

Money Supply and Inflation Dynamics in Algeria and Egypt: A Comparative ARDL Bounds Testing Analysis, 1990–2025

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Abstract :

This paper examines the money supply–inflation nexus in Algeria and Egypt over 1990–2025 using the ARDL bounds testing approach. Annual data are used to estimate two harmonized country-specific models. The results indicate cointegration in both countries, while revealing different monetary transmission dynamics. In Algeria, nominal broad-money growth has a positive and significant short- and long-run effect on inflation, alongside a strong exchange-rate channel. In Egypt, broad-money growth also has a positive and significant long-run effect, but its short-run transmission occurs with a lag, while exchange-rate depreciation exerts an immediate inflationary effect. The error-correction terms are negative and significant in both models, confirming convergence toward long-run equilibrium. Overall, the findings identify a common positive long-run monetary effect, with more immediate transmission in Algeria and delayed transmission in Egypt.

Key Words: Money Supply; Inflation Dynamics; ARDL Bounds Testing.

JEL Classification : E31, E51, C32, O57

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Introduction

Inflation remains one of the most important macroeconomic issues facing developing economies because it directly affects purchasing power, monetary stability, income distribution, saving behavior, and the credibility of economic policy. In economies where financial markets are less deep, exchange-rate movements are frequent, and fiscal and monetary interactions are strong, inflation is rarely the outcome of a single source. It may reflect monetary expansion, exchange-rate depreciation, import dependence, administered prices, expectations, external shocks, or changes in the stance of monetary policy. Nevertheless, the money supply remains a central variable in inflation analysis. In the monetary tradition, persistent growth in money relative to the economy's capacity to absorb nominal expenditure is expected to generate upward pressure on the price level (Friedman, 1968, 1970; Mishkin, 2019). Yet the empirical strength and timing of this relationship may differ substantially across countries according to their monetary, external, and institutional structures.

The money–inflation relationship is especially relevant in the cases of Algeria and Egypt. Both are major North African economies, both experienced

important monetary and external-sector transformations during the last three decades, and both faced episodes of substantial inflationary pressure. However, the two economies differ in ways that may influence the transmission of broad-money growth to consumer prices. Algeria has historically combined monetary management with a comparatively managed exchange-rate environment, strong public-sector involvement, and substantial dependence on external receipts. Egypt, by contrast, has experienced more pronounced exchange-rate adjustments and repeated episodes in which broad-money expansion and currency depreciation coincided with sharp increases in consumer prices. These differences make the comparison particularly useful: the same monetary variable may generate a similar long-run inflationary effect while being transmitted at different speeds across the two economies.

Theoretically, two channels are especially relevant to the present study. The first is the conventional monetary channel, according to which persistent growth in broad money can increase nominal expenditure and place upward pressure on prices when the expansion of liquidity is not matched by a corresponding capacity to absorb it through real transactions. This view is consistent with the quantity-theory tradition and with long-run empirical evidence linking money growth and inflation (Friedman, 1970; De Grauwe & Polan, 2005; Teles et al., 2016). The second is the exchange-rate channel. In open economies, depreciation of the domestic currency can raise consumer prices through the higher domestic-currency cost of imported final goods and intermediate inputs, as well as through expectations and firms' pricing decisions (Dornbusch, 1976; Taylor, 2000; Campa & Goldberg, 2005; Choudhri & Hakura, 2006). Monetary and exchange-rate effects can therefore operate jointly, although their timing and persistence need not be identical.

Previous empirical studies have examined inflation dynamics in Algeria and Egypt, but much of the evidence remains country-specific. For Algeria, studies have emphasized the relevance of money supply, exchange-rate movements, import prices, public expenditure, and other domestic and external factors in explaining inflationary movements (Laourari & Abderrahim, 2022; Mahfoudi, 2024; Benabdallah & Oulddali, 2024). For Egypt, the literature has investigated the effects of monetary expansion, exchange-rate movements, output conditions, imports, and external price pressures on inflation (El-Sakka & Ghali, 2005; Abonazel & Elnabawy, 2020; Dekkiche, 2022). These contributions clarify important country-specific inflation determinants, but they do not fully resolve the comparative question of whether the same nominal monetary variable generates comparable long-run inflation effects and similar short-run transmission patterns in Algeria and Egypt.

This paper addresses this gap by examining the money supply–inflation relationship in Algeria and Egypt over the common period 1990–2025 within a harmonized comparative framework. Annual consumer price inflation is measured identically in the two countries, and nominal broad-money growth is employed as the principal monetary explanatory variable in both equations. Exchange-rate

depreciation is likewise included as a common transmission channel. The core stochastic specification is therefore the same in the two economies—INF, M2G, and EXRG—while country-specific deterministic interventions are introduced only to isolate major persistent or exceptional historical disturbances. This design prevents differences in variable definition from driving the comparative findings.

The central research question is therefore **whether nominal broad-money growth exerts a comparable long-run effect on inflation in Algeria and Egypt? and whether the timing of monetary transmission differs between the two economies?** This distinction is important because a common positive long-run monetary relationship does not imply identical short-run dynamics. Broad-money expansion may affect inflation within the same annual period in one economy but emerge with a lag in another. Exchange-rate depreciation may likewise transmit to prices more rapidly than monetary expansion. The comparative design therefore focuses not only on the sign and magnitude of the long-run monetary coefficient, but also on the timing of monetary and exchange-rate transmission.

Methodologically, the paper employs the autoregressive distributed lag bounds testing approach. This framework permits the joint analysis of short-run dynamics and long-run relationships and can accommodate variables that are integrated of order zero or one, provided that none is integrated of order two (Pesaran & Shin, 1999; Pesaran et al., 2001). The ARDL approach is particularly appropriate for the present analysis because the inflationary consequences of broad-money growth and exchange-rate depreciation need not occur contemporaneously. Distributed lags allow the data to determine whether monetary and exchange-rate effects are immediate, delayed, or persistent, while the associated error-correction representation measures the speed at which inflation returns toward its long-run equilibrium.

The empirical strategy estimates separate country-specific ARDL equations rather than imposing a pooled model. This preserves differences in dynamic adjustment while maintaining an identical core set of stochastic variables and a common observation period. For Algeria, the specification additionally includes the level interventions S1996 and S2003; for Egypt, it includes the impulse interventions P2008 and P2023. These deterministic controls are not alternative economic determinants of inflation but devices for preventing major historical disturbances from being absorbed into the systematic M2G and EXRG coefficients. The final specifications are evaluated through residual, functional-form, multicollinearity, and stability diagnostics, together with finite-sample bounds inference.

The contribution of this paper is threefold. First, it provides a directly comparable analysis of the money supply–inflation nexus in Algeria and Egypt using the same inflation measure, the same nominal broad-money growth variable, the same exchange-rate variable, and the same ARDL framework. Second, it distinguishes between the long-run magnitude and the short-run timing of monetary transmission, allowing the same monetary concept to generate different dynamic adjustment patterns across countries. Third, it explicitly controls for country-

specific structural episodes while preserving a harmonized stochastic specification. In this way, the paper contributes to the broader literature showing that inflation in developing and emerging economies reflects the interaction of monetary expansion, exchange-rate developments, and country-specific macroeconomic conditions (Loungani & Swagel, 2001; Ha et al., 2019).

The remainder of the paper is organized as follows. Section 1 reviews the theoretical and empirical literature on money supply, inflation, exchange-rate pass-through, and the timing of monetary transmission, with particular attention to Algeria and Egypt. Section 2 presents the data, variable definitions, structural interventions, model specifications, and ARDL bounds testing methodology. Section 3 reports the empirical results, including unit-root tests, model selection, bounds tests, long-run coefficients, short-run dynamics, diagnostics, and stability evidence. Section 4 discusses the comparative implications of the findings. Finally, the Conclusion.

I. Money Supply, Inflation and Monetary Transmission: Literature Review

1. Money Supply and Inflation

The relationship between money supply and inflation occupies a central position in monetary economics. In its simplest form, the monetary view argues that persistent increases in the quantity of money, when not matched by a proportional expansion in the economy's capacity to absorb nominal expenditure, generate upward pressure on the general price level. This proposition is rooted in the quantity theory of money and was reinforced by the monetarist tradition, which associates persistent inflation, particularly over longer horizons, with sustained monetary expansion (Friedman, 1968, 1970). In this framework, money growth affects inflation through aggregate expenditure, liquidity conditions, and expectations about future prices.

The empirical relationship, however, is not necessarily one-to-one or immediate. Its strength can depend on money demand, financial development, monetary-policy credibility, the exchange-rate environment, and the speed with which liquidity is transmitted to expenditure and prices. In economies exposed to external shocks or changing financial conditions, part of monetary expansion may initially be absorbed through changes in real activity, asset holdings, foreign-currency demand, or other components of nominal expenditure. This is particularly relevant for developing economies, where monetary aggregates may also reflect fiscal financing, credit expansion, foreign-exchange operations, or changes in financial depth (Mishkin, 2019).

Empirical evidence consequently tends to distinguish between short-run monetary fluctuations and more persistent long-run relationships. De Grauwe and Polan (2005) show that the relationship between money growth and inflation is considerably clearer in higher-inflation environments than in low-inflation economies. Teles et al. (2016) likewise show that the interpretation of the quantity-theory relationship depends on the monetary environment and on properly accounting for factors affecting money demand. These findings support an

empirical strategy in which the long-run effect of broad-money growth is estimated separately from its short-run timing rather than assuming an immediate one-to-one response.

2. Exchange Rate and Inflation Transmission

In open economies, inflation is influenced not only by domestic liquidity but also by exchange-rate movements. A depreciation of the domestic currency can increase consumer prices through several channels. It raises the domestic-currency price of imported consumption goods, increases the cost of imported intermediate inputs, and can affect expectations and price-setting behavior. The exchange-rate channel is therefore closely connected to monetary transmission, particularly when monetary expansion and currency depreciation occur simultaneously.

Theoretical work on exchange-rate dynamics emphasizes that monetary disturbances can influence exchange rates and domestic prices through expectations and asset-market adjustment (Dornbusch, 1976). The degree of exchange-rate pass-through depends on the inflation environment, monetary-policy credibility, market structure, and the composition of imports. Taylor (2000) links the degree of pass-through to the inflationary environment and firms' pricing behavior. Campa and Goldberg (2005) document substantial differences in pass-through across countries and product categories, while Choudhri and Hakura (2006) show that the inflation environment is an important determinant of the extent of pass-through.

The interaction between money supply and exchange-rate movements is particularly relevant in developing economies. Monetary expansion can increase demand for foreign currency and reinforce depreciation pressures, while depreciation can increase imported inflation and alter the subsequent monetary-policy response. The observed inflation outcome may therefore reflect simultaneous monetary and exchange-rate forces rather than either mechanism in isolation. This provides a strong rationale for including broad-money growth and exchange-rate depreciation jointly in empirical inflation models (Loungani & Swagel, 2001; Ha et al., 2019).

3. Dynamic Timing of Monetary and Exchange-Rate Transmission

The inflationary consequences of monetary expansion need not emerge within the same period in which money growth occurs. Even when broad-money growth has a positive long-run relationship with inflation, its short-run transmission may be immediate, delayed, or distributed over several periods. Adjustment in expenditure, portfolio decisions, expectations, and contractual prices can create lags between monetary expansion and observed consumer-price inflation. The evidence that the money–inflation relationship becomes clearer over longer horizons therefore provides a basis for explicitly modelling distributed monetary effects (De Grauwe & Polan, 2005; Teles et al., 2016).

Exchange-rate depreciation may follow a different transmission profile. Changes in the domestic-currency cost of imported goods and intermediate inputs can affect prices relatively rapidly, while the persistence of that effect depends on firms' pricing behavior and the inflationary environment (Taylor, 2000; Campa &

Goldberg, 2005; Choudhri & Hakura, 2006). A model may consequently exhibit strong contemporaneous exchange-rate pass-through even when the response to broad-money growth is statistically visible only after a lag.

This distinction is central to a comparative ARDL framework. Algeria and Egypt can exhibit the same positive long-run relationship between nominal broad-money growth and inflation without displaying identical short-run coefficients. The distributed-lag structure allows the data to determine whether monetary transmission is contemporaneous or delayed and whether exchange-rate effects are more immediate or persistent. The relevant comparative question is therefore not only whether M2G and EXRG affect inflation, but also how rapidly their effects are transmitted to consumer prices in each economy.

4. Empirical Evidence on Inflation in Algeria

Empirical evidence for Algeria generally emphasizes the importance of monetary and external factors in explaining inflation. Algeria's inflation process has been examined in relation to money supply, exchange-rate movements, import prices, public expenditure, and other macroeconomic conditions. This literature suggests that monetary expansion is relevant to inflation but operates alongside exchange-rate and external-price channels rather than as an isolated determinant.

Laourari and Abderrahim (2022) examine inflation dynamics in Algeria using a specification that incorporates monetary and external variables, including money supply, exchange-rate movements, import prices, and public expenditure. Their analysis illustrates the multidimensional character of Algerian inflation. Mahfoudi (2024) examines more directly the relationship between money supply, exchange-rate changes, and inflation using an ARDL bounds-testing framework over 1990–2022. The study is particularly relevant to the present analysis because it considers the same two principal transmission variables—money supply and the exchange rate—within an Algerian inflation equation. Benabdallah and Oulddali (2024) also examine the determinants of inflation in Algeria using an ARDL cointegration framework, providing further evidence for the usefulness of dynamic long-run modelling in the Algerian context.

Other research has focused specifically on the interaction between monetary expansion and exchange-rate movements. Aid and Benelbar (2023) examine the relationship between money supply and the exchange rate in Algeria, showing why the two variables should not necessarily be treated as independent macroeconomic processes. This connection is relevant to inflation analysis because exchange-rate movements can constitute an important channel through which monetary and external pressures reach domestic prices. Overall, the Algerian literature supports the joint consideration of broad-money growth and exchange-rate depreciation while leaving open the precise magnitude and timing of their inflationary effects.

5. Empirical Evidence on Inflation in Egypt

The Egyptian case has attracted considerable attention because inflation has repeatedly occurred alongside broad-money expansion, exchange-rate adjustments, import-price pressures, and changing macroeconomic conditions. The literature therefore generally treats monetary and exchange-rate variables as important components of Egyptian inflation dynamics. El-Sakka and Ghali (2005) provide earlier multivariate evidence on the sources of inflation in Egypt by examining monetary, exchange-rate, output, and external-price variables. Abonazel and Elnabawy (2020) subsequently employ the ARDL bounds-testing approach to investigate Egyptian inflation using variables that include money supply, the exchange rate, and real output. Their study is particularly relevant methodologically because it demonstrates the applicability of the ARDL framework to Egyptian inflation dynamics. Dekkiche (2022), using a VECM approach, examines the impact of money supply on inflation in Egypt while incorporating the exchange rate, imports, and output. Although the methodology differs, the study remains directly relevant to the monetary and exchange-rate channels examined here. The wider evidence from developing economies reinforces the use of these variables. Loungani and Swagel (2001) show that inflation in developing countries is associated with monetary growth, exchange-rate movements, and external shocks, while Ha et al. (2019) document the broader importance of domestic and global inflation drivers across emerging and developing economies. This literature supports a specification in which nominal broad-money growth and exchange-rate depreciation are analyzed jointly, while allowing their relative importance and transmission speed to be determined empirically in the Egyptian case.

6. Research Gap and Contribution

The reviewed literature provides substantial evidence on inflation determinants in Algeria and Egypt, but three limitations remain. First, much of the evidence is country-specific, with the two economies generally examined separately. Second, studies frequently employ different monetary definitions, control variables, periods, or econometric designs, which makes direct comparison difficult. Third, relatively few studies impose a harmonized comparative structure in which the dependent variable, principal monetary variable, exchange-rate channel, observation period, and econometric framework are made directly comparable while country-specific structural disturbances are explicitly controlled.

This paper addresses these limitations by examining the money supply–inflation nexus in Algeria and Egypt over 1990–2025 using a common ARDL bounds-testing framework. The same consumer-price inflation measure, nominal broad-money growth variable, and exchange-rate depreciation variable are used in both equations. Country-specific structural interventions are included only to isolate major persistent or exceptional historical disturbances. The contribution therefore lies not merely in estimating two separate inflation equations, but in determining whether a common nominal monetary variable produces a comparable long-run inflation relationship while allowing the timing of monetary and

exchange-rate transmission to differ across the two economies. Finite-sample bounds inference, explicit structural interventions, and diagnostic and stability checks further strengthen the comparative design.

II. Data, Methodology and Models

1. Data and variables

This study uses annual data for Algeria and Egypt over the period 1990–2025. An identical sample period is imposed on the two countries in order to maximize comparability and to cover a sufficiently long horizon to examine short-run inflation dynamics, monetary transmission, structural changes, and long-run equilibrium relationships. The macroeconomic series are obtained from internationally harmonized World Bank and IMF databases (World Bank, 2026; International Monetary Fund [IMF], 2026), while exchange-rate growth and the deterministic structural-intervention variables are constructed from the underlying series.

The dependent variable is consumer price inflation, denoted by INF_t , and measured identically in the two countries as the annual percentage change in the consumer price index. The use of the same inflation measure is fundamental to the comparative nature of the analysis because differences between Algeria and Egypt cannot then be attributed to different definitions of the dependent variable.

The main explanatory variable is nominal broad-money growth, denoted by $M2G_t$, and defined as:

$$M2G_t = 100 \left(\frac{M2_t - M2_{t-1}}{M2_{t-1}} \right)$$

where ($M2_t$) denotes broad money. The same monetary variable is imposed on the two countries and measures the rate of expansion of economy-wide nominal liquidity. A positive relationship with inflation is expected because persistent monetary expansion can generate excess nominal spending and price pressure when the growth of liquidity exceeds the economy's capacity to absorb it through real transactions.

The models also include exchange-rate depreciation, defined as:

$$EXRG_t = 100 [\ln(EXR_t) - \ln(EXR_{t-1})]$$

where EXR_t is the number of domestic currency units per US dollar. A positive value therefore represents depreciation of the domestic currency. Exchange-rate depreciation can increase consumer prices through imported final goods, imported intermediate inputs, production costs, and inflation expectations.

The common stochastic specification is supplemented by country-specific deterministic structural interventions. For Algeria, ($S1996$) and ($S2003$) are level interventions:

$$S1996_t = \begin{cases} 0 & \text{if } t < 1996, \\ 1 & \text{if } t \geq 1996. \end{cases}$$

$$S2003_t = \begin{cases} 0 & \text{if } t < 2003, \\ 1 & \text{if } t \geq 2003. \end{cases}$$

The first captures the persistent change associated with the mid-1990s stabilization and adjustment regime, while the second controls for a subsequent persistent shift beginning in 2003.

For Egypt, (P2008) and (P2023) are impulse interventions:

$$P2008_t = \begin{cases} 0 & \text{if } t = 2008, \\ 1 & \text{otherwise.} \end{cases}$$

$$P2023_t = \begin{cases} 0 & \text{if } t = 2023, \\ 1 & \text{otherwise.} \end{cases}$$

The impulse form is appropriate because these variables isolate exceptionally strong inflation episodes without imposing permanent shifts on the Egyptian inflation process.

Table 1. The variables used in the empirical analysis are summarized as follows

Symbol	Variable	Measurement	Expected effect
INF	Consumer price inflation	Annual percentage change in consumer prices	Dependent variable
M2G	Nominal broad-money growth	Annual percentage growth of broad money	Positive
EXRG	Exchange-rate depreciation	$100[\ln(EXR_t) - \ln(EXR_{t-1})]$	Positive
S1996	Algeria 1996 level intervention	1 from 1996 onward; 0 otherwise	Structural shift
S2003	Algeria 2003 level intervention	1 from 2003 onward; 0 otherwise	Structural shift
P2008	Egypt 2008 impulse intervention	1 in 2008; 0 otherwise	Positive inflation impulse
P2023	Egypt 2023 impulse intervention	1 in 2023; 0 otherwise	Positive inflation impulse

Source: Prepared by the researcher based on the final empirical specification.

The common use of consumer price inflation, nominal broad-money growth, and exchange-rate depreciation substantially strengthens comparability between Algeria and Egypt. The intervention variables do not change the underlying monetary specification; their purpose is to isolate persistent or exceptional historical movements that would otherwise be absorbed by the coefficients of the common economic variables.

2. Model specification

The empirical analysis is based on two country-specific equations sharing exactly the same core stochastic variables. Consumer price inflation is explained by nominal broad-money growth and exchange-rate depreciation in both countries, while deterministic interventions account for identified structural episodes.

For Algeria, the inflation equation is specified as:

$$INF_t^{DZ} = f(M2G_t^{DZ}, EXRG_t^{DZ}, S1996_t, S2003_t)$$

or in linear form:

$$INF_t^{DZ} = \alpha_0 + \alpha_1 M2G_t^{DZ} + \alpha_2 EXRG_t^{DZ} + \alpha_3 S1996_t + \alpha_4 S2003_t + \varepsilon_t^{DZ}$$

For Egypt, the inflation equation is specified as:

$$INF_t^{EG} = f(M2G_t^{EG}, EXRG_t^{EG}, P2008_t, P2023_t)$$

or in linear form:

$$INF_t^{EG} = \gamma_0 + \gamma_1 M2G_t^{EG} + \gamma_2 EXRG_t^{EG} + \gamma_3 P2008_t + \gamma_4 P2023_t + \varepsilon_t^{EG}$$

The two specifications therefore use the same dependent variable, the same monetary variable, the same exchange-rate variable, the same annual frequency, and the same 1990–2025 observation window. The only differences are deterministic interventions required to isolate country-specific structural episodes. This permits the substantive monetary relationship to be compared directly while allowing the timing of adjustment to be determined by the data.

3. ARDL bounds testing approach

The study employs the autoregressive distributed lag bounds testing approach developed by Pesaran and Shin (1999) and Pesaran et al. (2001). The approach is appropriate because it permits a combination of $I(0)$ and $I(1)$ variables provided that no variable is $I(2)$, allows simultaneous analysis of short-run and long-run dynamics, and is suitable for parsimonious annual macroeconomic models.

The general Algerian ARDL representation is:

$$INF_t^{DZ} = c + \sum_{i=1}^p \varphi_i INF_{t-i}^{DZ} + \sum_{j=0}^q \beta_j M2G_{t-j}^{DZ} + \sum_{k=0}^{\tau} \gamma_k EXRG_{t-k}^{DZ} + \delta_1 1996_t + \delta_2 2003_t + \mu_t$$

For Egypt:

$$INF_t^{EG} = c + \sum_{i=1}^p \varphi_i INF_{t-i}^{EG} + \sum_{j=0}^q \beta_j M2G_{t-j}^{EG} + \sum_{k=0}^{\tau} \gamma_k EXRG_{t-k}^{EG} + \delta_1 2008_t + \delta_2 2023_t + \mu_t$$

The maximum dynamic lag is restricted to two annual periods, and the final lag structure is selected using the Akaike Information Criterion. This allows delayed transmission while retaining a parsimonious specification relative to the available sample.

The conditional unrestricted error-correction representation is:

$$\Delta INF_t = c + \lambda_1 INF_{t-1} + \lambda_2 M2G_{t-1} + \lambda_3 EXRG_{t-1} + \sum_{i=1}^{p-1} \vartheta_i INF_{t-i} + \sum_{j=0}^{q-1} \partial_j M2G_{t-j} + \sum_{k=0}^{\tau-1} \delta_k EXRG_{t-k} + \delta' Z_t + u_t$$

where Z_t represents the relevant structural interventions.

The null hypothesis of no long-run relationship is:

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = 0$$

against the alternative:

$$H_1: (\lambda_1, \lambda_2, \lambda_3) \neq (0, 0, 0)$$

If the calculated (F)-statistic exceeds the upper critical bound, the null of no cointegration is rejected. In addition to conventional asymptotic inference, the analysis applies 200,000 finite-sample simulations to generate sample-specific lower and upper critical bounds. This provides an additional safeguard against distortion from relying exclusively on asymptotic critical values in a relatively short annual sample.

4. Long-run and short-run dynamics

Once cointegration is established, the normalized long-run coefficient of broad-money growth is obtained from:

$$\theta_{M2G} = \frac{\sum_{j=0}^q \beta_j}{1 - \sum_{i=1}^p \varphi_i}$$

while the corresponding exchange-rate coefficient is:

$$\theta_{EXRG} = \frac{\sum_{k=0}^T \gamma_k}{1 - \sum_{i=1}^p \varphi_i}$$

The long-run *M2G* coefficient is the principal comparative parameter because exactly the same monetary variable is used in Algeria and Egypt. A positive and significant coefficient indicates that sustained broad-money expansion raises the equilibrium inflation rate.

Short-run dynamics are evaluated through the UECM. A valid error-correction term should be negative and statistically significant. Its magnitude indicates the proportion of disequilibrium corrected within one year. Significance of $\Delta M2G_t$ indicates immediate monetary transmission, whereas significance of a lagged *M2G* term indicates delayed transmission.

The deterministic intervention coefficients are interpreted separately. Permanent level interventions in Algeria can affect the conditional long-run inflation level, whereas the Egyptian pulse variables capture temporary one-period inflation disturbances. Their inclusion ensures that exceptional structural episodes do not contaminate the systematic monetary and exchange-rate coefficients.

5. Diagnostic and stability tests

The reliability of the estimated relationships is examined using a comprehensive diagnostic battery. Serial correlation is tested using the Breusch–Godfrey LM test. Heteroskedasticity is examined using the Breusch–Pagan test, while ARCH-LM tests for autoregressive conditional heteroskedasticity. Residual normality is examined using the Jarque–Bera test. Functional-form adequacy is evaluated using the Ramsey RESET test, and the Durbin–Watson statistic provides an additional indication of residual dependence. Multicollinearity is evaluated through pairwise correlation matrices and variance inflation factors. Parameter stability is assessed using CUSUM and CUSUMSQ evidence after the structural interventions have been incorporated. The final empirical judgment therefore rests jointly on integration properties, bounds cointegration, long-run coefficients, short-run error correction, residual diagnostics, multicollinearity, and structural stability.

III. Empirical Results

1. Preliminary overview and descriptive statistics

This section reports the empirical findings for the final country-specific ARDL models. The same consumer price inflation, broad-money growth, and exchange-rate depreciation variables are employed in the two equations. Algeria additionally contains S1996 and S2003, while Egypt contains P2008 and P2023. Descriptive statistics are calculated over the common 1990–2025 observation window.

Table 2. Descriptive statistics for Algeria

Variable	Obs.	Mean	Median	Max	Min	Std. Dev	Skewness	Kurtosis
INF	36	8.2765	4.6543	31.6697	0.3392	8.7531	1.6855	4.6651
M2G	36	13.7425	13.3661	54.0514	-0.7575	9.5471	2.1791	11.4509
EXRG	36	7.9180	4.0430	72.3811	-7.1414	14.8986	2.7656	12.7706
S1996	36	0.8333	1.0000	1.0000	0.0000	0.3780	-1.8676	4.5722
S2003	36	0.6389	1.0000	1.0000	0.0000	0.4871	-0.6038	1.2648

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

Algerian inflation averages 8.28% over the full period but displays substantial dispersion, with a maximum of 31.67%. Its positive skewness and kurtosis above three reflect the concentration of unusually high inflation rates in particular historical episodes. Broad-money growth averages 13.74% and is even more leptokurtic, reflecting occasional very large liquidity expansions. Exchange-rate depreciation is the most volatile continuous variable, with a standard deviation of 14.90 percentage points and a maximum annual depreciation of 72.38%, supporting its inclusion as an important inflation-transmission channel.

Table 3. Descriptive statistics for Egypt

Variable	Obs.	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis
INF	36	11.2746	10.0676	33.8848	2.2698	7.5021	1.3844	5.0658
M2G	36	16.4149	14.1521	39.5091	5.6636	7.0861	1.2775	5.1599
EXRG	36	11.2194	2.1463	70.5333	-6.9741	19.6644	1.7693	5.3126
P2008	36	0.0278	0.0000	1.0000	0.0000	0.1667	6.0000	39.0000
P2023	36	0.0278	0.0000	1.0000	0.0000	0.1667	6.0000	39.0000

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

Egypt records a higher average inflation rate than Algeria at 11.27%, while broad-money growth averages 16.41%. Exchange-rate depreciation is particularly volatile, with a standard deviation of 19.66 percentage points and a maximum annual change of 70.53%. The positive skewness of the three continuous variables indicates that unusually strong inflation, monetary expansion, and depreciation episodes occur predominantly in the upper tail. P2008 and P2023 display the extreme skewness expected from one-year deterministic impulses.

2. Unit root tests

Before estimating the ARDL bounds models, the stationarity properties of INF, M2G, and EXRG are examined using both Augmented Dickey–Fuller and Phillips–Perron tests. Each test is reported under the same three deterministic specifications used in the original empirical design: no constant, constant only, and constant with trend. PP statistics use a Bartlett kernel with Newey–West automatic bandwidth. For specifications in which level stationarity is not obtained, the first difference is also tested to establish the maximum order of integration.

Table 4. ADF and PP stationarity tests for Algeria

Vars	Specification	ADF stat.	ADF p-value	PP stat.	PP p-value	ADF decision	PP decision
INF	None	-1.5978	0.1038	-1.5717	0.1092	I(1)	I(1)
INF	Constant	-1.6832	0.4398	-1.6678	0.4478	I(1)	I(1)
INF	Const. & trend	-1.9852	0.6095	-2.0982	0.5471	I(1)	I(1)
M2G	None	-1.5324	0.1178	-1.9286	0.0513	I(1)	I(1)
M2G	Constant	-4.5755	0.0001	-4.6015	0.0001	I(0)	I(0)
M2G	Const. & trend	-5.6025	0.0000	-5.6029	0.0000	I(0)	I(0)
EXRG	None	-2.4328	0.0145	-3.2328	0.0012	I(0)	I(0)
EXRG	Constant	-2.0493	0.2654	-3.8096	0.0028	I(1)	I(0)
EXRG	Const. & trend	-1.8773	0.6663	-4.7949	0.0005	I(1)	I(0)

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

For Algeria, the tests indicate a mixture of $I(0)$ and $I(1)$ behavior. Inflation is consistently classified as $I(1)$, with first-difference ADF and PP p-values below 0.001 under all three deterministic specifications. M2G is strongly stationary in levels once a constant or trend is included. EXRG produces the expected test sensitivity to deterministic terms: ADF with an intercept or trend classifies it as

$I(1)$, whereas PP rejects the unit root in levels. First-difference tests strongly reject the unit root whenever required. The decisive implication for ARDL is therefore unambiguous: no Algerian stochastic variable is $I(2)$.

Table 5. ADF and PP stationarity tests for Egypt

Vars	Specification	ADF stat.	ADF p-value	PP stat.	PP p-value	ADF decision	PP decision
INF	None	-1.6356	0.0963	-1.4882	0.1280	I(1)	I(1)
INF	Constant	-3.4799	0.0085	-3.0076	0.0342	I(0)	I(0)
INF	Const. & trend	-4.1234	0.0058	-3.2631	0.0725	I(0)	I(1)
M2G	None	-0.6860	0.4185	-1.2374	0.1983	I(1)	I(1)
M2G	Constant	-3.6869	0.0043	-3.7399	0.0036	I(0)	I(0)
M2G	Const. & trend	-4.6130	0.0010	-4.6072	0.0010	I(0)	I(0)
EXRG	None	-3.6077	0.0003	-3.5669	0.0004	I(0)	I(0)
EXRG	Constant	-5.8085	0.0000	-3.8692	0.0023	I(0)	I(0)
EXRG	Const. & trend	-6.1626	0.0000	-3.8767	0.0131	I(0)	I(0)

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

For Egypt, the economically relevant constant specification classifies INF, M2G, and EXRG as stationary in levels under both ADF and PP. The trend specification gives the same conclusion for ADF except for the PP inflation test, while the no-constant specification is less suitable for variables with non-zero means. All nonstationary cases become strongly stationary at first difference. Hence, as in Algeria, there is no evidence that any variable is $I(2)$, satisfying the fundamental integration requirement of the bounds procedure.

3. Optimal ARDL model selection

The optimal lag structures were selected using the Akaike Information Criterion within a maximum of two annual lags. The model-selection process retains the common INF–M2G–EXRG structure and treats structural interventions as fixed deterministic regressors.

Table 6. ARDL model selection for Algeria

Dependent variable	Explanatory variables	Selected ARDL order	AIC	BIC	HQIC
INF	M2G, EXRG, S1996, S2003	ARDL(1,2,1)	159.9319	173.6692	164.6167

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The selected Algerian model contains one lag of inflation, two lags of broad-money growth, and one lag of exchange-rate depreciation, with S1996 and S2003 entering as fixed structural controls. The specification permits both immediate and delayed monetary effects while remaining parsimonious relative to the annual sample.

Table 7. ARDL model selection for Egypt

Dependent variable	Explanatory variables	Selected ARDL order	AIC	BIC	HQIC
INF	M2G, EXRG, P2008, P2023	ARDL(1,1,1)	190.9879	203.4306	195.2831

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The selected Egyptian model contains one lag each of inflation, broad-money growth, and exchange-rate depreciation, while P2008 and P2023 enter as fixed impulse controls. The shorter distributed lag indicates that the relevant dynamic information is concentrated within one annual lag.

4. Estimated ARDL coefficients

Table 8. Estimated ARDL coefficients for Algeria

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	0.9346	4.5560	0.2050	0.8390
INF(-1)	0.4915	0.0948	5.1820	0.0001
M2G	0.1817	0.0578	3.1450	0.0043
M2G(-1)	0.0520	0.0530	0.9810	0.3360
M2G(-2)	0.0284	0.0432	0.6580	0.5160
EXRG	0.2683	0.0666	4.0270	0.0009
EXRG(-1)	0.0858	0.0417	2.0570	0.0500
S1996	-8.5649	2.4492	-3.4970	0.0020
S2003	6.2921	1.6833	3.7380	0.0010

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The Algerian ARDL results show substantial inflation persistence: INF(-1) is positive and highly significant. More importantly, current broad-money growth is positive and significant at the 1% level. A one-percentage-point increase in M2G is associated with an immediate increase of approximately 0.18 percentage point in inflation, conditional on the remaining dynamics. M2G(-1) and M2G(-2) are not individually significant, but their inclusion is selected by the information criterion and their combined contribution enters the normalized long-run monetary coefficient.

Exchange-rate depreciation also has a strong inflationary effect. Current EXRG has a coefficient of 0.2683 and is highly significant, while EXRG(-1) remains positive at the 5% threshold. S1996 is negative and significant, indicating a persistent downward change in the conditional inflation regime, while S2003 is positive and significant, capturing a subsequent upward level shift. Explicitly controlling for these shifts prevents them from being incorrectly attributed to M2G or EXRG.

Table 9. Estimated ARDL coefficients for Egypt

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	-0.5828	2.0670	-0.2820	0.7801
INF(-1)	0.4634	0.1067	4.3410	0.0002
M2G	0.0403	0.1031	0.3910	0.6990
M2G(-1)	0.2643	0.1253	2.1100	0.0440
EXRG	0.1673	0.0492	3.4030	0.0020
EXRG(-1)	-0.0662	0.0467	-1.4180	0.1680
P2008	9.6291	3.5849	2.6860	0.0120
P2023	13.5846	3.7279	3.6440	0.0010

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The Egyptian equation also exhibits strong inflation persistence. The contemporaneous M2G coefficient is positive but insignificant, whereas M2G(-1) is positive and statistically significant at 5%. The monetary effect is therefore delayed: broad-money expansion becomes statistically visible in consumer-price inflation after approximately one annual lag.

EXRG has a positive and highly significant contemporaneous coefficient, providing clear evidence of rapid exchange-rate pass-through. Its lag is insignificant, implying that most of the independent exchange-rate response is concentrated in the contemporaneous period. Both inflation impulses are positive and significant, and P2023 is larger than P2008, confirming the exceptional

magnitude of the 2023 inflation episode after conditioning on ordinary monetary and exchange-rate dynamics.

5. Bounds test results

Table 10. Bounds test for Algeria

F-statistic	Lower-bound p-value	Upper-bound p-value	Decision
7.2431	0.0001	0.000873	Cointegration

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The Algerian bounds statistic rejects the null hypothesis of no cointegration at the 5% significance level. In addition, the 200,000-draw finite-sample simulation yields 5% critical values of 4.2175 for $I(0)$ and 5.3761 for $I(1)$. Since $7.2431 > 5.3761$, the null hypothesis of no cointegration is rejected even against the more conservative finite-sample upper bound. Consistent with this result, the corresponding finite-sample upper-bound p-value is 0.0125. Hence, the evidence of a long-run relationship is robust to the use of finite-sample rather than asymptotic critical values.

Table 11. Bounds test for Egypt

F-statistic	Lower-bound p-value	Upper-bound p-value	Decision
6.1085	0.0006	0.00451	Cointegration

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The Egyptian bounds statistic also rejects the null hypothesis of no cointegration at the 5% significance level. The 200,000-draw finite-sample simulation yields 5% lower- and upper-bound critical values of approximately 4.2040 and 5.3676, respectively. Since $6.1085 > 5.3676$, the null hypothesis of no cointegration is rejected even against the more conservative finite-sample upper bound. Consistent with this result, the corresponding finite-sample upper-bound p-value is 0.0289. Hence, the evidence supports the existence of a long-run equilibrium relationship among INF, M2G, and EXRG in Egypt. Taken together with the Algerian results, the same INF–M2G–EXRG framework exhibits evidence of a long-run equilibrium relationship in both economies.

6. Long-run coefficients

Table 12. Long-run coefficients for Algeria

Variable	coefficient	Std. Error	t-statistic	p-value
M2G	0.5154	0.2400	2.1480	0.0416
EXRG	0.6965	0.2058	3.3849	0.0024
S1996	-16.8435	3.9288	-4.2860	0.0002
S2003	12.3738	4.8908	2.5300	0.0179
Constant	1.8380	8.7269	0.2110	0.8350

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The long-run Algerian results show that nominal broad-money growth has a positive and statistically significant effect on inflation. The coefficient of 0.5154 implies that a sustained one-percentage-point increase in broad-money growth is associated with approximately a 0.52 percentage-point increase in equilibrium inflation. This provides direct support for a conventional monetary interpretation based on a nominal money measure defined independently of inflation.

EXRG is also positive and highly significant in the long run, with a coefficient of 0.6965. Persistent currency depreciation therefore has an even larger estimated equilibrium pass-through than broad-money growth. The normalized S1996 and S2003 coefficients represent persistent conditional level shifts: the

former is negative and strongly significant, whereas the latter is positive and significant. Their significance confirms that structural changes matter independently of the systematic monetary and exchange-rate effects.

Table 13. Long-run coefficients for Egypt

Variable	coefficient	Std. Error	t-statistic	p-value
M2G	0.5677	0.2719	2.0880	0.0464
EXRG	0.1884	0.1023	1.8420	0.0767
P2008*	17.9447	7.5759	2.3680	0.0254
P2023*	25.3168	8.2614	3.0640	0.0048
Constant	-1.0861	3.9190	-0.2770	0.7840

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

Note: The normalized coefficients of P2008 and P2023 are conditional intervention multipliers; because the underlying variables are one-period impulses, they do not imply permanent post-shock regime effects.

Nominal broad-money growth has a positive and statistically significant long-run effect on Egyptian inflation. The coefficient of 0.5677 implies that a sustained one-percentage-point increase in M2G is associated with approximately a 0.57 percentage-point increase in equilibrium inflation. The magnitude is close to the Algerian estimate of 0.5154, providing a powerful comparative result: when money is defined identically, its long-run association with inflation is positive and economically substantial in both economies.

The normalized EXRG coefficient is positive and significant at the 10% level, whereas its contemporaneous short-run effect is much stronger statistically. This indicates that exchange-rate depreciation is particularly important for short-run Egyptian inflation, while persistent monetary expansion provides the clearer 5% long-run monetary effect. The intervention multipliers remain large and statistically significant but represent exceptional temporary disturbances rather than permanent structural regimes.

7. Short-run dynamics and error-correction results

Table 14. Short-run UECM coefficients for Algeria

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	0.9346	4.5560	0.2050	0.8390
ECM / INF(-1)	-0.5085	0.0940	-5.4085	0.000013
M2G(-1)	0.2621	0.0922	2.8418	0.0088
EXRG(-1)	0.3542	0.0773	4.5824	0.00011
ΔM2G	0.1817	0.0575	3.1598	0.0041
ΔM2G(-1)	-0.0284	0.0431	-0.6589	0.5160
ΔEXRG	0.2683	0.0663	4.0462	0.00044
S1996	-8.5649	2.4366	-3.5151	0.0017
S2003	6.2921	1.6743	3.7579	0.00092

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

For Algeria, the error-correction coefficient is -0.5085 and is highly significant. Approximately 50.9% of disequilibrium from the long-run inflation relationship is corrected within one year. Because the coefficient lies between zero and minus one, convergence is stable and monotonic.

The monetary channel is significant in both horizons. (M2G) is positive and significant at the 1% level, showing an immediate inflationary effect, while M2G(-1) is positive and significant in the level relationship. EXRG exhibits the same consistency: both its short-run change and lagged level are strongly significant. The

two structural interventions remain highly significant after reparameterization, confirming that regime shifts are distinct from ordinary monetary transmission.

Table 15. Short-run UECM coefficients for Egypt

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	-0.5828	2.0670	-0.2820	0.7801
ECM / INF(-1)	-0.5366	0.1067	-5.0313	0.000028
M2G(-1)	0.3046	0.1468	2.0754	0.0476
EXRG(-1)	0.1011	0.0562	1.7990	0.0835
ΔM2G	0.0403	0.1031	0.3908	0.6990
ΔEXRG	0.1673	0.0492	3.4019	0.0021
P2008	9.6291	3.5748	2.6936	0.0120
P2023	13.5846	3.6819	3.6896	0.0010

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

For Egypt, the error-correction coefficient is -0.5366 and is highly significant, implying correction of approximately 53.7% of disequilibrium within one year. The similarity to Algeria's -0.5085 coefficient indicates remarkably similar annual equilibrium-restoration speeds.

The contemporaneous change in M2G is insignificant, whereas M2G(-1) in the level relationship is positive and significant at 5%. This confirms delayed monetary transmission rather than absence of monetary transmission. By contrast, (EXRG) is positive and highly significant, showing rapid exchange-rate pass-through. The lagged exchange-rate level is positive and significant at approximately the 10% level. P2008 and P2023 remain positive and strongly significant, isolating exceptional inflation disturbances from the systematic dynamics.

8. Model fit, diagnostic tests and multicollinearity

Table 16. Model fit, diagnostic tests for Algeria

Indicator	Value
Effective observations	34
R-squared	0.9433
Adjusted R-squared	0.9251
F-statistic	51.9700
F p-value	1.14×10^{-13}
Jarque-Bera p-value	0.5448
Breusch-Godfrey LM p-value	0.5132
Breusch-Pagan p-value	0.8567
ARCH-LM p-value	0.8292
Ramsey RESET p-value	0.0968
Durbin-Watson statistic	2.2940
Maximum VIF excluding constant	4.4549
CUSUM p-value	0.9180
CUSUMSQ stability statistic	0.0977
CUSUMSQ 5% critical distance	0.2332

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The Algerian model displays very strong goodness of fit. Its R-squared is 0.9433 and the adjusted R-squared remains 0.9251, indicating that approximately 94.3% of the variation in inflation is accounted for by the dynamic specification without the explanatory performance being driven merely by parameter proliferation. The model is jointly highly significant, with an F-statistic of 51.97 and a p-value of 1.14×10^{-13} .

All major residual diagnostics are satisfactory at the 5% level. Normality is not rejected, there is no evidence of serial correlation, Breusch-Pagan and ARCH-

LM do not indicate unstable variance, and RESET does not reject the functional form. The maximum VIF of 4.4549 is well below the conventional threshold of 10, providing no evidence of severe multicollinearity. The CUSUM p-value is 0.9180, and the CUSUMSQ statistic remains well inside its 5% stability limit.

Table 17. Model fit, diagnostic tests for Egypt

Indicator	Value
Effective observations	35
R-squared	0.8432
Adjusted R-squared	0.8025
F-statistic	20.7300
F p-value	2.53×10^{-9}
Jarque-Bera p-value	0.1184
Breusch-Godfrey LM p-value	0.1911
Breusch-Pagan p-value	0.8915
ARCH-LM p-value	0.9268
Ramsey RESET p-value	0.6359
Durbin-Watson statistic	2.2400
Maximum VIF excluding constant	2.6195
CUSUM p-value	0.9775
CUSUMSQ stability statistic	0.2176
CUSUMSQ 5% critical distance	0.2299

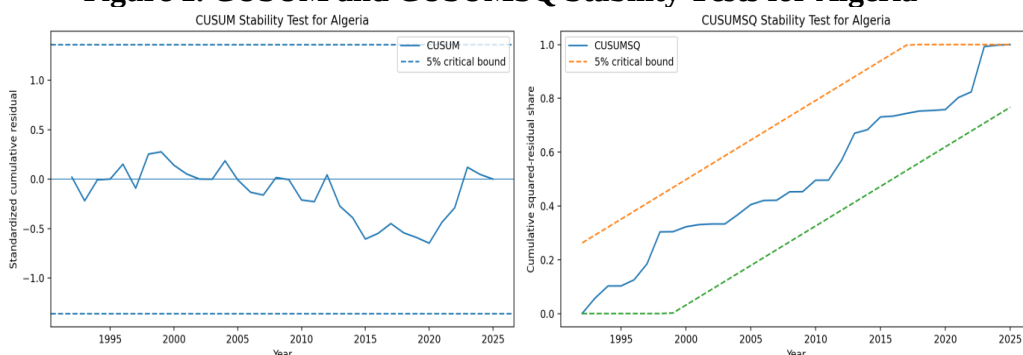
Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The Egyptian model also displays strong explanatory power. The R-squared is 0.8432 and the adjusted R-squared is 0.8025, meaning that more than four-fifths of the variation in inflation is explained even after adjusting for model complexity. The model is jointly highly significant, with an F-statistic of 20.73 and a p-value of 2.53×10^{-9} .

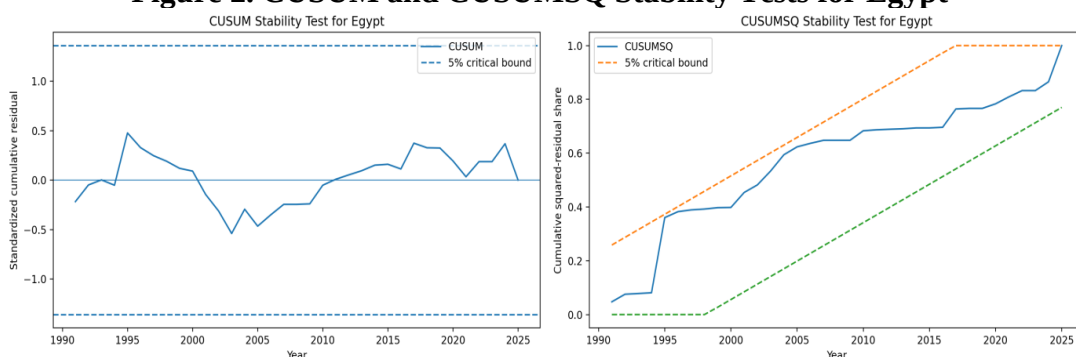
The entire reported diagnostic battery is satisfactory at 5%. There is no residual non-normality, serial correlation, heteroskedasticity, ARCH effect, or RESET-detected functional-form failure. The Durbin-Watson statistic is close to two. The maximum VIF is only 2.6195, ruling out serious multicollinearity. The CUSUM p-value of 0.9775 strongly supports stability, while CUSUMSQ remains inside the corresponding 5% critical distance.

9. Stability tests: CUSUM and CUSUMSQ

The stability of the estimated coefficients was assessed using CUSUM and CUSUMSQ evidence. These tests are particularly important because the common sample covers major monetary, exchange-rate, and inflation episodes. Structural interventions are first incorporated explicitly, after which the stability tests assess whether statistically important residual instability remains.

Figure 1. CUSUM and CUSUMSQ Stability Tests for Algeria

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

Figure 2. CUSUM and CUSUMSQ Stability Tests for Egypt

Source: Prepared by the researcher based on the outputs of Python 3.14.2 software.

The stability diagnostics support both final specifications. The CUSUM test yields p-values of 0.9180 for Algeria and 0.9775 for Egypt, while the corresponding CUSUMSQ paths remain within the 5% critical bounds. Taken together, these results provide no evidence of parameter instability after incorporating the explicitly modeled structural interventions.

IV. Discussion: Comparative Implications for Algeria and Egypt

The empirical findings provide a direct comparative assessment of the money supply–inflation relationship in Algeria and Egypt. Unlike specifications that use different monetary concepts across countries, the final models employ exactly the same consumer price inflation measure, nominal broad-money growth variable, exchange-rate depreciation variable, annual frequency, and 1990–2025 observation horizon. The comparison therefore isolates genuine differences in transmission rather than differences in measurement.

For Algeria, nominal broad-money growth has a positive and statistically significant effect on inflation in both the short run and the long run. The contemporaneous coefficient is 0.1817 and significant at the 1% level, while the normalized long-run coefficient is 0.5154 and significant at 5%. Monetary expansion therefore begins to affect prices within the same annual period, with the cumulative equilibrium response substantially exceeding the immediate effect. This result is consistent with the conventional monetary proposition that sustained nominal-liquidity expansion generates persistent inflationary pressure.

The Algerian exchange-rate channel is also strong. Current depreciation has a coefficient of 0.2683 and is highly significant, the first lag remains positive at approximately 5%, and the normalized long-run coefficient equals 0.6965 with a p-value of 0.0024. Persistent depreciation therefore generates a substantial consumer-price response. The money and exchange-rate channels should be viewed as complementary: monetary expansion increases nominal purchasing power, while depreciation raises the domestic-currency cost of imported consumption and production inputs.

The structural interventions further clarify the Algerian result. S1996 produces a large negative conditional level shift, while S2003 produces a significant positive shift. These variables are not substitutes for the monetary model; rather, they isolate persistent historical changes that would otherwise be forced into M2G or EXRG. Their inclusion therefore strengthens rather than weakens interpretation of the systematic monetary coefficients.

Egypt produces the same positive long-run monetary conclusion but a different short-run timing pattern. The normalized M2G coefficient is 0.5677 and is significant at 5%, almost identical in magnitude to Algeria's 0.5154. However, contemporaneous M2G is insignificant and M2G(-1) is significant. Egyptian monetary transmission is therefore delayed: changes in nominal liquidity affect the long-run inflation equilibrium, but the strongest identifiable annual response appears after approximately one year.

Exchange-rate depreciation in Egypt operates considerably faster. Current EXRG has a coefficient of 0.1673 with a p-value of 0.0020, demonstrating strong contemporaneous pass-through. Its normalized long-run coefficient remains positive but is only significant at the 10% level. This pattern indicates that currency depreciation is particularly important for short-run price dynamics, whereas broad-money expansion provides the more clearly identified persistent 5% long-run monetary effect.

The Egyptian impulse variables are also economically informative. P2008 and P2023 are positive and significant, and the latter is larger. Their significance indicates that exceptional inflation episodes contained price pressure beyond that predicted by normal money and exchange-rate dynamics. Treating those years explicitly prevents exceptional observations from determining the systematic M2G coefficient.

The central comparative result is the similarity of the long-run monetary coefficients. Algeria produces 0.5154 and Egypt 0.5677, with both coefficients positive and significant at 5%. The evidence therefore supports a common long-run monetary proposition: sustained broad-money expansion is associated with higher consumer-price inflation in both North African economies. The estimated effect is substantial but below one-for-one, implying that part of monetary expansion is absorbed through other components of nominal activity rather than being transmitted mechanically into prices.

The difference between the countries concerns the timing and complementary channels rather than the sign of the monetary relationship. Algeria exhibits

significant immediate monetary transmission together with strong exchange-rate effects. Egypt exhibits delayed monetary transmission while exchange-rate depreciation affects prices immediately. This distinction is economically plausible because monetary impulses can propagate through different credit, expectations, fiscal, and exchange-rate structures even when the same aggregate M2 measure is used.

The error-correction coefficients provide another striking similarity. Algeria's ECT is -0.5085 and Egypt's is -0.5366. Both coefficients are negative, highly significant, and strictly between zero and minus one. Approximately one-half of a deviation from long-run equilibrium is therefore eliminated within one year in each economy. The convergence mechanism is stable and does not exhibit the overshooting problem associated with error-correction coefficients below minus one.

The cointegration evidence is particularly robust because it survives finite-sample inference. Algeria's F-statistic of 7.2431 exceeds the simulated 5% upper bound of 5.3761, and Egypt's F-statistic of 6.1085 exceeds 5.3676. Their finite-sample upper p-values are 0.0125 and 0.0289. Thus, the long-run conclusions do not depend exclusively on asymptotic bounds that might be questioned in an annual sample.

The explanatory and diagnostic performance of the two models reinforces the substantive conclusions. Algeria achieves an R-squared of 0.9433 and an adjusted R-squared of 0.9251. Egypt achieves 0.8432 and 0.8025. Both models are jointly highly significant and pass the Jarque–Bera, Breusch–Godfrey, Breusch–Pagan, ARCH-LM, RESET, CUSUM, and CUSUMSQ checks at conventional levels. VIF values additionally show no serious multicollinearity.

The findings are consistent with the monetary literature emphasizing the long-run association between money growth and inflation (Friedman, 1968, 1970; De Grauwe & Polan, 2005). They are also consistent with exchange-rate pass-through theory, under which depreciation affects domestic prices through import costs, production costs, expectations, and pricing decisions (Dornbusch, 1976; Taylor, 2000; Campa & Goldberg, 2005; Choudhri & Hakura, 2006). The present contribution is to show these mechanisms within a harmonized Algeria–Egypt framework rather than through incompatible country equations.

The policy implication is that broad-money growth should be monitored as an important medium- and long-run inflation indicator in both countries. In Algeria, the significant contemporaneous M2G effect suggests that excessive liquidity growth can translate into price pressure relatively rapidly, particularly when accompanied by depreciation. In Egypt, policymakers must account for the delayed inflationary consequences of current liquidity expansion even when its immediate coefficient is weak.

Exchange-rate developments must also be integrated into the inflation-control framework. Algeria displays significant contemporaneous, lagged, and long-run exchange-rate effects, while Egypt exhibits especially strong contemporaneous

pass-through. Monetary and exchange-rate conditions should therefore be analyzed jointly rather than as independent sources of inflation.

Overall, the comparative evidence demonstrates a common positive long-run money–inflation relationship combined with country-specific short-run timing. The use of the same M2G variable in both equations reveals that differences between Algeria and Egypt arise from dynamic transmission and structural conditions rather than from incompatible monetary definitions.

Conclusion

This paper examined the relationship between money supply and inflation in Algeria and Egypt over the period 1990–2025 using a comparative ARDL bounds testing framework. The empirical design uses the same consumer price inflation variable, nominal broad-money growth variable, exchange-rate depreciation measure, annual frequency, and sample period in both countries. Country-specific interventions are employed only to isolate major persistent or exceptional structural episodes.

The results confirm the existence of a long-run relationship in both economies. The bounds F-statistics are 7.2431 for Algeria and 6.1085 for Egypt, both exceeding their corresponding finite-sample 5% upper critical values. The error-correction coefficients are -0.5085 and -0.5366, respectively, and are highly significant. Inflation therefore converges toward its long-run equilibrium at a rate of approximately one-half of the previous year's disequilibrium in both economies.

The central finding is that nominal broad-money growth has a positive and statistically significant long-run effect on inflation in both countries. The normalized M2G coefficient equals 0.5154 for Algeria and 0.5677 for Egypt. Consequently, a common nominal monetary measure produces the same qualitative long-run result in the two economies and supports the proposition that persistent broad-money expansion contributes to sustained inflationary pressure.

The short-run transmission mechanisms nevertheless differ. Algeria exhibits a positive and significant contemporaneous M2G effect, whereas Egypt exhibits a significant lagged monetary effect. Monetary transmission is therefore more immediate in Algeria and more delayed in Egypt. Exchange-rate depreciation provides a significant additional channel: Algeria displays strong immediate and persistent pass-through, whereas Egypt displays particularly strong contemporaneous pass-through.

The structural interventions also contribute independently to inflation dynamics. Algeria exhibits significant persistent shifts beginning in 1996 and 2003, while Egypt exhibits significant temporary inflation impulses in 2008 and 2023. Explicit treatment of these episodes prevents exceptional historical movements from being incorrectly attributed to ordinary monetary expansion.

The statistical quality of both equations is strong. Algeria records an R-squared of 0.9433 and an adjusted R-squared of 0.9251, while Egypt records 0.8432 and 0.8025. Both models are jointly highly significant, exhibit finite-sample cointegration, have correctly signed and significant error-correction terms, and pass

the residual normality, serial-correlation, heteroskedasticity, ARCH, functional-form, multicollinearity, and stability checks.

These findings have direct policy implications. Sustained broad-money growth should be treated as a relevant medium- and long-run inflation indicator in Algeria and Egypt. In Algeria, the immediate response to monetary expansion and strong exchange-rate channel imply a need for timely coordination between liquidity management and exchange-rate conditions. In Egypt, the lagged monetary response implies that the inflationary consequences of liquidity growth can persist beyond the period in which monetary expansion initially occurs, while currency depreciation can affect prices considerably faster.

The comparative contribution of the paper lies in demonstrating that a harmonized monetary specification does not require identical short-run behavior. Broad-money growth raises long-run inflation in both countries, but Algeria exhibits more immediate monetary transmission whereas Egypt exhibits a delayed response. The common 1990–2025 sample, identical core variables, parsimonious ARDL structure, explicit structural interventions, finite-sample bounds inference, and comprehensive diagnostic testing together provide a coherent empirical framework for assessing the money supply–inflation nexus in Algeria and Egypt.

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