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Comparative Analysis of Exchange Rate Regime Classifications on Macroeconomic Performance in Nigeria

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Abstract: This study utilizes two alternative approaches to exchange rate regime classifications to examine their impact on macroeconomic performance in Nigeria. Exploring the ARDL modeling framework and utilizing data from 1970 to 2020, it was observed that the dynamics of the impact of exchange rate regimes on macroeconomic performance is sensitive to the choice of exchange rate regimes classifications under consideration. The study showed that the impact of exchange rate regimes on macroeconomic performance is relatively more viable when the exchange rate regime is IMF's de-jure to de-facto compared to the LYS classification. Based on the consistency of our finding of relative efficiency of empirical estimates obtained from IMF–based exchange rate regime classifications compared to those obtained from the LYS, it is recommended that preference should be given to the IMF de- jure to de-facto classification in the context of the Nigerian economy as this tend to enhance macroeconomic performance.

Keywords: Exchange rate regimes; IMF–LYS; Macroeconomic Performance; ARDL; Nigeria
JEL Classification: E65, F31, F40,

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1. Introduction

The phenomenon exchange rate in whatever form, does not only imply relative prices, but also an anchor of sustainable internal and external macroeconomic balances over the medium-term to long-term. Consequently, there has been increasing efforts to understand not only the dynamics of exchange rate managements but also its macroeconomic implications. Saying it differently, the appeal for an effective exchange rate management both on the part of policymakers and the academics has been the essence of empirical literature on the impact of exchange rate regime on economic performance. However, while acknowledging the proliferation of both theoretical and empirical literature on the subject matter, it is instructive that a number of questions yet remain unanswered. Should a country fix the exchange rate or allow it to float? And if fixed, should it be to a single hard currency or a basket of currencies? More so, there has been growing concern on which dimensions of the exchange rate regime classification is the most appropriate. That is, in addition to differences in the investigated economies, sample coverage, methodology, among other; which has continued to fuel discrepancy in the literature regarding the dynamic of the nexus between exchange rate regimes and economic performance; it is also not clear the extent to which the effectiveness or otherwise of a particular exchange rate regime is sensitive to the choice of exchange rate classification method that is under consideration. Thus, germane to this study is whether the effectiveness or

otherwise of the effect of exchange rate varies for different methods of exchange rate regimes classification.

As cited and stated in Dabrowski, Papiez and Smiech (2019, p. 2), the three well-known classifications of de facto exchange rate regimes were developed by the IMF, Reinhart and Rogoff (2004; in what follows RR) and Levy-Yeyati and Sturzenegger (2005; in what follows LYS). The IMF's classification was based on officially reported arrangements till 1998. Starting in 1999 the IMF has adopted a hybrid approach: a country is classified in line with its declared exchange rate arrangement if it is consistent with observed policies and outcomes. In case of inconsistency, a country is classified by the IMF's staff on the basis of 'the observed behavior of the exchange rate, complemented by information on the monetary and foreign exchange policy actions taken by country authorities' (Habermeier et al., 2009). The RR classification is mainly based on the behavior of a parallel exchange rate as it is considered 'a far better barometer of monetary policy than is the official exchange rate. Specifically, Reinhart and Rogoff (2004) emphasized in their classification of exchange rate arrangements that gauging the true extent of exchange rate flexibility requires incorporating the parallel market exchange rate has in the analysis, especially for developing countries but also for advanced economies during the Bretton Woods era. Two other important features of their approach are that they use extensive chronologies of the history of exchange arrangements and related factors (exchange controls, currency reforms, anchor currencies); they included a separate 'freely falling' category for countries whose annual inflation is above 40%. The LYS classification combines information on volatility of three variables: the level of the exchange rate, its changes, as well as foreign exchange reserves. The two distinguishing features of their approach are that: they employed a statistical methodology to identify clusters of pegs, floats, and intermediate regimes; and they allowed for an 'inconclusive' category if volatilities examined are very low as the exchange rate and reserves stability may simply reflect an absence of shocks.

Accurate identification of exchange rate regime is important for many reasons, particularly for proper empirical tests of theoretical hypotheses, such as the effect of the exchange rate regime on economic performance. Prior to late 90s, particularly between 1975 and 1998, data on exchange rate regime usually based on the official (de jure) regime classification with IMF merely compiling report by country´s monetary authorities, despite well-documented mismatches between reports and reality. The de jure classification specifically distinguished between three main categories of exchange rate regime: pegged regimes, regime with limited flexibility, and regime with flexible arrangement (Bubula & Otker-Robe, 2002). For its comprehensiveness in terms of country coverage, frequent updating, and long history, many empirical analyses in the literature have continued to rely on the de jure approach to exchange rate classification. However, in recognition of the divergence between actual and operational regimes, the IMF has since January 1999 moved from a purely de jure classification based on what countries report they do, to a hybrid one which combines information based on the IMF officials' 'informed judgment' about the actual behavior of the exchange rate. This notwithstanding, the growing doubt about the accuracy of regime classification published by the IMF have prompted researchers to develop alternative schemes (statistical methods) that attempt to characterize more accurately countries' de facto regimes.

In view of the above, this study sets out investigate whether the impact of exchange rate regimes on macroeconomic performance is sensitive to the choice of regime classification that is under consideration. This is particularly necessary to avoid running into exchange rate policy erroneously that might result from the generalizing of the dynamics of the impact of exchange rate regimes on different indicators of macroeconomic. In addition to this introductory section, the rest of the paper is structured as follows: Section 2 present brief literature review. Section 3 discuss the data and present the methodology. Section 4 present the results and discuss the findings while section 5 concludes the paper.

2. Brief Literature Review

Notwithstanding the huge number of empirical studies on exchange rate regimes and economic performance, there has been little or no consensus on the subject matter, hence the literature remains inconclusive. Using the case of developed and developing countries, Bailliu et al. (2003) examine the impact of exchange rate

regime on growth using dynamic GMM panel estimation technique. On the one hand, the study suggests there is a positive link between fixed regime and growth, an intermediate regime without an anchor was on the other revealed in the study to be negatively associated with growth. In the case of Husain et al. (2005), they estimate (with and without fixed country effects) exchange rate regime durability and performance across a large panel of advanced, emerging and developing economies. The study finds that in developing countries flexible regimes are associated with high inflation but do not lead to gains in output growth while fixed or near fixed regimes deliver lower inflation without sacrificing growth.

In attempt to replicates the LYS growth regressions, Miles (2006) using the case of developing countries' subset of the LYS original sample finds, that exchange rate regimes exert no independent impact on the output growth of developing countries. Related to this study is the study by Bleaney & Francisco (2007), where the official (IMF) and four alternative de facto exchange rate regime classifications were considered in their examination of the impact of exchange rate regimes on inflation and growth. Except for estimates obtained from the Reinhart & Rogoff (2004) regime classification, which produce quite unfavorable outcomes for flexible regimes (higher inflation and lower growth), the study generally suggests that floats have very similar growth rates to 'soft' (easily adjustable) pegs while 'hard' pegs (currency unions and currency boards) have slower growth than other regimes. Utilizing panel data based GMM estimation technique to investigate the impact of exchange rate misalignment on economic performance, Raji (2013) show that the investigated economies for instance WAMZ is exposed to asymmetrical correlation between real exchange rate misalignment and economic performance.

In the quest to understand the relevance of exchange rate regime in restraining current account imbalance in Sub-Saharan African nations, Gnimassoun (2015) explore the Bayesian model of averaging (BMA) technique to shows that flexible exchange rate regimes are more effective in preventing disequilibria. In a related development, Nathaniel et al. (2019) investigated the impact of exchange rate regimes on economic integration in the ECOWAS using econometric technique of panel fixed effect model. The study found that exchange rate regimes have the potential to deepening economic integration in the ECOWAS.

It equally of importance to point out the fact quite a number of the extant studies have also focus on the case of the Nigerian economy. Notable among the previous Nigerian studies on exchange rate regimes and economic performance relationship are Adeoye & Atanda(2010); Omojimite & Akpokodje (2010); Mahmood& Ali (2011); Dada & Oyeranti (2012); Adesoye (2012); among other. However, to the best of our knowledge, none of these studies have considered the likelihood of the relationship between exchange rate regimes and economic performance been sensitive to the choice of exchange regime classification method that is under consideration. Taken cognizant of this concern, this present study herein hypothesized that the impacts of exchange rate regimes on economic performance varies for alternative methods of exchange rate regimes classification and across different indicators of macroeconomic performance.

3. Methodology and data

3.1 The Model

Macroeconomic performance in the context of this study is measures via four important indicators, namely, output growth (YG), inflation rate (INFL) and interest rate (INTR) and a trade balance (TB). Thus, the question of whether the impact of exchange rate regimes on macroeconomic performance is sensitive to the choice of exchange rate regime classifications will be considered singly for each of these indicators of macroeconomic performance as demonstrated in the followings.

3.1.1 Output growth model

We commence our model specification with the conventional growth regression which expressed real per capita GDP growth as a function of physical capital (PK), human capital (HK), government spending (GC), inflation rate (INFL), exchange rate (EXR) and trade openness (TOP).

$YG = f(PK, HK, GC, INFL, EXR, TOP)$ (1)

$$YG = A*(PK)^{\beta_1}*(HK)^{\beta_2}*(GC)^{\beta_3}*(INFL)^{\beta_4}*(EXR)^{\beta_5}*(TOP)^{\beta_6} \quad (2)$$

The growth model in equation (2) is similar to the one expanded by Levy-Yeyati and Sturzenegger (2001) and Garofalo (2005) to include the indicator of exchange rate regime as below.

$$YG = A*(PK)^{\beta_1}*(HK)^{\beta_2}*(GC)^{\beta_3}*(INFL)^{\beta_4}*(EXR)^{\beta_5}*(TOP)^{\beta_6}*(RGM)^{\beta_7} \quad (3)$$

Equation (3) is our extended growth model which now include indicator for exchange rate regime (i.e., RGM). We further rewrite equation (3) ina natural logarithm as follows:

$$\log YG_t = \beta_0 + \beta_1 \log PK_t + \beta_2 \log HK_t + \beta_3 \log GC_t + \beta_4 INFL_t + \beta_5 \log EXR_t + \beta_6 \log TOP_t + \beta_7 RGM_t + \varepsilon_t \quad (4)$$

Where *YG* representing output growth is measured as log of real GDP per capita, PK denoting physical capital is measured as log of gross fixed capital formation while human capital (HK) is measured as the ration of secondary school enrolment to the gross total of school enrolment. The term GC is government consumption measured as log of total government consumption expenditure, inflation (INFL) is measured as log of consumer price index while the sum of export and import as a ratio of GDP is the proxy for trade openness (TOP). We expect output growth to respond positively to all the variables expect inflation and exchange rate

(i.e., $\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 < 0$ and $0 < \beta_6 > 0$).

3.1.2 Inflation model

Here, we follow the Batini and Haldane (1999) to utilize a reduced-form Phillips curve inflation model which is derived from a combination of mark-ups, wage-contracting and consumption price index equations. The mark-up and wage contracting equations are used to represent the supply side of the model based on the staggered contract theory (Fuhrer and Moore, 1995; Buiter and Jewitt, 1981) while domestic and foreign goods prices are combined into a consumption price index. This combination yields an aggregate supply (Phillips's curve) or price-setting equation which characterizes the dynamic response of inflation to the output gap. The final specification is an open economy aggregate supply equation that depicts inflation as a function of its own lagged values (backward-looking inflation), output gap (representing current mark-up of firms' prices over marginal costs) and real exchange rate changes (reflecting the price effects of exchange rate changes on imported goods). This is represented by equation (5).

$$INFL = \beta_0 * INFL_{t-1}^{\beta_1} * YG^{\beta_2} * EXR^{\beta_3} * e^{\mu} \quad (5)$$

Again, equation (5) is further extended to capture the impact of exchange rate regime on economic performance via the inflation rate channel.

$$INFL = \beta_0 * INFL_{t-1}^{\beta_1} * YG^{\beta_2} * EXR^{\beta_3} * RGM^{\beta_4} * e^{\mu} \quad (6)$$

The natural logarithm variant of the extended inflation model in equation (6) is as given below.

$$\log INFL_t = \beta_0 + \beta_1 \log INFL_{t-1} + \beta_2 \log YG_t + \beta_3 \log EXR_t + \beta_4 \log RGM_t + \varepsilon_t \quad (7)$$

The inclusion of the lagged value of inflation represents the short-run trade-off between inflation and the output gap with coefficient $1 \leq \beta_1 \leq 0$ since β_1 is expected to decline from 1 with the relative importance of backward-looking expectations. In other words, when it is close to 0, inflation responds to its past values and therefore, may take some periods for the accumulated effect of monetary policy to affect

The inclusion of the lagged value of inflation represents the short-run trade-off between inflation and the output gap with coefficient $1 \leq \beta_1 \leq 0$ since $\beta_1$is expected to decline from 1 with the relative importance of backward-looking expectations. In other words, when it is close to 0, inflation responds to its past values and therefore, may take some periods for the accumulated effect of monetary policy to affect inflation. The closer it is to 1, the more will a small, but persistent increase in interest rates have a huge and instant impact on current inflation. The equation also recognizes that interest rate affects inflation via the current and past outputs. The coefficient β_2 on output gap is expected to decline in a situation when adaptive expectations are more important. This is because the output gap also operates via its expected price movements (Berg et al., 2006). The inclusion exchange rate changes originate from the afore- mentioned mark-up, wage-contract, and consumption price index equations. Thus, the coefficient on exchange rate is expected to be positive but depending on the relatively openness of the economy.

3.1.3 Interest rate model

The interest rate model in the context of this study rests on the assumption that the monetary policy instrument is based on short-term nominal interest rate (MPR in the case of Nigeria), and that the Central Bank sets this instrument in order to achieve a target level for inflation. It may also react to deviations of output from equilibrium. Therefore, interest rate is a function of output gap, exchange rate, inflation, and monetary policy rate. In addition to the inclusion of exchange rate which is motivated on the ground that we are not sure whether uncovered interest parity holds in the case of Nigeria, we also control for changes in exchange rate regime on the assumption that fluctuations in exchange rate which usually necessitate change in exchange rate regime matters to policy makers.

$$INTR = f(YG, INFL, EXR, MPR, RGM) \quad (8)$$

where INTR is the nominal interest rate, MPR is monetary policy rate while other variables remain as earlier defined. The estimable and econometric representation of the above interest rate function in a logarithm form is as follows.

$$\log INTR_t = \beta_0 + \beta_1 \log YG_t + \beta_2 \log INFL_t + \beta_3 \log EXR_t + \beta_4 \log MPR_t + \beta_5 \log RGM_t + \varepsilon_t \quad (9)$$

Theoretically, the higher the interest rate the lower the expected investment and thus output thus we expect inverse relationship between interest rate and output gap such that, $\beta_1 < 0$. Similarly, the higher the interest rate the higher the inflation, hence $\beta_2 < 0$. However, an increase in interest rate relative to abroad will lead to exchange rate appreciation for instance $\beta_3 > 0$. Finally, monetary policy rate serves as one of the policy instruments used by the CBN to control the level of interest rate and there exists a positive relationship between the two variables ($\beta_4 > 0$).

3.1.4 Trade balance model

The rationale here is to further explore the potential of exchange rate regime for explaining economic performance from the perspective of the external activity of the economy, particularly from the balance of trade channel. The Nigerian foreign trade can be categorized by its trade deficit, and that is because the country's export consists mainly primary goods and raw materials while the country's import on the other hand consists of capital goods, industrial goods, luxury items, etc. To this end, balance of trade is usually measured as exports less imports of visible goods. Thus, the nexus between trade balance and exchange rate is usually anchored on the assumption that neither imports nor exports are perfect substitute for domestic goods. More so, the economy consists of two goods; home and foreign goods and part of home goods is exported, and part of foreign goods is also demanded by domestic consumers. Consequently, the trade balance (TB) can be expressed as a function of foreign income (FY), domestic income, (DY), exchange rate (EXR), and trade openness (TOP). Thus, the functional representation of the trade balance model is given as follows:

$$TB = f(FY, DY, EXR, TOP) \quad (10)$$

The estimable and econometric representation of the above functional relational is further represented in

natural logarithm form as below.

$$\log TB_t = \beta_0 + \beta_1 \log FY_t + \beta_2 \log DY_t + \beta_3 \log EXR_t + \beta_4 \log TOP_t + \varepsilon_t \qquad (11)$$

To capture the extent to which exchange rate regime matters for trade balance, equation (11) is further modified and extended as below.

$$\log TB_t = \beta_0 + \beta_1 \log FY_t + \beta_2 \log DY_t + \beta_3 \log EXR_t + \beta_4 \log TOP_t + \beta_5 RGM_t + \varepsilon_t \qquad (12)$$

3.2 Data Source and Description

In consistent with the above specified models, the variables used in the context of this study are selected based on their theoretical importance, performance measures of the economy, and also their uses and findings in the previous empirical literature. More importantly, the data are annual frequency spanning between 1970 and 2020 and totaling 50 as the number of observations. The data were obtained from secondary sources including Central Bank of Nigeria (CBN) online databases, CBN annual statistical bulletin, and World Development Indicators (WDI) online database. The key variables of interest include output growth (YG) measured as log of real GDP per capita, inflation (INFL) measured as log of consumer price index, interest rates (INTR) measures as log of prime lending rates, and trade balance (TB) measured as log of exports less log of imports of visible goods. In additional exchange rates (EXR) measured as the log of the country's national currency (Naira) relative to dollar, which was captured in each of the model, we also control for other variables depending on the model under consideration.

In the growth model for example, we control for physical capital (PK) measured as log of gross fixed capital formation. For human capital (HK), it is measured using secondary school enrolment as a ratio of total school enrolment while labour force (LAB) model is measured as log of total labor force. Other determinants of output growth considered are government consumption (GC) measures as log of total government final consumption expenditure, trade openness (TOP) measured as the sum of export and import as a ratio of GDP, while inflation as determinant of growth remains as earlier defined. Other variables under consideration are monetary policy rate (MPR) in the interest rate model, domestic income (DY) and foreign income (FY) in the trade balance model. The former is measured as log of the Nigeria's real GDP while the latter is measured as log of world real GDP less log of Nigeria's real GDP.

With respect to the exchange rate regimes variables, the dummies for exchange rate regimes were classified into three major groups namely, pegged/fixed regime (FIX), intermediated regime (INTER) and floating/flexible regime (FLEX). In line with the main objective of the study, we considered two alternative exchange rate regimes classification methods namely, IMF's de jure -de facto exchange rate regime classification and the statistical method developed by Levy-Yeyati & Sturzenegger (LYS, 2003). The dummies take the value of one if a specific exchange rate regime prevailed in a given period, and zero if otherwise. Saying it differently, irrespective of which of the alternative exchange rate regime classification method is under consideration, we create dummies for pegged/fixed, intermediate (INTER), and floating/flexible (FLEX) exchange rate regimes. However, FLEX was reflected as default benchmark so as to avoid running into the problem of dummy trap and more so to understand in relative term the extent to which economic performance respond differently to difference groups of exchange rate regimes.

3.3 Econometric Method and Estimation Procedure

To simultaneously capture the short and long run dynamics of the impact of exchange rate regimes on macroeconomic performance, the Auto-regressive Distributed Lag (ARDL) modeling procedure is preferred. The preference for ARDL compared to other alternative methods in the literature hinge on the flexibility of its application regardless of whether the variables are stationary or become stationary through the first difference. Also, and according toPesaran et al. (2001), the selection of the optimum ARDL model involves automatic correction of the residual serial correlation and of the endogeneity problem. Thus, the ARDL

representation of the nexus between macroeconomic performance and exchange rate regime is as given below.

$$\Delta \ln Z_t = \varphi + \alpha_1 \ln Z_{t-1} + \alpha_2 \ln X_{t-1} + \alpha_3 \ln EXR_{t-1} + \sum_{j=1}^{p} \beta_{1j} \Delta \ln Z_{t-j} + \sum_{i=0}^{q1} \beta_{2i} \Delta \ln X_{t-i} + \sum_{i=0}^{q2} \beta_{3i} \Delta \ln EXR_{t-i} + \sum_{n=1}^{k} \lambda_n D_{nt} + \varepsilon_t \qquad (13)$$

Where *Z*is a vector represents the various indicators of macroeconomic performance to be captured singly such as output growth (YG), inflation rate (*INFL*), interest rate (*INTR*) and trade balance (*TB*). The term *X*is a set of exogenous variables depending on which measure of macroeconomic performance is being considered. The*EXR* represent exchange rate with US dollar the reference currency while *D* is a matrix representing dummy variable for exchange rate regime type to be captured as fixed regressor(s).

The long run parameters for the intercept and slope coefficients are computed as: $-\frac{\varphi}{\alpha_1}, -\frac{\alpha_2}{\alpha_1}$ and $-\frac{\alpha_3}{\alpha_1}$. However, since in the long run it is assumed that $\Delta Z_{t-j} = 0$ and $\Delta(X, EXR)_{t-i} = 0$, respectively, then the short run estimates are obtained as β_{1j}, β_{2i} *and* β_{3i}. Since the variables in first differences can accommodate more than one lag, determining the optimal lag combination for the ARDL becomes necessary. The optimal lag length was selected using Schwartz Information Criterion (SIC). The lag combination with the least value of the chosen criterion among the competing lag orders is considered the optimal lag. Consequently, the preferred ARDL model is used to test for long run relationship in the model. This approach of testing for cointegration as earlier described is referred to as bounds testing as it involves the upper and lower bounds. The test follows an *F* distribution such that, if the calculated F- statistic is greater than the upper bound, there is cointegration; if it is less than the lower bound, there is no cointegration and if it lies in between the two bounds, then, the test is considered inconclusive.

Equation (13) can be re-specified to include an error correction term as follows:

$$\Delta \ln Z_t = \varphi + \delta ECT_{t-1} + \sum_{j=1}^{p} \beta_{1j} \Delta \ln Z_{t-j} + \sum_{i=0}^{q1} \beta_{2i} \Delta \ln X_{t-i} + \sum_{i=0}^{q2} \beta_{3i} \Delta \ln EXR_{t-i} + \sum_{n=1}^{k} \lambda_n D_{nt} + \varepsilon_t \qquad (14)$$

Equation (14) is the error correction variant of the ARDL specification in equation (27), where the ECT_{t-1} is the error correction term while the coefficient represent the speed of adjustment to equilibrium level. If the value of the coefficient is in the (-1, 0) range, then the error correction mechanism is stable and *ECT* helps to adjust the long-run relationship due to the impact of a specific exogenous shock. In the case of positive coefficient, then the *ECT* model leads to the model deviation from the long-run equilibrium so that a certain shock will no longer be neutralized. If those ratios are closer to 0, then the exogenous shock adjustment is performed at low speed, while the closeness to -1 corresponds to a high shock adjustment in one period taken into account (for example, one year in the case of annual data, a quarter for quarterly data etc.). It is instructive that the term *D* in both equations (13 & 14) which is a matrix of dummy variables for fixed (FIX), intermediate (INTER) and flexible (FLEX) exchange rate regime types will be capture as fixed regressors with the latter (i.e., FLEX) suppressed from the estimation to avoid perfect collinearity problem and instead expressed as the reference dummy.

4. Result Presentation and Discussion

4.1 Preliminary Results

A cursory look at table 1 shows that average output growth in Nigeria when measured as real GDP was 220.8 US billion dollars for the period between 1970 and 2020. However, the average interest rates over the same period were 15% while the positive sign on the mean value of the trade balance (TB) is an indication that the country has on average maintaining a trade surplus over period between 1970 and 2020. Further presented in Tables 2a&b are unit testing results on all the variables under consideration. The essence is to determine the stationary status of the series and in turn the suitability of the chosen estimation techniques.

For robustness and consistency purposes, this present study considered both the basic Augmented Dickey-Fuller (ADF) test and its extended variant for instance Dickey-Fuller GLS test. Starting with the ADF results, the null hypothesis of unit root tends to hold for a number the variables with TB, PK and TOP the few notable exceptions, particularly when the ADF test was performed with the model with constant only. Same as the ADF results, the unit root test results obtained from DF-GLS test also revealed the integration properties of series to hover between I(0) and I(1). This by implications further re-enforces our preference for ARDL technique as the most appropriate to accommodate the mixed order of integration exhibited by the series.

Table 1: Descriptive/Summary Statistics

	Mean	Max.	Min.	*Std. Dev.*	N-Std. Dev.	Skewness	Kurtosis	J-B
YG	220.79	487.47	94.69	127.72	0.58	0.99	2.42	9.12(0.01)
INFL	52.81	294.88	0.10	76.74	1.45	1.65	4.85	30.28(0.00)
INTR	15.32	31.65	6.00	6.10	0.40	0.12	2.48	0.69(0.71)
TB	1.04	3.19	-1.17	1.20	1.16	0.27	2.01	2.71(0.26)
EXR	78.25	307.76	0.55	95.57	1.22	1.09	3.20	10.17(0.01)
PK	51.66	85.79	11.89	16.41	0.32	-0.76	3.55	5.57(0.06)
HK	26.54	56.21	4.43	12.60	0.47	-0.08	2.60	0.39(0.82)
GC	9.41	33.44	1.09	11.94	1.27	1.01	2.24	9.93(0.01)
TOP	33.32	53.28	9.14	11.91	0.36	-0.46	2.33	2.78(0.25)
FY	46481	86338	19117	19739	0.42	0.44	1.99	3.83(0.15)
MPR	11.72	26.00	6.00	4.54	0.39	0.53	3.36	2.67(0.26)

Note: The terms Min in the table denotes Minimum statistic, Max means Maximum, Std. Dev. denotes standard deviation while N-Std. Dev. is the normalized variant of the standard deviation statistic computed as: standard deviation/mean. The values in parenthesis are probability values associated with the reported Jaque-Bera (JB) statistics.

Table 2(a): ADF unit root test results

	Model with Constant			Model with Constant & Trend		
Variable	Level	First Difference	I(d)	Level	First Difference	I(d)
YG	0.600	-2.297***	I(1)	1.429	-2.486***	I(1)
INFL	-1.384	-4.099***	I(1)	-1.519	-4.272***	I(1)
INTR	-1.621	-6.682***	I(1)	-0.927	-6.881***	I(1)
TB	-2.612*	-	I(0)	-2.575	-7.322***	I(1)
EXR	-0.363	-5.618***	I(1)	-1.444	-5.555*	I(1)
PK	-3.302**	-	I(0)	-6.005***	-	I(0)
HK	-1.788	-2.772*	I(1)	-2.547	-5.966**	I(1)
GC	-0.231	-7.227**	I(1)	-1.778	-7.230**	I(1)
TOP	-2.866*	-	I(0)	-2.827	-7.871**	I(1)
FY	-1.761	-5.354**	I(1)	-4.494*	-	I(0)
MPR	-2.111	-8.634***	I(1)	-2.198	-8.591***	I(1)
Table 2(b): DF-GLS unit root test results						
YG	1.294	-2.072***	I(1)	-1.377	-2.695	I(1)
INFL	0.420	-4.146***	I(1)	-1.701	-4.343***	I(1)
INTR	-0.906	-6.685***	I(1)	-1.086	-6.952***	I(1)
TB	-2.496**	-	I(0)	-2.579	-7.445***	I(1)
EXR	0.374	-5.427***	I(1)	-1.314	-5.616***	I(1)

PK	-0.4661	-2.769***	I(1)	-1.789	-3.321**	I(1)
HK	-0.807	-2.818***	I(1)	-2.900*	-	I(0)
GC	0.252	-7.282***	I(1)	-1.625	-7.385***	I(1)
TOP	-2.413**	-	I(0)	-2.777	-7.937***	I(1)
FY	0.868	-4.867***	I(1)	-2.711	-5.506***	I(1)
MPR	-1.493	-8.707***	I(1)	-2.180	-8.752***	I(1)

Note: The exogenous lags are selected based on Schwarz info criteria while ****, **, * imply that the series is stationary at 1%, 5% and 10% respectively. The null hypothesis is that an observable time series is not stationary (i.e., has unit root).

4.2 Regression Results

The main innovation in this study hinges on the hypothesis that the impact of exchange rate regimes on macroeconomic performance is sensitive to the choice of the alternative measures of exchange rate regimes classification in the literature. More so, is whether the validity or otherwise of the hypothesis varies for different indicators macroeconomic performance. To justify our comparison and the quest to avoid any possible biasness in the inference(s) that will be drawn from the findings of this study, our empirical results were presented and discussed under two sub-headings and across the two alternative methods of exchange regimes classification that are of interest to this study.

4.2.1 Empirical Results on the Impacts of IMF–Based Exchange Rate Regimes on Macroeconomic Performance

The following presents and discussed the dynamics of the impact of IMF –based exchange rate regimes for different indicators of macroeconomic performance. Starting with the Bound cointegration testing results, the null hypothesis of no cointegration was significantly rejected at 1% both in Tables 3 and 4, where inflation and output growth are the measures of macroeconomic performance, respectively. However, when the indicators of macroeconomic performance are interest rate and trade balance, the null hypothesis of no cointegrationappears to be rejected at 10% and 5% levels of significance in Tables 5&6, respectively. Conform to the bound cointegration testing results are the coefficients on the error correction term (ECT) reported in each of these tables.

With respect to the elasticities of the coefficients, the regression result in table 3 shows that the impact of exchange rate regimes on inflation was -0.22 for fixed regime compared to floating regime and -0.05 for intermediate regime compared to floating regime. However, while the impact seems statistically evident at 1% level of significance for a fixed regime, the significance of the impact was only weakly evident at 10% level of significance when the regime is intermediate. In addition to the lagged value of inflation, other determinants of inflation reported in the table are level of income (YG) and exchange rate (EXR). However, the extent to which these factors matter for explaining inflation is only statistically viable on the coefficients on exchange rates both in the long run and short run.

Table 3: ARDL estimates on the impact of IMF –based exchange rate regime on inflation

Long Run Equation	**Dependent variable: Inflation (INFL)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
YG	-0.4353	1.0207	-0.4265	0.6718
EXR	0.0960***	0.1903	5.0457	0.0000
Short Run Equation				
Constant	0.3181	0.3474	0.9158	0.3648
$\Delta INFL_{t-1}$	-0.0779**	0.0352	-2.2166	0.0319
ΔYG	-0.0339	0.0713	-0.0475	0.6366
ΔEXR	0.0748**	0.0339	2.2067	0.0326

ECT_{t-1}	-0.0779***	0.0077	-10.0343	0.0000
Fixed Regressors				
Pegged / Fixed (FIX)	-0.2218***	0.0661	-3.3574	0.0069
Intermediate (INTER)	-0.0504*	0.0277	-1.8202	0.0826
Bound Test Cointegration Results				
Level of Significance	F-statistic	I(0)	I(1)	
10%	5.23***	2.63	3.35	
5%		3.10	3.87	
1%		4.13	5.00	
Diagnostic and Post-Estimation Results				
Adjusted R^2:	0.98			
F-statistics:	5955.61 (0.00)			
Autocorrelation test (Q-Statistic):	13.275 (0.021)			
Heteroscedasticity test (ARCH LM)	3.0923 (0.019)			
Normality test (Jaque-Bera):	11.612 (0.003)			

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

For macroeconomic performance measured as output growth, the empirical estimates in table 4 revealed coefficients on exchange rate regimes as statistically insignificant both for fixed and intermediate regimes when compared to the floating regime. What this portends, is that the potential of exchange rate regime for explaining or enhancing economic growth in Nigeria may depend, among other, on the degree of variability of the regime under consideration. Whereas our finding of positive impact of government consumption (GC) on economic growth tends to confirm the hypothesis that increase in government spending cause a rise in aggregate demand. However, the evidence of negative sign on the coefficient on inflation (INFL) seems to be suggesting that increasing general price level tends to stifle purchasing power and consequently cause declining aggregate demand and negative economic growth in return.

Table 4: ARDL estimates on the impact of IMF –based exchange rate regime on output growth

Long Run Equation	**Dependent variable: Economic Growth (YG)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
PK	-0.6478	0.7325	-0.8843	0.3818
HK	0.0118	0.0205	0.5775	0.5668
GC	0.3526**	0.1629	2.1647	0.0364
INFL	-0.2744**	0.0037	3.8139	0.4205
TOP	0.0237	0.0184	1,2937	0.2032
EXR	0.3785	0.3499	1.0818	0.2858
Short Run Equation				
Constant	0.4512*	0.2447	1.8439	0.0726
ΔYG_{t-1}	-0.0741	0.0492	0.1396	0.1396
ΔPK	-0.0480	0.0354	-1.3573	0.1823
ΔHK	0.0009	0.0013	0.6875	0.4958
ΔGC	0.0261	0.0187	1.3970	0.1701
$\Delta INFL$	-0.0203	0.0191	-1.0650	0.2933

ΔTOP	0.0017**	0.0008	2.3401	0.0244
ΔEXR	0.0281	0.0176	1.5959	0.1184
ECT_{t-1}	-0.0741***	0.011	-6.8532	0.0000
Fixed Regressors				
Pegged/Fixed (FIX)	0.0087	0.0259	0.3371	0.8552
Intermediate (INTER)	0.0039	0.0094	0.4173	0.8436
Bound Test Cointegration Results				
Level of Significance	F-statistic	I(0)	I(1)	
10%	4.99***	1.99	2.94	
5%		2.27	3.28	
1%		2.88	3.99	
Diagnostic and Post-Estimation Results				
Adjusted R^2:	0.93			
F-statistics:	695.481(0.000)			
Autocorrelation test (Q-Statistic):	7.043 (0.217)			
Heteroscedasticity test (ARCH LM):	0.806 (0.552)			
Normality test (Jaque-Bera):	0.164 (0.921)			

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

In another development, our empirical finding in table 5 shows that the impact of exchange rate regimes on macroeconomic performance measured as interest rate was -0.16 for fixed regime and -0.03 for intermediate regime. However, the viability of the relative impacts of these exchange rate regimes on interest rate was only statistically evident at 5% level of significance when the exchange rate management was under fixed regime. Expectedly, the coefficients on monetary policy rate (MPR) a major determinant of market interest rates are positive and significant both in the long run and short run.

Table 5: ARDL estimates on the impact of IMF –based exchange rate regime on interest rate

Long Run Equation	**Dependent variable: Interest Rate (INTR)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
YG	-0.4053	0.2584	-1.5681	0.1244
INFL	-0.1450	0.1378	-1.0526	0.2985
MPR	0.3793**	0.0042	3.5535	0.0345
EXR	0.2970**	0.2442	1.5535	0.0223
Short Run Equation				
Constant	1.1923	0.7238	1.6477	0.1069
$\Delta INTR_{t-1}$	-0.3448***	0.1079	-3.1956	0.0026
ΔINFL	-0.1397	0.1084	-1.2888	0.2045
ΔMPR	0.1308***	0.0009	4.6630	0.0015
ΔEXR	0.1024**	0.0446	2.2941	0.0269
ECT_{t-1}	-0.3448***	0.0744	-4.6365	0.0000
Fixed Regressors				
Pegged / Fixed (FIX)	-0.1620**	0.0736	-2.2013	0.0286
Intermediate (INTER)	-0.0306	0.0306	-1.2969	0.5669
Bound Test Cointegration Results				

Level of Significance	F-statistic	I(0)	I(1)
10%	3.20*	2.20	3.09
5%		2.56	3.49
1%		3.29	4.37
Diagnostic and Post-Estimation Results			
Adjusted R^2:	0.92		
F-statistics:	91.113(0.000)		
Autocorrelation test (Q-Statistic):	9.687(0.085)		
Heteroscedasticity test (ARCH LM)	0.908(0.454)		
Normality test (Jaque-Bera):	3.149(0.207)		

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

So far, we have only considered macroeconomic performance mainly from the internal economic conditions. Saying it differently, the macroeconomic performance in the empirical estimates presented in table 6 is measured as trade balance thus reflecting the external condition of the Nigerian economy. Interestingly, we find the magnitude of the coefficients on the impacts of exchange rate regimes to be relatively higher and significantly more pronounced when the measure for macroeconomic performance is trade balance (TB). For instance, the coefficient on for fixed regime was 1.67 and statically significant at 1% level of significance while that of intermediate regime was 1.12 and also statistically viable at 1% level of significance. Compared to floating regime, both fixed regime and intermediate regime has the potential of increasing the net trade balance of the country positively.

Table 6: ARDL estimates on the impact of IMF –based exchange rate regime on trade balance

Long Run Equation	**Dependent variable: Trade Balance (TB)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
FY	2.2039	4.0463	0.5446	0.5889
DY	-3.1197*	1.6419	-1.9000	0.0643
TOP	0.0302	0.0242	1.2455	0.2199
EXR	0.4406	0.4835	0.9111	0.3675
Short Run Equation				
Constant	-5.0908	18.8844	-0.2696	0.7888
ΔTB_{t-1}	-0.5352***	0.1255	-4.2652	0.0001
ΔFY	1.1794	2.1049	0.5603	0.5782
ΔDY	-1.6696**	0.7957	-2.0983	0.0419
ΔTOP	0.0161	0.0123	1.3138	0.1960
ΔEXR	0.2358	0.2717	0.8679	0.3904
ECT_{t-1}	-0.5352***	0.1032	-5.1861	0.0000
Fixed Regressors				
Pegged / Fixed (FIX)	1.6711***	0.5464	3.0583	0.0345
Intermediate (INTER)	1.1206***	0.2675	4.1898	0.0024
Bound Test Cointegration Results				
Level of Significance	F-statistic	I(0)	I(1)	
10%	4.01**	2.20	3.09	
5%		2.56	3.49	
1%		3.29	4.37	
Diagnostic and Post-Estimation Results				
Adjusted R^2	0.60			

F-statistics	11.333(0.000)
Autocorrelation test (Q-Statistic)	2.658(0.753)
Heteroscedasticity test (ARCH LM)	0.398(846)
Normality test (Jaque-Bera)	7.465(0.239)

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

4.2.2 Empirical Results on the Impacts of LYS–Based Exchange Rate Regimes on Macroeconomic Performance[1]

Compared to the ARDL estimates reported in subsection 4.2.1, where the exchange rate regime was based on IMF's de jure -de facto classification method, the exchange rate regime considered herein was based on the LYS statistical approach to exchange rate regimes classification. Again, this approach was considered for the different indicators of macroeconomic performance. Presented in Table A through to Table D are the short and long run ARDL estimates on the impact of LYS –based exchange rate regimes on inflation, output growth, interest rates and trade balance, respectively. Same as our earlier results, we find the null hypothesis of no cointegration consistently rejected across all the alternative indicators of macroeconomic performance but interest rates and when the classification of exchange rate regimes was based on LYS approach.

More importantly, a look at the elasticities of the coefficients in table A seems to be suggesting, that the exchange rate regimes exhibit no statistical significance as potential for explaining inflation, particularly when the dummies for the exchange rate regimes were obtained from the LYS approach to exchange rate regimes classification. That said, a look at table B shows that the coefficients on the impact of exchange rate regimes on economic performance yet remains insignificant even when the variables for exchange rate regime were obtained from LYS –based exchange rate regimes classification.

Again, unlike the empirical estimates reported in table 5 where the exchange rate regime impacts interest rate negatively and significantly, particularly when the exchange rate management was under fixed regime; the empirical estimates in table C rather suggest that neither the fixed regime nor the intermediate regime has significant impact on interest rate when the exchange rate regime classification was based on LY. However, the empirical results in table D shows that both the fixed regime and intermediate regime has positive impacts on trade balance (TB). But, while this appears to conform to our earlier finding in table 6, where exchange rate regime classification was based on IMF, it is instructive that the significance of the impact in the case of LYS method is only viable when the exchange rate management is under fixed regime.

5. Conclusion

Using historical annual frequency spanning between 1970 and 2020, this study explored the ARDL modelling framework to determine whether the dynamic of the impact of exchange rate regimes on macroeconomic performance is sensitive to the choice of exchange rate regime classification method that is under consideration. Utilizing two alternative approaches to exchange rate regime classification, we find the significance of exchange rate regimes for explaining macroeconomic performance in Nigeria to be relatively more viable when the exchange rate regimes classification is IMF's de jure –de facto compared to the LYS approach. Confirming this position, the study found that the impact of exchange rate regimes on macroeconomic performance to be statistically significant for inflation, interest, and trade balance when the exchange rate regimes are based on the IMF's classification method. Whereas exchange

[1]Note: The ARDL regression results on the impacts of LYS –based exchange rate regimes on macroeconomic performance were documented at the appendix section of this paper as supplementary results, where Table A presents the impacts of LYS –based exchange rate regimes on inflation and Tables B, C & D for output growth, interest rates and trade balance.

rate regimes based on LYS classification seems to be statistically significance only when macroeconomic performance is measured as trade balance and mainly when the exchange rate management is under fixed regime. This, among other, further affirms our hypothesis that the nexus between macroeconomic performance and exchange rate regimes might be sensitive to the choice of exchange rate regimes that is under consideration. Thus, while acknowledging the debate on which mode of exchange rate regimes classification is the most accurate is still ongoing in the literature, we recommend that in the context of the Nigerian economy and for the period under consideration, preference should be given to the IMF's IMF de Jure –de Facto approaches to exchange rate regimes classification. This position was particularly informed by our finding of relative efficiency and robustness of empirical estimates obtained from exchange rate regime classification based on IMF compared to those obtained from exchange rate regime based on LYS method.

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Appendix: Supplementary Results

Appendix A: Impact of LYS –based exchange rate regime on inflation rate (INFL)

Presented in Table A are the short run and long run ARDL estimates on the impact of LYS –based exchange rate regime on inflation

Table A: ARDL estimates on the impact of LYS –based exchange rate regime on INFL

Long Run Equation	**Dependent variable: Inflation (INFL)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
YG	-2.4075	2.9352	-0.8202	0.4165
EXR	1.4531***	0.5242	2.7721	0.0081
Short Run Equation				
Constant	0.6195*	0.3511	1.7642	0.0846
$\Delta INFL_{t-1}$	-0.0445	0.0340	-1.3059	0.1984
ΔYG	-0.1072	0.0696	-1.5409	0.1305
ΔEXR	0.0647*	0.0334	1.9391	0.0589
ECT_{t-1}	-0.0445***	0.0059	-7.5725	0.0000
Fixed Regressors				
Pegged / Fixed (FIX)	0.0087	0.0352	0.2476	0.8344
Intermediate (INTER)	0.0443	0.0392	1.1302	0.3292
Bound Test Cointegration Results				
Level of Significance	F-statistic		I(0)	I(1)
10%	13.42***		2.63	3.35
5%			3.10	3.87
1%			4.13	5.00
Diagnostic and Post-Estimation Results				
Adjusted R^2:	0.93			
F-statistics:	5131.236(0.000)			
Autocorrelation test (Q-Statistic):	18.719 (0.002)			

Heteroscedasticity test (ARCH LM)	4.970(0.001)
Normality test (Jaque-Bera):	6.513(0.039)

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

Appendix B: Impact of LYS based exchange rate regime on economic growth (YG)

Presented in Table B are the short run and long run ARDL estimates on the impacts of LYS based exchange rate regime on economic growth.

Table B: ARDL estimates on the impact of LYS based exchange rate regime on YG

Long Run Equation	**Dependent variable: Economic Growth (YG)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
PK	-0.7292	0.6425	0.2631	0.2631
HK	0.0085	0.0179	0.4750	0.6374
GC	0.3505***	0.1279	2.7404	0.0091
INFL	-0.2324	0.3105	-0.7485	0.4586
TOP	0.0211	0.0164	1.2877	0.2633
EXR	0.3647	0.3214	1.1345	0.2052
Short Run Equation				
Constant	0.4962**	0.2417	2.0533	0.0466
ΔYG_{t-1}	-0.0767	0.0486	-1.5783	0.1224
ΔHK	-0.0559**	0.0267	-2.0861	0.0434
ΔHK	0.0007	0.0012	0.5498	0.5855
ΔGC	0.0268	0.0169	1.5933	0.1190
$\Delta INFL$	-0.0178	0.0190	-0.9355	0.3551
ΔTOP	0.0016**	0.0007	2.4235	0.0200
ΔEXR	0.0279	0.0168	1.6636	0.1040
ECT_{t-1}	-0.0767***	0.0101	-7.6074	0.0000
Fixed Regressors				
Pegged/Fixed (FIX)	0.0189	0.0117	1.6197	0.2785
Intermediate (INTER)	0.0074	0.0126	0.5633	0.6859
Bound Test Cointegration Results				
Level of Significance	F-statistic		I(0)	I(1)
10%	6.16***		1.99	2.94
5%			2.27	3.28
1%			2.88	3.99
Diagnostic and Post-Estimation Results				
Adjusted R^2	0.96			
F-statistics	715.525(0.000)			
Autocorrelation test (Q-Statistic)	6.609(0.251)			
Heteroscedasticity test (ARCH LM)	0.593(0.706)			
Normality test (Jaque-Bera)	0.441(0.802)			

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

Appendix C: Impact of LYS based exchange rate regime on interest rate (INTR)

Presented in Table C are the short run and long run ARDL estimates on the impacts of LYS –based exchange rate regime on interest rate.

Table C: ARDL estimates on the impact of exchange rate regime on INTR

Long Run Equation	**Dependent variable: Interest Rate (INTR)**			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
YG	-0.4299	0.2699	-1.5926	0.1187
INFL	-0.0695	0.1239	-0.5607	0.5779
MPR	0.3235***	0.2190	2.3898	0.0214
EXR	0.2257*	0.1158	1.9484	0.0581
Short Run Equation				
Constant	1.0851	0.7458	1.4548	0.1532
$\Delta INTR_{t-1}$	-0.3367***	0.1102	-3.0567	0.0039
ΔYG	-0.1448	0.1113	-1.3014	0.2002
$\Delta INFL$	-0.0234	0.0392	-0.5974	0.5534
ΔMPR	0.1763**	0.0728	2.4213	0.0199
ΔEXR	0.0760*	0.0412	1.8469	0.0718
ECT_{t-1}	-0.3367***	0.0829	-4.0628	0.0002
Fixed Regressors				
Pegged / Fixed (FIX)	-0.0147	0.0322	-0.4582	0.7471
Intermediate (INTER)	0.0058	0.0359	0.1628	0.9046
Bound Test Cointegration Results				
Level of Significance	F-statistic		I(0)	I(1)
10%	2.46		2.20	3.09
5%			2.58	3.49
1%			3.29	4.37
Diagnostic and Post-Estimation Results				
Adjusted R^2:	0.92			
F-statistics:	87.042(0.000)			
Autocorrelation test (Q-Statistic):	9.556(0.089)			
Heteroscedasticity test (ARCH LM)	0.955(0.457)			
Normality test (Jaque-Bera):	5.839(0.054)			

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.

Appendix D: Impact of LYS based exchange rate regime on trade balance (TB)

Presented in Table D are the short run and long run ARDL estimates on the impacts of LYS –based exchange rate regime on trade balance.

Table D: ARDL estimates on the impact of LYS based exchange rate regime on TB

Long Run Equation	Dependent variable: Trade Balance (TB)			
	Coefficient	**Standard Error**	**T-statistic**	**P-value**
FY	-0.4114	5.1468	-0.0799	0.9367
DY	-1.7274	2.3136	-0.7466	0.4595
TOP	0.0493	0.0409	1.2039	0.3519
EXR	0.6434	0.6836	0.9413	0.2353
Short Run Equation				
Constant	3.0099	14.2692	0.2109	0.8340
ΔTB_{t-1}	-0.3062***	0.1056	-2.8986	0.0059
ΔFY	-0.1259	1.5890	-0.0793	0.9372
ΔDY	-0.5288	0.6351	-0.8327	0.4097
ΔTOP	0.0151	0.0113	1.3319	0.1901
ΔEXR	0.1969	0.2195	0.8975	0.3746
ECT_{t-1}	-0.3062***	0.0669	-4.5763	0.0000
Fixed Regressors				
Pegged / Fixed (FIX)	0.6714***	0.2408	2.7883	0.0273
Intermediate (INTER)	0.8087	0.2424	3.3362	0.0130
Bound Test Cointegration Results				
Level of Significance	F-statistic		I(0)	I(1)
10%	3.12*		2.20	3.09
5%			2.56	3.49
1%			3.29	4.37
Diagnostic and Post-Estimation Results				
Adjusted R^2	0.57			
F-statistics	10.629(0.000)			
Autocorrelation test (Q-Statistic)	4.299(0.507)			
Heteroscedasticity test (ARCH LM)	1.219(0.318)			
Normality test (Jaque-Bera)	2.512 (0.285)			

Note: The value in parenthesis represents the probability values for the various post estimation tests performed, while ***, ** and * denote 1%, 5% and 10% level of significance.