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Testing Frankel's Monetary Model in Algeria Evidence from 1995 to 2023

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Abstract:

This study analyzes short- and long-term determinants of exchange rate movements using the ARDL model. Based on monetary and output theories, it considers money supply, income differentials, and interest rate spreads. Results confirm a stable long-run cointegration: domestic money growth depreciates the currency, while higher income strengthens it. Interest rate differentials affect short-term fluctuations but not the long run. The error correction term shows rapid adjustment to equilibrium. Short-term dynamics also capture lagged effects of money and income. Findings support uncovered interest parity. Diagnostic tests validate model stability, stressing the importance of prudent monetary policy and balanced growth for exchange rate stability.

Keywords: Exchange Rate, Monetary Fundamentals, Interest Rate, ARDL, Algeria.

Jel Classification Codes: F31, E52, E41, C32.

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1- Introduction:

The explanation and interpretation of exchange rate behavior at the international level remains one of the central concerns of international economic theories. The divergence among these theories stems primarily from differences in the criteria used to select the monetary base, as well as the time horizon considered when analyzing exchange rate dynamics—whether in the short, medium, or long term.

A critical issue in defining the appropriate model for determining the equilibrium exchange rate lies in the choice of explanatory variables. These variables are not always readily available, and the methods of their computation may vary significantly from one economy to another.

Within a flexible exchange rate system, currency values are shaped by a range of fundamental factors, encompassing both monetary indicators and real economic variables. While the sticky-price framework aligns closely with the flexible-price model in terms of identifying the key long-run drivers of exchange rate behavior, it diverges in the short-run context. Specifically, the sticky-price model incorporates an adjustment parameter that accounts for temporary deviations from the long-run equilibrium exchange rate. This inclusion reflects the reality that, in the short term, prices do not fully adjust, thereby introducing a dynamic correction mechanism into the model. Consequently, under sticky-price conditions, price rigidity becomes a central feature, distinguishing it from models assuming immediate price flexibility in the monetary explanation of exchange rate fluctuations.

Jeffrey Frankel introduced an important extension to the monetary model by blending the flexible-price model with the sticky-price version. This hybrid is known as the real interest rate differential (RIRD) model, in which real interest rate differentials are incorporated as an additional explanatory variable in the determination of exchange rates.

In the case of Algeria, the exchange rate has exhibited significant fluctuations due to its dependence on foreign trade and its vulnerability to external shocks. Despite the oil price boom and the resulting substantial surplus in foreign exchange reserves, the exchange rate remained at the level set by the Bank of Algeria. This situation raises important questions

about the adequacy of the current exchange rate level in light of recent economic developments.

To what extent does the basic monetary model of the exchange rate under price flexibility (Frenkel-Bilson model) explain the behavior of the exchange rate in Algeria in the long run, particularly in light of fluctuations in monetary and macroeconomic variables?

Hypotheses:

1- **H_1**: The disparity in money supply between Algeria and its foreign counterparts (M - M*) exerts a statistically significant and positive influence on Algeria's real exchange rate.
2- **H_2**: A negative and significant relationship exists between the differential in real output (Y - Y*) and the real exchange rate, indicating that higher domestic output relative to external output leads to currency appreciation.
3- **H_3**: Variations in nominal interest rates across countries (i - i*) are positively associated with changes in the real exchange rate, reflecting a significant effect.
4- **H_4**: The principal monetary and real-sector variables embedded within the standard monetary model provide significant explanatory strength in capturing the long-term behavior of exchange rates in Algeria.

2- LITERATURE REVIEW

The literature on testing monetary models includes various approaches to conducting such evaluations. Some of these approaches have focused on estimating the equations of monetary models, particularly the fundamental monetary model equations of real interest rate differentials. These involve comparing the signs and magnitudes of the estimated parameters from models such as those of (Frankel, 1976) and (Bilson, 1978) with theoretical predictions. The early empirical studies namely those by (Frankel, 1976), (Bilson, 1978), and (Kohlhagen, 1979) generally centered on estimating the basic equation of the monetary theory in the following form:

$$St=\beta 0+\beta 1(m-m*)+\beta 2(y-y*)+\beta 3(i-i*)+\varepsilon\varepsilon$$

In some cases, the interest rate differential $(i-i*)$is replaced by the forward premium $(ft-st)$.

Most of these studies found results supportive of the monetary model, especially during periods of hyperinflation. However, empirical tests conducted after 1978 produced disappointing results, particularly for the basic monetary model. Estimated coefficients often failed to match theoretical expectations in both magnitude and sign, and the explanatory power of the model—as measured by the R^2 statistic was frequently low. Additionally, the presence of autocorrelation in the error terms indicated that important explanatory variables may have been omitted from the analysis.

The literature has also addressed the real interest rate differential (RIRD) model, an extended version of the monetary model initially proposed by Frankel, with the following general form:

$$St=\beta 0+\beta 1(m-m*)+\beta 2(y-y*)+\beta 3(i-i*)+\beta 4(p-p*)+\varepsilon$$

Among the researchers who tested this extended version, Frankel himself estimated this equation using monthly data for the German mark against the U.S. dollar over the period July 1974 to February 1978. His results were consistent with theoretical expectations and helped explain the depreciation of the German mark during that period. Other notable contributions to this literature include studies by (Driskill & Sheffrin, 1981), (Haynes & Stone, 1981), and (Boothe & Glassman, 1987) all of which focused on the German mark but reported mixed findings.

On another front, some empirical tests have employed the concept of cointegration to explore the existence of long-term relationships between exchange rates and macroeconomic fundamentals such as output, interest rates, money supply, and inflation. The application of cointegration techniques has provided stronger empirical support for monetary models, particularly under price rigidity conditions.

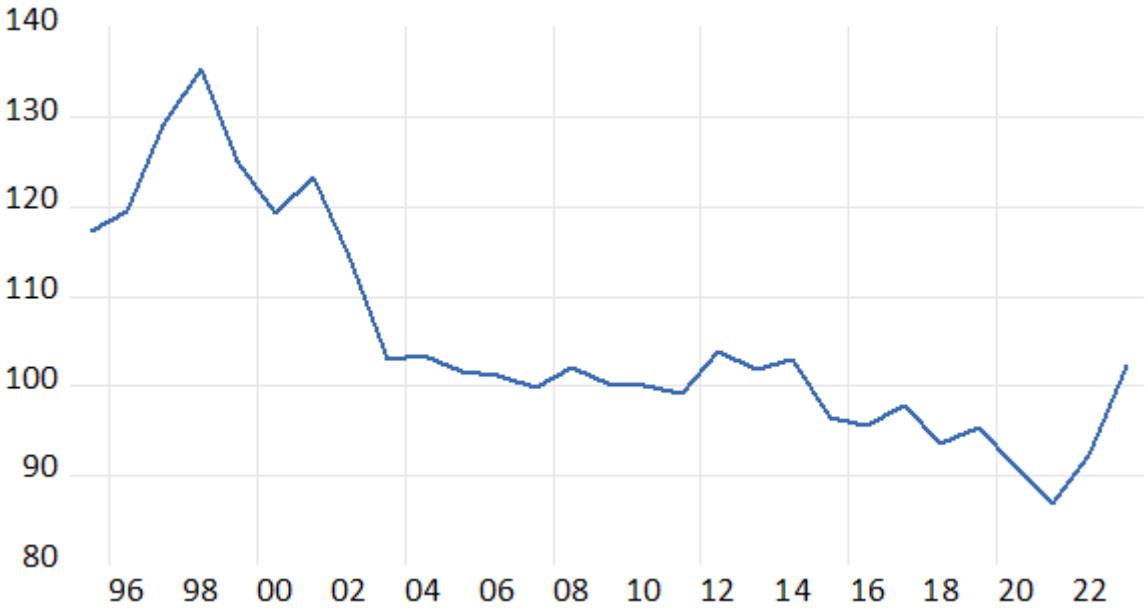
In the context of testing long-run relationships between the exchange rate and macroeconomic variables, the Engle–Granger two-step method has been applied to monetary models in studies such as those by (Taylor, 1994), (MacDonald & Wallace, 1994). These studies provide strong evidence in favor of cointegration under the monetary model framework.

In our study, we focus solely on estimating the basic monetary model and investigating the potential long-run relationship between its variables using the concept of cointegration.

3- **The Evolution of the Exchange Rate in Algeria (1995–2023)**

Between 1995 and 2023, Algeria's exchange rate policy underwent significant transformations, reflecting broader macroeconomic reforms and global economic shifts. In the mid-1990s, Algeria adopted a managed floating exchange rate regime as part of structural adjustment programs initiated in cooperation with the International Monetary Fund. This period marked a departure from the fixed exchange rate system that had dominated earlier decades. The devaluation of the Algerian dinar was a central component of these reforms, aimed at restoring external competitiveness and addressing balance of payments imbalances (Sarah & Chahinez, 2019). Throughout the 2000s, the dinar continued to depreciate gradually, influenced by oil price fluctuations, Algeria’s principal export commodity, and by persistent trade deficits. The Banque d'Algérie intervened periodically in the foreign exchange market to curb excessive volatility, maintaining relative stability without adopting a fully flexible regime (Rafika & Nassira, 2021). The period post-2014 witnessed increased depreciation pressures due to the sharp decline in global oil prices, which significantly reduced foreign currency inflows. The COVID-19 crisis further intensified these pressures, prompting a shift toward more flexible exchange rate adjustments to accommodate fiscal constraints and declining foreign reserves (Said, 2020). By 2023, Algeria's exchange rate regime had become increasingly adaptive, aiming to strike a balance between macroeconomic stability and external competitiveness, albeit still under the close oversight of monetary authorities.

Fig1. The Evolution of the Exchange Rate in Algeria during (1995–2023)



Source: world bank

4- METHODOLOGY

IV.1. Data descriptive and variables

From a methodological standpoint, this research adopts a quantitative design, integrating both descriptive analysis and econometric modeling to fulfill its investigative aims. The dataset primarily comprises official statistics gathered from the Bank of Algeria's published reports and the World Bank's Development Indicators. The empirical focus is confined to the Algerian economy, spanning the timeframe from 1995 to 2023. A comprehensive overview of the variables utilized in the empirical framework is presented in Table 1.

Table 1. Description of variables

Variable	Acronym	Proxy	Source
Logarithm of nominal exchange rate	Log(E)	nominal exchange rate	World Bank
Logarithm of the local monetary mass and the foreign monetary mass	Log(m-m*)	- local monetary mass. -foreign monetary mass	World Bank
logarithm of GDP and foreign gross product.	Log(y-y*)	-GDP and foreign gross product	World Bank
domestic interest rate and represents the real interest rate.	(i-i*)	- domestic interest rate - the real interest rate	World Bank Bank of algeria

Source. Prepared by the researcher

IV. 2. Model specification

The empirical model used to investigate the relationship between the variables is represented as follows:

$$\log E = \beta_0 + \beta_1(\log m - \log m*) + \beta_2(\log y - \log y*) + \beta_3(i - i*) + \varepsilon$$

All variables employed in the analysis have been previously defined, except for the disturbance term ϵt. The coefficients β_1, β_2, and β_3 serve to quantify

the magnitude and direction of the relationship between the independent variables and the dependent variable namely, the nominal exchange rate.

5- Empirical results

V.1. stationarity tests of time series :

In statistical terms, a time series has a unit root if it follows a random walk, meaning that shocks to the series have a permanent effect. This implies that the series does not revert to a long-term mean and that its variance increases over time (Gujarati, 2011). To assess the stationarity of the time series data, the study utilized the Augmented Dickey-Fuller (ADF) test, a standard procedure for identifying the presence of unit roots. Establishing stationarity is a necessary step prior to implementing the ARDL model, as it ensures the validity of examining both short-run fluctuations and long-run equilibrium relationships among the variables. The ADF test was applied at two levels: the original data level, denoted as I(0), and the first-differenced form, denoted as I(1), with the corresponding outcomes detailed in Table 3. The findings reveal that all variables attain stationarity upon first differencing. This mixed order of integration some variables being I(0) and others I(1) validates the suitability of the ARDL framework for the subsequent empirical analysis.

Table 3. stationarity tests of time series : ADF

Test / variable	Log(E)	Log(M-M*)	Log(Y-Y*)	(i-i*)
At Level				
With constant	-1.3593 (0.5874)	-3.2201 (0.0293)	-1.9708 (0.2972)	-4.5633 (0.0012)
With constant & trend	-1.7438 (0.7043)	-0.8616 (0.9467)	-1.7005 (0.7242)	-4.6846 (0.0043)
Without constant & trend	-0.5625 (0.4645)	2.3978 (0.9946)	5.5914 (1.0000)	-3.3672 (0.0015)
At First Difference				
With constant	-3.8740 (0.0277)	-3.6785 (0.0105)	-4.9393 (0.0005)	-6.3465 (0.0000)

With constant & trend	-3.8740 (0.0277)	-4.8612 (0.0030)	-5.0385 (0.0020)	-6.2837 (0.0001)
Without constant & trend	-3.9633 (0.0003)	-1.8580 (0.0611)	-2.9945 (0.0042)	-6.4668 (0.0000)
Order	I(1)	I(1)	I(1)	I(0)

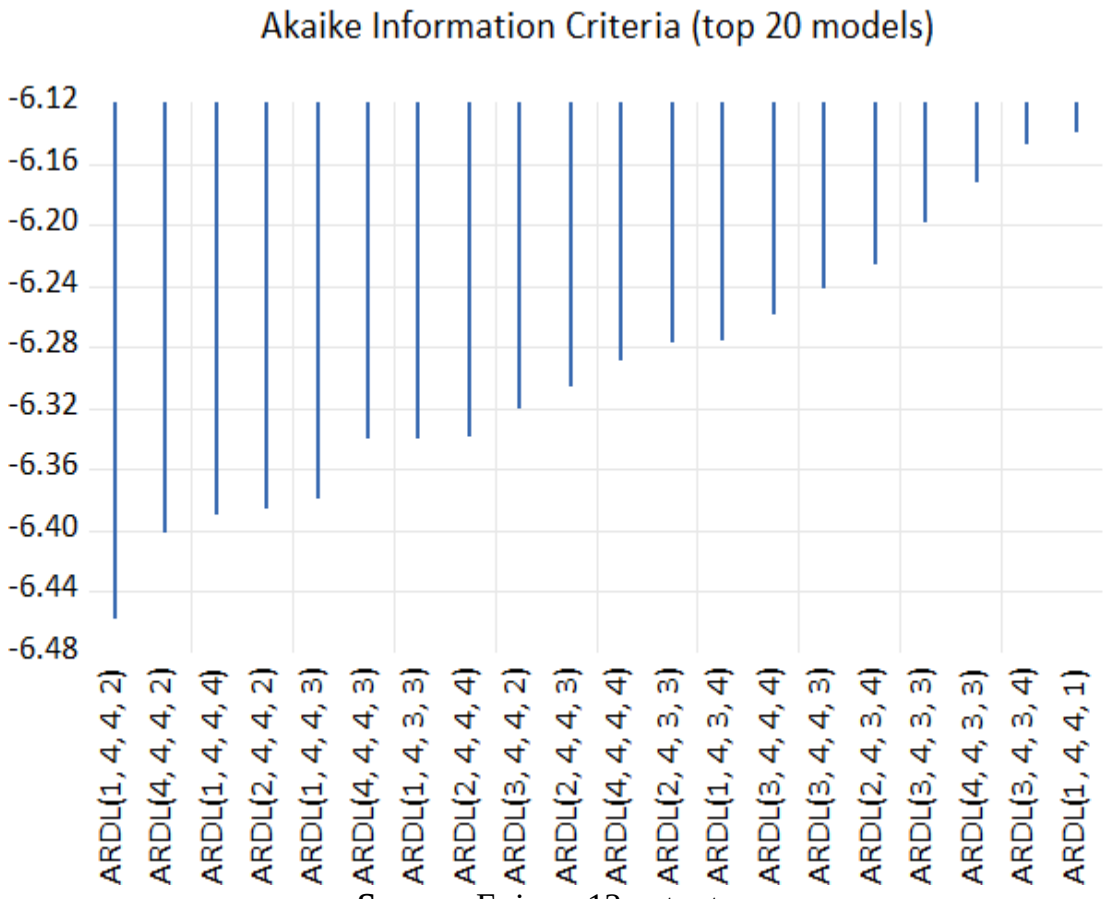
Source. Eviews 12 output

V.2. Lag length selection

For lag selection we depended on the value of akaike information criterion (AIC): (AKAIKE, 1974)

$$AIC= \hat{\sigma}^2 \exp\left[2(\frac{p+q}{N})\right]$$

Fig.1. Lag order selection criteria results



Source. Eviews 12 output

The outcomes illustrated in Figure 1 suggest that the optimal ARDL specification comprises lag orders of (1, 4, 4, 2). This configuration forms the basis for investigating both the long-run equilibrium relationships and the short-run dynamic adjustments among the included variables. Accordingly, the ARDL model is structured as follows:

$$\mathbf{Log(E)_t = C_0 + \sum_{i=1}^{1} \propto_1 \Delta\ log(E)_{t-1} + \sum_{i=1}^{4} \propto_2 \Delta\ log(M-M^*)_{t-1} + \sum_{i=1}^{4} \propto_3 \Delta\ log(Y-Y^*)_{t-1} + \sum_{i=1}^{2} \propto_3 \Delta\ log(i-i^*)_{t-1} + \beta_1\ log(E)_{t-1} + \beta_2\ log(M-M^*)_{t-1} + \beta_3\ log(Y-Y^*)_{t-1} + \beta_4\ log(i-i^*)_{t-1} + \varepsilon_t}$$

Where:

- Δ denotes the difference operator,
- C_0 is the intercept term,
- $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are the short-run coefficients associated with the changes in the variables,
- $\beta 1, \beta 2, \beta 3, \beta 4$ are the long-run coefficients associated with the lagged levels of the variables,
- ϵt represents the error term.

The specified ARDL model facilitates an in-depth exploration of both short-run variations and long-run trajectories between the explanatory variables and the nominal exchange rate. Through the interpretation of the model's estimated coefficients, researchers are able to discern the distinct impacts of the independent variables over different time horizons. This dual-layered insight offers a robust foundation for evidence-based economic policymaking and strategic planning**,** particularly in contexts where understanding currency behavior is critical to macroeconomic stability.

V.3. Bounds testing for cointegration

Bound testing was used to examine the existence of a long-term equailibrium relationship between variables. Conducting this test with dummy variables only depends on th F-statistics (omar, maamar, & amal,

2025).As presented in Table 4, the results of the bounds testing indicate that, at a 5% significance level, the computed F-statistic of 5.740717 exceeds the upper critical bound value of 3.67. This outcome signifies the presence of cointegration among the selected variables.

Given this evidence of a long-run relationship, we can proceed to estimate the long-term association between the independent variables and nominal exchange rate. The selection of the ARDL model, specifically ARDL(1,4,4,2), is based on the Akaike Information Criterion (AIC), which aids in determining the model that best fits the data while penalizing for complexity.

Table 4. Bound test for cointegration relationship

Test statistics	**Value**	**Level**	**Critical values**	
			I(0)	I(1)
F-statistics	5.740717	10%	2.37	3.20
K	2	5%	2.79	3.67
		1%	3.15	4.08

Source. Eviews 12 output

IV.4. Long-run estimation

The Autoregressive Distributed Lag (ARDL) model estimated with lag order (1,4,4,2), selected based on the Akaike Information Criterion (AIC), investigates the long-term determinants of the exchange rate, proxied by the logarithm of the domestic currency per unit of foreign currency log(E). The model incorporates relative money supply $\log(M-M*)$, relative income $\log(Y-Y*)$, and the interest rate differential $(i-i*)$ as explanatory variables. The objective is to determine whether a stable long-term relationship exists between these macroeconomic fundamentals and the exchange rate.

The estimation results reveal a statistically significant and negative long-term relationship between relative money supply and the exchange rate.

Specifically, the coefficient of $\log(M-M*)$ is -1.13 and is highly significant at the 1% level ($p = 0.0002$). This indicates that a 1% increase in the domestic money supply relative to the foreign money supply leads to an approximate 1.13% depreciation of the domestic currency. This finding is consistent with the monetary model of exchange rate determination, which posits that excess money supply in the domestic economy erodes the value of the domestic currency in the long run. It reinforces the importance of monetary discipline, especially for countries with a history of inflation or macroeconomic instability.

In contrast, the coefficient on relative income $\log(Y-Y*)$ is positive and statistically significant at the 1% level, with a value of 1.38 ($p = 0.0006$). This suggests that a 1% increase in domestic income relative to foreign income is associated with a 1.38% appreciation of the domestic currency. Economically, this can be interpreted in several ways. Higher domestic income may signal increased productivity, stronger economic fundamentals, or improved trade balances, which can attract foreign capital and strengthen the currency. Alternatively, higher income might reduce demand for foreign goods and currency, leading to an appreciation of the domestic currency.

However, the interest rate differential $(i-i*)$ shows a very weak and statistically insignificant effect on the exchange rate in the long term, with a coefficient close to zero (-0.0208) and a high p-value (0.9504). This implies that changes in the domestic interest rate relative to the foreign interest rate do not play a meaningful role in explaining long-run exchange rate movements in this model. Several factors might account for this insignificance: it could be due to the presence of capital controls, the dominance of non-interest fundamentals in determining the exchange rate, or market participants' expectations being anchored on other variables.

The constant term in the regression is 0.7187 and marginally significant at the 10% level ($p = 0.0848$), capturing the effects of other structural or institutional factors that are not explicitly included in the model but may influence the long-run equilibrium of the exchange rate.

In conclusion, the ARDL analysis provides robust evidence of a long-run cointegrating relationship between the exchange rate and its monetary and income fundamentals. The relative money supply emerges as a key driver

of depreciation pressures, while stronger relative income supports currency appreciation. In contrast, the interest rate differential does not exert a significant long-term influence. These findings have important policy implications: maintaining a stable and disciplined monetary policy and fostering real economic growth are essential to ensuring long-run exchange rate stability. Future analysis may benefit from including additional control variables or examining the short-run error correction dynamics to further elucidate the transmission mechanisms at play.

Table 5. long-run estimates

ARDL (1,4,4,2) selected based on AIC dependent variable = log(E)				
Variable	Coefficient	SE	t-statistic	Probability value
Log(M-M*)	-1.129318	0.202732	-5.570494	0.0002
Log(Y-Y*)	1.379242	0.277995	4.961390	0.0006
(i-i*)	-0.020761	0.325209	-0.063840	0.9504
Constant	0.718699	0.375657	1.913180	0.0848

Source. Eviews 12 output

V.5. Short-run estimation

The short-run results of the ARDL(1,4,4,2) model highlight the immediate effects of macroeconomic variables on the exchange rate, as well as the speed at which any disequilibrium from the long-run relationship is corrected. The dependent variable remains the logarithm of the exchange rate log(E), with changes in relative money supply, relative income, and interest rate differential included in differenced form to capture short-term fluctuations.

In the short run, changes in relative money supply specifically at the third lag have a positive and statistically significant effect on the exchange rate. The coefficient of $\Delta\log(M-M*)_{t-3}$ is 0.248 (p = 0.001), indicating that a 1% increase in the domestic money supply relative to the foreign money supply

(three periods prior) leads to an approximate 0.25% depreciation of the domestic currency. This finding is consistent with short-term liquidity effects, where monetary expansion exerts immediate depreciating pressure on the exchange rate.

Conversely, changes in relative income at the third lag exhibit a negative and highly significant impact on the exchange rate, with a coefficient of -0.277 ($p = 0.0009$). This suggests that a 1% increase in domestic income relative to foreign income results in a 0.28% appreciation of the currency in the short term. The result aligns with the demand-side interpretation that stronger domestic income can reduce imports or attract capital inflows, thus strengthening the currency.

The interest rate differential also shows a significant short-term effect. The first lag of $\Delta(i-i*)$ has a coefficient of -0.273 ($p = 0.0056$), indicating that an increase in the domestic interest rate relative to the foreign interest rate leads to an appreciation of the domestic currency. This is consistent with conventional economic theory and uncovered interest parity: higher domestic interest rates attract foreign capital, increasing demand for the domestic currency.

Crucially, the error correction term (ECM_{t-1}) is both negative and highly significant, with a coefficient of -0.620 ($p = 0.0001$). This term measures the speed at which the exchange rate returns to its long-run equilibrium following a short-term shock. The magnitude of -0.62 implies that approximately 62% of the deviation from the long-run equilibrium is corrected within one period, which suggests a relatively fast adjustment process. This strong error correction behavior reinforces the validity of the long-run relationship established earlier and confirms the model's dynamic stability.

Table 6. Results of short-run dynamic model

ARDL (1,4,4,2) selected based on AIC dependent variable = log(E)				
Variable	Coefficient	SE	t-statistic	Probability value
Δ log (M-M*)$_{t-3}$	0.247735	0.053846	4.600828	0.0010
Δlog(Y-Y*)$_{t-3}$	-0.276771	0.059688	-4.636941	0.0009
Δ(i-i*) $_{t-1}$	-0.273403	0.077859	-3.511503	0.0056
ECM$_{t-1}$	-0.619861	0.097783	-6.339166	0.0001
R^2	0.930993			
Adjested R^2	0.881698			
DW	2.795389			

Source. Eviews 12 output

V.6. Diagnostic tests results

Finally, we conducted several diagnostic tests to validate our findings. As shown in Table 7, at the 5% significance level, our model demonstrates that it is free from serial correlation, heteroscedasticity, and functional misspecification. Additionally, the Jarque-Bera statistic indicates that the residuals of our model are normally distributed. These diagnostic checks reinforce the robustness of our model and the reliability of our findings regarding the long-run relationship between the study variables.

Table 7. Diagnostic tests

Specification	**F-statistics**	**Probability value**
Breusch-Godfrey LM test	3.335493	0.4893
Breusch-Pagan	0.672612	0.7584
(hetroscedasticity)	0.284326	0.867480
Jarque-Bera (normality)	1.510972	0.2502
Ramsey RESET		

Source. Eviews 12 output

In a similar vein, the outcomes derived from the CUSUM and CUSUM of Squares (CUSUMSQ) diagnostic tests—depicted in Figures 2 and 3, respectively—confirm the overall stability of the estimated model. The plotted test statistics remain consistently within the 5% confidence bounds throughout the sample period, indicating the absence of significant structural instabilities or parameter shifts. These findings lend further support to the robustness and reliability of the ARDL specification employed in the analysis.

Fig.2. Plots of CUSUM

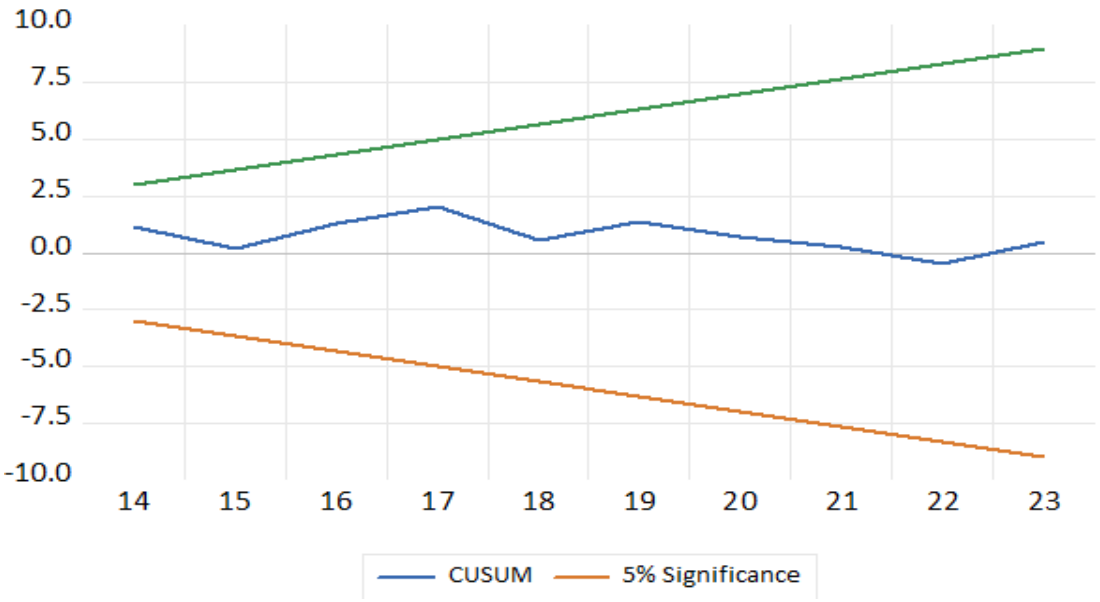
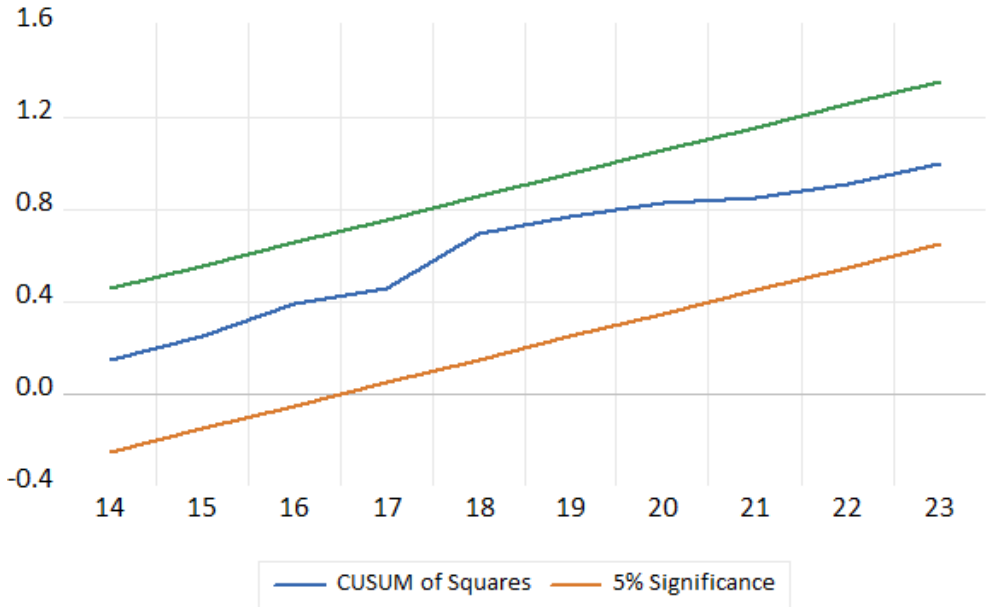


Fig.3. CUSUM of squares



Source. Eviews 12 output

6- Discussion of Hypotheses and Results

This section discusses the empirical findings in light of the study's theoretical framework and the hypotheses outlined earlier. The objective was to assess the long- and short-run determinants of the exchange rate, specifically the roles of relative money supply, relative income, and interest rate differential. The results obtained from the ARDL(1,4,4,2) model allow us to evaluate the validity of each hypothesis.

Hypothesis 1: An increase in the domestic money supply relative to the foreign money supply leads to a depreciation of the domestic currency.

The results support this hypothesis both in the long and short run. In the long run, the coefficient on relative money supply is negative and statistically significant (-1.13, p = 0.0002), indicating that an expansionary monetary policy relative to the foreign country exerts depreciating pressure

on the exchange rate. This is consistent with monetary models of exchange rate determination, where an increase in money supply reduces the value of the domestic currency due to inflationary expectations and increased liquidity. Similarly, in the short-run dynamics, the third lag of the first difference of relative money supply shows a positive and significant coefficient (0.25, p = 0.001), confirming that recent monetary expansions have short-term depreciating effects. These findings affirm the importance of disciplined monetary policy in maintaining currency stability.

Hypothesis 2: An increase in domestic income relative to foreign income leads to an appreciation of the domestic currency.

This hypothesis is also strongly confirmed by the empirical results. In the long run, the coefficient of relative income is positive and statistically significant (1.38, p = 0.0006), implying that stronger economic performance compared to trading partners supports domestic currency appreciation. This could reflect increased investor confidence, improved trade balances, or higher productivity, all of which enhance the attractiveness of the domestic economy. In the short run, the effect remains consistent: the third lag of the relative income differential is negative and significant (-0.28, p = 0.0009), indicating that a rise in domestic income relative to foreign income contributes to an immediate appreciation. These results validate the role of real economic fundamentals in influencing both the immediate and long-term behavior of the exchange rate.

Hypothesis 3: A higher domestic interest rate relative to the foreign rate leads to an appreciation of the domestic currency.

The empirical findings provide only partial support for this hypothesis. While the short-run coefficient of the first lag of the interest rate differential is negative and statistically significant (-0.27, p = 0.0056), indicating that a temporary increase in domestic interest rates attracts capital inflows and strengthens the currency, the long-run relationship is statistically insignificant. The long-term coefficient is very close to zero (-0.0208, p =

0.9504), suggesting that interest rate differentials do not exert a lasting influence on the exchange rate in the context of the model used. This finding may be attributed to several structural factors, including capital flow restrictions, underdeveloped financial markets, or expectations that interest rate changes are not sustainable. It also points to the greater relevance of real variables, such as income and money supply, in explaining long-run exchange rate behavior.

Hypothesis 4: The exchange rate adjusts toward its long-run equilibrium after short-term shocks.

This hypothesis is confirmed by the highly significant and negative error correction term (-0.62, $p = 0.0001$), which implies that approximately 62% of deviations from the long-run equilibrium are corrected within one period. This strong error correction mechanism confirms the existence of a stable long-term cointegrating relationship among the variables and supports the dynamic validity of the ARDL model.

7- Conclusion

This study set out to examine the long- and short-run determinants of the exchange rate using an ARDL approach, focusing on the roles of relative money supply, relative income, and interest rate differentials. The analysis was grounded in theoretical models of exchange rate determination, particularly the monetary and portfolio balance frameworks.

The results provide robust evidence of a long-run cointegrating relationship between the exchange rate and its macroeconomic fundamentals. In the long run, a relative increase in the domestic money supply leads to a significant depreciation of the domestic currency, underscoring the importance of disciplined monetary policy. Conversely, higher domestic income relative to foreign income contributes to currency appreciation, highlighting the role of real economic strength in supporting exchange rate stability. However, the interest rate differential, often emphasized in

traditional models, was found to be statistically insignificant in the long run—suggesting that, in this context, nominal interest rate movements are less influential than real economic variables.

Short-run dynamics confirm these patterns, with lagged effects of relative money supply and income exerting statistically significant impacts on the exchange rate. Additionally, the interest rate differential displays a short-term influence consistent with uncovered interest parity theory. Importantly, the highly significant and negative error correction term indicates that deviations from long-run equilibrium are rapidly corrected, lending support to the stability and validity of the model.

Diagnostic tests affirm the robustness of the model, showing no signs of serial correlation, heteroscedasticity, or model misspecification. Furthermore, CUSUM and CUSUMSQ plots confirm the structural stability of the estimated model throughout the sample period.

From a policy perspective, the findings stress the need for sound monetary management and strategies that promote sustainable economic growth. Policymakers should recognize that inflationary pressures from excessive monetary expansion can undermine currency value, while fostering income growth and economic resilience can strengthen exchange rate fundamentals.

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