residual follows the normal distribution as postulated by classical OLS assumption. This is tested using the Jarque-Bera test. The hypothesis is formulated as follows:

Ho: µ = 0 (Residual follow normal distribution)

H1: µ ≠ 0 (Residual does not follow normal distribution)

The Jarque- Bera test result is presented in Figure 2 below:



**Figure 2. Jarque- Bera Test**

**Post estimation test**

Evidently, the null hypothesis cannot be accepted since the Jarque- Bera probability is 0.000000 (≤ 0.05). Thus we rejectHo and conclude that the residual did notfollows normal distribution and that the assumption of normal distribution is hereby not satisfied.

**Ramsey Reset Test:** This test is used to test for model mis-specification. The hypothesis is formulated as follows:

Ho: Model is not mis-specified

H1: Model is mis-specified

**Table 7. Ramsey Reset test**

|  |  |  |
| --- | --- | --- |
| Ramsey RESET Test |  |  |
| Equation: UNTITLED |  |  |
| Specification: BOP BOP(-1) BOP(-2) INTR INTR(-1) INTR(-2) INTR(-3) C |
| Omitted Variables: Squares of fitted values |  |
|  | Value | df | Probability |  |
| t-statistic | 2.067300 | 30 | 0.0474 |  |
| F-statistic | 4.273728 | (1, 30) | 0.0474 |  |

Evidently, the null hypothesis is rejected since the probability value of F-statistic is 0.0474 (≤ 0.05). Thus we reject Ho and conclude that the model is not mis-specified.

**Multicollinearity Test:** Multicollinearity test is used here to ascertain the violation of the assumption of randomness of the classical linear regression model. In carrying out the test, we made use of the correlation matrix table. The result is shown in table 7 below.

Decision Rule:

If the pair–wise or zero–order correlation coefficient between two explanatory variables is high, say in excess of 0.8, then multicollinearity is a serious problem (Gujarati and Sangeetha, 2007).

**Table 7. Correlation Matrix. Series: EXR, INF, INTR and MOS**

**MULTICOLINEARITY TEST**

|  |  |
| --- | --- |
|  | INTR |
| INTR | 1.000000 |

From the result in table 7, the partial correlation in the correlation matrix is 1.000000and greater than 0.8. Thus, there is a strong problem of multicollinearity in the model.

**Conclusion**

The total interest on an amount lent or borrowed depends on the principal sum, the interest rate, the compounding frequency, and the length of time over which it is lent, deposited, or borrowed. The preferred habitat theory points out that expectations risk premium and market segmentation all play their part in determining the structure of interest rates. If lenders and borrowers in the capital market are not rigidly tied to market segments, but simply have preferred habitats, then expectations play their parts in determining interest rates which are not completely independent. Other things being equal, lender’s preference for liquidity will have a tendency for long term rates to be above short-term rates.Base on the empirical results in chapter 4, the summary of the findings are itemized as follows:

* The ARDL Bound co-integration result shows evidence of long run relationship between BOP in Nigeria
* Equally, interest rate has short run positive and insignificant impact on balance of payment in Nigeria, while at long run; it has positive and significant impact on balance of payment.

**Policy recommendation**

The policy implications of this study are that if government wishes to replace a given amount of long-term debt by a short-term debt, it will be successful in twisting the structure of interest rates. Another implication is that the Central Bank can affect the yields to maturity of securities or the term structure of interest rates by permitting the relative supplies of long-term and short-term securities. Again, the Central Bank cannot affect the long-term interest rate by changing only the supply of short-term securities. It can only do so by changing both securities. The study further recommends that policy makers should come up with the best way to fund government project or budget deficit other than public borrowing that is on the rise and as observed from the study. It is a major contributor to increase in BOP deficit.

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