

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria :Evidence from 1990–2024

استكشاف آثار سعر الصرف الحقيقي على التضخم في الجزائر في المديين القصير والطويل أدلة من 1990 إلى 2024

Khelassi Abdel-illah

Tlemcen University, Faculty of Economics, Business, and Management, - Tlemcen (Algeria)
khelassi.abdelillah@univ-tlemcen.dz

Received: 30/10/2025

Accepted: 12/12/2025

Published: 31/12/2025

Abstract:

This study analyzes the impact of real exchange rate fluctuations on inflation in Algeria over 1990–2024, focusing on short- and long-run dynamics. Using an ARDL framework with GDP, money supply, trade openness, and the real exchange rate, it captures the interplay of monetary, real, and external factors. Results show that exchange rate depreciation, monetary expansion, and trade openness significantly raise inflation in the short run, while GDP has no immediate effect. The significant negative error-correction term (-0.0458) confirms a stable long-run equilibrium but a slow adjustment process. In the long run, none of the variables significantly influence inflation. These findings highlight Algeria's short-term vulnerability to external shocks and underscore the need for prudent monetary and exchange rate policies alongside structural reforms to reduce import dependence.

Keywords: Real Exchange Rate; Inflation; ARDL Model; Monetary Policy; Algeria.

JEL Classification Codes: E31 ; F31 ; C32.

ملخص:

تحلل هذه الدراسة أثر تقلبات سعر الصرف الحقيقي على التضخم في الجزائر خلال الفترة 1990–2024، مع التركيز على ديناميكيات الأجلين القصير والطويل. اعتمدت نموذج الانحدار الذاتي للإبطاء الموزع (ARDL) باستخدام الناتج المحلي الإجمالي، وعرض النقد، والانفتاح التجاري، وسعر الصرف الحقيقي لالتقاط تفاعل العوامل النقدية والحقيقية والخارجية. أظهرت النتائج أن انخفاض قيمة سعر الصرف وتوسع عرض النقد والانفتاح التجاري يزيدون التضخم معنويًا في الأجل القصير، بينما لا يظهر الناتج المحلي الإجمالي تأثيرًا فوريًا. وأكد معامل تصحيح الخطأ (-0.0458) وجود علاقة توازنية مستقرة وبطء في التكيف. أما في الأجل الطويل، فلم تظهر المتغيرات أثرًا معنويًا في التضخم. وتبرز النتائج هشاشة الاقتصاد أمام الصدمات الخارجية على المدى القصير، مما يستدعي سياسات نقدية وسعر صرف رشيدة وإصلاحات تقلل الاعتماد على الواردات.

كلمات مفتاحية: سعر الصرف الحقيقي؛ التضخم؛ نموذج ARDL؛ السياسة النقدية؛ الجزائر.

تصنيفات JEL : E31 ، F31 ، C32.

INTRODUCTION:

Exchange rate dynamics and inflation represent fundamental variables in shaping macroeconomic stability and trade performance worldwide (Mosbei et al., 2021). Their interaction influences the pricing of internationally traded goods and services, thereby affecting trade volumes and the global competitiveness of economies (Akosah & Omane-Adjepong, 2017). The exchange rate is generally understood as the relative price of one currency against another (Fofanah, 2020). More specifically, while the nominal exchange rate reflects this price in simple terms, the real exchange rate (RER) accounts for inflation differentials across countries, providing a more accurate measure of competitiveness and purchasing power parity (Sarno & Taylor, 2002).

In the context of increasing globalization and trade openness, exchange rate fluctuations have become a critical determinant of economic performance. They directly influence output levels, consumer prices, export revenues, and import costs, with stable and transparent policies typically associated with lower volatility (Madesha et al., 2013). Since the 1970s, many countries, especially developing ones, have faced persistent inflationary pressures partly driven by external shocks. In such economies, imported inflation tends to undermine the effectiveness of domestic monetary policies, illustrating how exchange rate instability can exacerbate price increases (Miller & Benjamin, 2004).

The transmission of exchange rate movements into domestic prices is commonly referred to as exchange rate pass-through (ERPT). This mechanism explains how currency depreciation or appreciation can influence inflation both in the short and long run, depending on the structure of the economy and the flexibility of its markets (Pétursson, 2008). While earlier approaches emphasized trade flows as the key driver of exchange rate adjustments, modern theories highlight the dominant role of international financial asset markets, where prices shift rapidly in response to demand and supply imbalances (Miller & Benjamin, 2004).

For developing countries, the link between the real exchange rate and inflation is particularly relevant, as exchange rate misalignments can create inflationary pressures and hinder growth. Recent empirical evidence shows that fiscal shocks, such as increases in government spending, often result in real exchange rate appreciation and higher inflationary dynamics (Ferrara et al., 2021). Moreover, a threshold effect has been observed in exchange rate depreciation, where excessive depreciation significantly amplifies inflation through stronger ERPT (Valogo et al., 2023). These findings suggest that monetary and fiscal authorities must carefully coordinate exchange rate and price stability policies to sustain macroeconomic stability (Pham et al., 2022; Nassif et al., 2025).

In Algeria, the interaction between exchange rate fluctuations and inflation reflects the structural characteristics of an oil-dependent economy that remains highly exposed to external shocks and internal rigidities. Persistent inflationary pressures are largely associated with public spending patterns, particularly social transfers and investment expenditures, which amplify the transmission of exchange rate movements into domestic prices (Mehibel & Belarbi, 2018). Empirical evidence also highlights the co-integration between exchange rate shocks and inflation, confirming the lasting impact of exchange rate misalignments on price dynamics (Benkhelouf & Sahed, 2024). Moreover, the role of money supply is notable in the short run, as inflation-induced depreciation of the Algerian dinar underscores the need for coordinated monetary and fiscal responses (Beldjebel & Hellal, 2024; Aid & Benelbar, 2023).

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

Given the reliance on hydrocarbon revenues and the volatility of global energy markets, Algeria faces additional constraints in preserving price stability and sustaining growth (Merieme & Nouria, 2018; Dekkiche et al., 2022). In this context, exchange rate management and inflation control remain central policy challenges, requiring a balanced approach that integrates stabilization measures with long-term strategies for economic diversification and resilience (Musa, 2021).

Accordingly, this study aims to examine the impact of real exchange rate fluctuations on inflation in Algeria, emphasizing both short- and long-run dynamics. The paper is structured as follows: the next section reviews the relevant literature, followed by the data and methodological framework. The subsequent section presents and discusses the empirical findings, while the final section concludes with the key results and policy implications.

1- Literature Review:

The relationship between the real exchange rate and inflation has long attracted the attention of scholars and policymakers, given its central role in shaping macroeconomic stability. A substantial body of research has examined this link across different countries and periods, often highlighting how structural features, institutional settings, and exchange rate regimes shape the magnitude and direction of the pass-through effect. Building on this broad literature, the following subsections first review international evidence, then focus on studies conducted in the Algerian context, before identifying the key research gap that motivates the present study.

1-1 International Evidence

At the international level, several studies highlight both short- and long-term dynamics. In Bangladesh, Hossain (2002) finds that inflation was a key driver of currency depreciation during the 1970s, though this relationship weakened following economic liberalization and IMF-supported reforms, as excessive money supply became the dominant inflationary factor. In Tanzania, Mbwanbo and Mchukwa (2024) report that exchange rate volatility negatively affects the trade balance in the short run through the J-curve effect, while the long-run impact turns positive. In Ethiopia, Kayamo (2021) identifies asymmetric effects of the real exchange rate on inflation, showing that both depreciation and appreciation fuel inflation in the long run, with monetary volatility and money supply shocks emerging as key drivers.

Evidence from Turkey indicates contractionary effects, as Berument and Pasaogullari (2003) demonstrate that real depreciation increases inflation and lowers output, while U.S. interest rates exert a significant external influence. Similarly, Burstein, Eichenbaum, and Rebelo (2003), studying Argentina, Brazil, and Mexico, find that large real depreciations amplify inflationary pressures due to slow adjustments in non-tradable goods' prices and wages. In Ghana, Valogo et al. (2023) highlight a threshold effect, showing that exchange rate depreciation exceeding 0.70% per month significantly magnifies inflation, emphasizing the relevance of threshold-based monetary policies.

Broader analyses confirm these dynamics. Aizenman, Hutchison, and Noy (2008) show that central banks in emerging markets adopting inflation-targeting frameworks respond strongly to exchange rate fluctuations, especially in resource-exporting economies. Ha, Stocker, and Yilmazkuday (2019) further demonstrate that the degree of exchange rate pass-through

depends on the type of shock and institutional settings, being stronger in economies with rigid exchange rate regimes and weak inflation-targeting frameworks. In Kenya, Okoth (2013) finds that interest rates and inflation explain a significant portion of exchange rate volatility, while higher interest rates contribute to stability. For The Gambia, Lowe (2019) observes that exchange rate movements have no significant long-term impact on inflation, with money supply and fiscal policy emerging as the dominant drivers. In Sudan, Sirag (2021) underscores the role of the parallel exchange rate, noting its strong and asymmetric inflationary effect. In Egypt, Helmy, Fayed, and Hussien (2018) show that exchange rate pass-through was high but incomplete, as government subsidies and interventions cushioned consumer prices. Finally, Emikönel and Orhan (2023), focusing on the “Fragile Five” (Brazil, Turkey, India, Indonesia, South Africa), confirm long-run relationships between exchange rate and inflation, though with varying pass-through magnitudes, stronger in Indonesia and South Africa, but weaker in Brazil, Turkey, and India.

1-2 Evidence from Algeria

In Algeria, the relationship between exchange rate dynamics and inflation has also been widely studied, producing nuanced results depending on methodology, period, and economic context. Azzou (2023), analyzing 2019–2022, shows that exchange rate depreciation exerts significant short-term effects on inflation, though long-term impacts remain weak. Earlier, Sorsa (1999) identified oil revenues as appreciating the dinar, while trade liberalization contributed to its depreciation, thus enhancing competitiveness but also underscoring resource curse vulnerabilities. Over the period 1980–2012, Tahraoui and Benelbar (2015) established a long-run equilibrium relationship, with Granger causality running from exchange rate to inflation, reinforcing the importance of exchange rate management.

Recent evidence by Gassem, Zemri, and Imamali (2024) suggests that both monetary and non-monetary factors shape Algeria’s inflation, with exchange rate fluctuations and GDP growth being particularly influential. Mahfoud, Atil, and Benmazou (2022) further introduce a threshold perspective, showing that inflation below 5.91% does not harm growth, whereas higher levels are detrimental, though the real effective exchange rate was statistically insignificant during their study.

At the trade level, Haffaci and Zitouni (2025) demonstrate that exchange rate volatility reduces trade flows in the short run, though long-term adjustments occur. The Bank of Algeria (2022) similarly identifies import prices and money supply as primary inflation drivers during 2011–2021, with exchange rates also playing a significant role. Using VAR analysis, Hellal, Brahmia, and Gueddouche (2025) confirm a transitory pass-through from exchange rate depreciation to inflation, without long-run cointegration, highlighting the temporary nature of shocks. Djorfi and Almi (2025), applying a MIDAS regression, show that exchange rate shocks significantly influence inflation with a lag of about four months, revealing a delayed pass-through effect.

Finally, Bouhassoun (2024) concludes that the exchange rate channel in Algeria’s monetary transmission mechanism remains weak, with limited explanatory power for inflationary outcomes. This suggests that money supply, fiscal policy, and external shocks dominate the inflationary process.

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

1-3 Research Gap

Overall, both international and national studies converge on the conclusion that exchange rate fluctuations affect inflation, though their magnitude, persistence, and mechanisms differ across countries and contexts. For Algeria, the evidence consistently points to strong short-term effects but weaker long-term impacts, underscoring the need for complementary monetary and structural policies to sustain macroeconomic stability. However, most existing works on Algeria either focus on limited time spans or analyze inflation determinants in isolation, without integrating monetary, real, and external factors in a unified model.

To address this gap, this study covers the period 1990–2024, encompassing key structural reforms, oil price shocks, and exchange rate adjustments. Using the ARDL approach, it captures both short- and long-run effects on inflation. The explanatory variables are GDP, money supply to GDP, trade openness, and the real exchange rate with 2010 as the base year, chosen for their relevance: GDP reflects real activity, money supply captures monetary influences, trade openness indicates external exposure, and the real exchange rate represents competitiveness. This framework provides a clearer assessment of the drivers of inflation in Algeria and the relative role of exchange rate fluctuations.

2- Data and Methodological Framework:

2-1 Data and Variables

The empirical investigation draws on annual time series data spanning the period 1990–2024 to examine the relationship between the real exchange rate and inflation in Algeria. Over these three decades, the country has undergone several macroeconomic transitions shaped by oil price fluctuations, structural reforms, and exchange rate adjustments. Such developments justify a closer look at how external competitiveness and monetary conditions interact with domestic price dynamics.

The dependent variable is Inflation (INF), measured by the annual percentage change in the consumer price index (CPI). As a key macroeconomic indicator, inflation reflects the evolution of household purchasing power and provides insight into the effectiveness of fiscal and monetary management.

The core explanatory variable is the Real Exchange Rate (RER), expressed as an index with 2010 as the reference year (2010 = 100). The RER reflects the relative value of domestic goods and services compared to those of major trading partners after accounting for inflation differentials. Its fluctuations are particularly relevant in Algeria, where import dependency makes consumer prices highly sensitive to exchange rate movements.

To enhance the robustness of the analysis, three additional macroeconomic variables were introduced:

- Gross Domestic Product (GDP): Measured at constant prices, serving as a proxy for economic activity and demand-side pressures on inflation.
- Money Supply relative to GDP (MS/GDP): Capturing liquidity conditions in the economy, with an expected positive association with inflation when monetary growth exceeds real output.
- Trade Openness (TO): Defined as the ratio of total trade (exports + imports) to GDP, representing the economy's exposure to global markets and the potential transmission

of external price shocks.

To provide a clearer overview of the dataset, Table 1 summarizes the variables along with their sources and reports the descriptive statistics, including measures of central tendency, dispersion, and distributional properties. These statistics offer preliminary insights into the behavior of the series over the study period.

Table (1): Variables, Sources, and Descriptive Statistics (1990–2024)

Variables description and Descriptive Statistics					
Code	Variables			Source	
INF	annual percentage change in the consumer price index (CPI)			World Bank – World Development Indicators (WDI), https://data.worldbank.org	
RER	Real Exchange Rate (Index, 2010 = 100)				
GDP	Gross Domestic Product Measured at constant prices				
TO	Trade Openness (% of GDP)			International Monetary Fund (IMF) – Data Portal https://data.imf.org	
MS	Money Supply (% of GDP)				
	INF	RER	GDP		
Mean	8.474541	112.7183	1.23E+11	58.10604	63.22525
Median	4.780000	102.3121	1.35E+11	55.92567	62.98582
Maximum	31.70000	220.5743	2.64E+11	76.68452	96.01186
Minimum	0.340000	86.67361	4.18E+10	44.92282	33.00584
Std.dev	8.802843	25.17134	6.89E+10	8.788479	16.49616
Skwness	1.582203	2.525230	0.252252	0.355722	-0.104903
Kurtosis	4.159503	10.85717	1.750278	2.021224	2.160979
Jarque-Bera	16.56363	127.2287	2.648814	2.135229	1.090797
Probability	0.000253	0.000000	0.265961	0.343828	0.579611

Source: Author's estimation using EViews 13.

The descriptive results highlight important features of the dataset:

Inflation (INF): The average inflation rate over the sample is 8.47%, with a wide range (0.34% to 31.7%), reflecting Algeria's exposure to both domestic shocks and external oil price volatility. The positive skewness (1.58) and kurtosis above the normal benchmark suggest that inflation episodes were marked by occasional sharp spikes, a feature confirmed by the Jarque–Bera test rejecting normality.

Real Exchange Rate (RER): The RER exhibits substantial variation, with values ranging from 86.67 to 220.57, indicating significant fluctuations in Algeria's external competitiveness. Its distribution is highly skewed (2.53) and leptokurtic (kurtosis = 10.86), confirming the presence of extreme movements likely linked to major exchange rate adjustments.

GDP: Real output shows steady long-term growth, with the mean at 1.23×10^{11} constant dinars. Its distribution is relatively symmetric (skewness close to zero), though the Jarque–Bera test does not reject normality, suggesting stable growth patterns compared to inflation and exchange rate dynamics.

Trade Openness (TO): Averaging 58% of GDP, openness indicates Algeria's significant integration into global trade, largely driven by hydrocarbon exports. The distribution is close to normality, as confirmed by the Jarque–Bera probability (0.344).

Money Supply relative to GDP (MS/GDP): With a mean of 63.2%, monetary liquidity expanded considerably over the period. The distribution is nearly symmetric and normally distributed, as indicated by skewness near zero and a non-significant Jarque–Bera statistic.

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

Overall, the data reveal marked volatility in inflation and exchange rates compared to more stable behavior in GDP, trade openness, and money supply. These stylized facts justify the use of econometric models capable of distinguishing between short-run fluctuations and long-run equilibria.

2-2 Methodological Implications

The statistical features of the dataset reveal important implications for model selection. The presence of volatility and non-normality in inflation and the real exchange rate, contrasted with the relative stability of GDP, money supply, and trade openness, suggests that the variables may not share the same order of integration, with some series stationary at level and others at first difference. This mixture of integration orders justifies the use of the Autoregressive Distributed Lag (ARDL) bounds testing approach proposed by Pesaran, Shin, and Smith (2001).

The ARDL framework accommodates both $I(0)$ and $I(1)$ variables without the risk of pre-testing errors (Narayan, 2004; Wooldridge, 2010), captures short-run dynamics and long-run equilibria simultaneously (Nkoro & Uko, 2016), and provides reliable estimates with relatively small samples (Narayan & Smyth, 2005; Rasool et al., 2022). Its distributed lag structure allows for the delayed transmission of shocks, such as exchange rate fluctuations or monetary expansion, to domestic prices, while the bounds testing procedure ensures robust identification of cointegration even under structural shifts typical of resource-dependent economies (Smaili & Khelassi, 2021).

Taken together, these features, combined with the descriptive evidence, confirm ARDL as the most appropriate empirical strategy for this study, enabling an integrated analysis of the short- and long-run effects of the real exchange rate and other macroeconomic factors on inflation in Algeria.

To formalize the empirical strategy, the general functional relationship can be expressed as :

$$INF = f(RER, GDP, TO, MS)$$

Based on this specification, the ARDL model is represented as:

$$INF = B_0 + B_1 INF_{t-1} + B_2 RER_{t-1} + B_3 GDP_{t-1} + B_4 TO_{t-1} + B_5 MS_{t-1} + \sum_{i=1}^p y_1 \Delta INF_{t-p} + \sum_{i=1}^p y_2 \Delta RER_{t-p} + \sum_{i=1}^p y_3 \Delta GDP_{t-p} + \sum_{i=1}^p y_4 \Delta TO_{t-p} + \sum_{i=1}^p y_5 \Delta MS_{t-p} + \varepsilon_i$$

Where:

ε : The error term.

Δ : The first difference.

$(B_1 \dots B_5)$: long-run relationship coefficients. $(y_1 \dots y_5)$: short –run relationship coefficients.

(INF, RER, GDP, TO, MS) Study Variables.

3- Findings and Interpretation of Results:

3-1 Preliminary Tests: Stationarity and Optimal Lag Selection

To ensure the suitability of the ARDL approach, we first examined the time-series properties of all variables using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP)

unit root tests. These tests allow for the identification of the order of integration of each variable, which is a prerequisite for the ARDL bounds testing procedure. The results of the stationarity analysis are presented in Table 2.

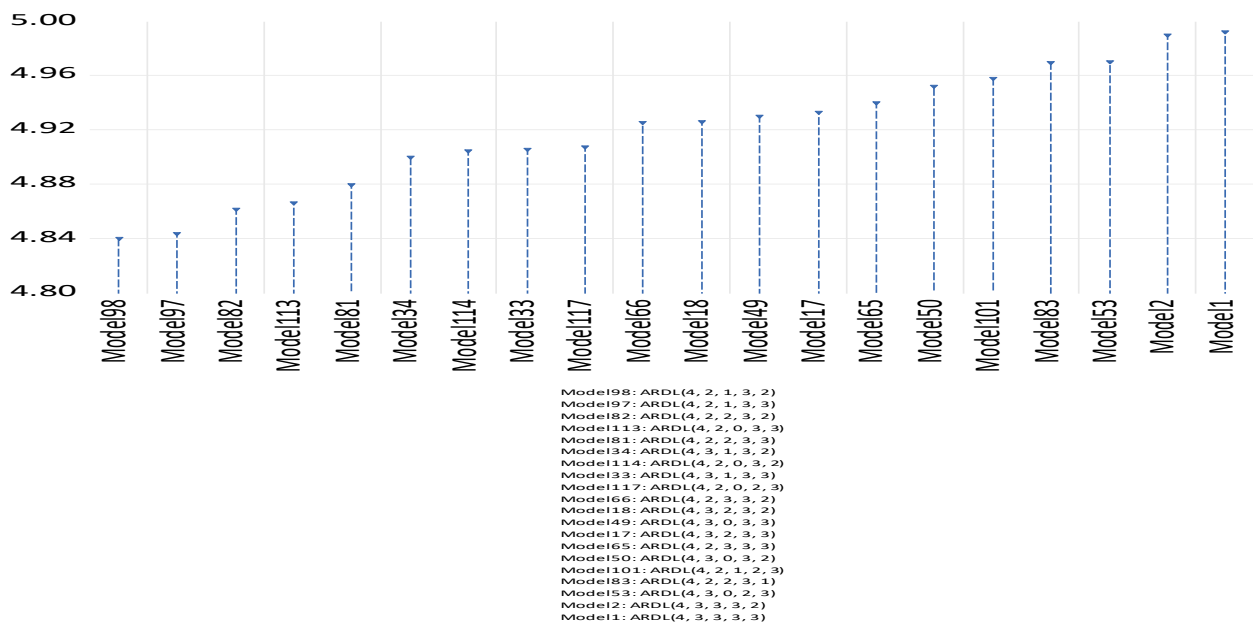
Next, to specify the dynamic structure of the ARDL model, we determined the optimal lag length by employing standard information criteria, particularly the Akaike Information Criterion (AIC). The selected lag order, which minimizes the information criterion, is illustrated in Figure 1.

Table (2): Unit Root Test Results

Variables	Augmented Dickey–Fuller (ADF)						Order of Integration
	At Level			At 1 st difference			
	T-Statistic	P-Value	C . V 5%	T-Statistic	P-Value	C . V 5%	
INF	-1.718387	0.4183	-2.951125	-5.735444	0.0000	-2.954021	I (1)
RER	-6.349308	0.0000	-2.951125	-11.58405	0.0000	-2.954021	I (0)
GDP	0.258052	0.9724	-2.951125	-4.653961	0.0007	-2.954021	I (1)
TO	-2.287077	0.1826	-2.967767	-5.513886	0.0001	-2.954021	I (1)
MS	-1.100644	0.7042	-2.951125	-5.522911	0.0001	-2.954021	I (1)
Variables	Phillips–Perron (PP)						Order of Integration
	At Level			At 1 st difference			
	T-Statistic	P-Value	C . V 5%	T-Statistic	P-Value	C . V 5%	
INF	-1.757072	0.3946	-2.951125	-5.796363	0.0000	-2.954021	I (1)
RER	-5.937591	0.0000	-2.951125	-21.35780	0.0001	-2.954021	I (0)
GDP	0.258052	0.9724	-2.951125	-4.636344	0.0007	-2.954021	I (1)
TO	-1.547871	0.4977	-2.951125	-5.528308	0.0001	-2.954021	I (1)
MS	-1.164305	0.6782	-2.951125	-5.970997	0.0000	-2.954021	I (1)

Source: Author's estimation using EViews 13.

Fig (1): Optimal Lag Length Selection Based on Akaike Information Criterion (AIC)
Akaike Information Criteria (top 20 models)



Source: Author's estimation using EViews 13.

The results reported in Table 2 from both the ADF and PP unit root tests confirm that none of the variables is integrated of order two I(2), which is a key requirement for applying the

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

ARDL bounds testing approach. Specifically, the real exchange rate (RER) is found to be stationary at level $I(0)$, while the other variables, namely inflation (INF), gross domestic product (GDP), trade openness (TO), and money supply (MS), become stationary only after first differencing $I(1)$. This mixture of integration orders validates the use of the ARDL methodology, as it can accommodate regressors that are either $I(0)$ or $I(1)$, but not $I(2)$.

The lag selection process, illustrated in Figure 1, indicates that among the twenty ARDL specifications considered, the model $ARDL(4, 2, 1, 3, 2)$ yields the lowest value of the Akaike Information Criterion (AIC). This implies that the chosen lag structure strikes an optimal balance between capturing the dynamic relationships among the variables and avoiding over-parameterization, thereby ensuring reliable estimation of both short-run and long-run coefficients in the subsequent analysis.

3-2 Bounds Testing for Cointegration

To investigate the existence of a long-run relationship among the variables, we employed the ARDL bounds testing approach developed by Pesaran et al. (2001). This procedure is appropriate given the mixed order of integration of the variables and provides a robust framework for testing cointegration. The calculated F-statistic is compared with the critical bounds provided for both asymptotic and finite sample distributions. The results are summarized in Table 3.

Table (3): F-Statistic Results from ARDL Bounds Test

Estimated model	INF=f(RER,GDP,TO,MS)		
	ARDL(4,2,1,3,2)		
Bound test F-statistics	7.672904		
	K= 4		
	Signif.	I(0)	I(1)
Asymptotic: n=1000	10 %	2.2	3.09
	5 %	2.56	3.49
	2.5 %	2.88	3.87
	1 %	3.29	4.37
Actual Sample Size 31	Finite sample: n=35		
	10 %	2.46	3.46
	5 %	2.947	4.088
	1 %	4.093	5.532
	Finite sample: n=30		
	10 %	2.525	3.56
	5 %	3.058	4.223
	1 %	4.28	5.84

Source: Author's estimation using EViews 13.

The results reported in Table 3 provide strong evidence of a long-run equilibrium relationship between inflation (INF) and its key determinants. The computed F-statistic of 7.6729 is well above the upper critical bounds at all conventional significance levels, including the 1% threshold, even after adjusting for finite sample size. This finding leads to the rejection of the null hypothesis of no cointegration, confirming that the variables share a stable long-run equilibrium relationship. The existence of cointegration suggests that, although the variables may fluctuate in the short run, they move together over time, and deviations from the long-run path are only temporary. This outcome justifies proceeding with the estimation of long-run

coefficients and the specification of an error-correction model (ECM) to capture the short-run dynamics and the speed of adjustment toward the long-run equilibrium.

3-3 Dynamic ARDL Estimates: Short- and Long-Run Relationships

Table 4 presents the dynamic ARDL estimation results for both the short- and long-run relationships between inflation and its key determinants. The upper part of the table reports the short-run coefficients derived from the error-correction model (ECM), while the lower part summarizes the estimated long-run coefficients. These results provide insights into how changes in the real exchange rate, gross domestic product, trade openness, and money supply affect inflation dynamics over different time horizons.

Table (4): Dynamic ARDL Estimates: Short- and Long-Run Relationships

Variables	Short-run (ECM Regression)			
	Coefficient	Std. Error	t-Statistic	Prob.
D(RER)	0.474734	0.96180	4.935875	0.0002
D(GDP)	1.84E-11	2.36E-11	0.780313	0.4482
D(TO)	0.417207	0.143484	2.907690	0.0115
D(MS)	0.415837	0.089399	4.651478	0.0004
CointEq (-1)*	-0.045845	0.005800	-7.904389	0.0000
R ² : 0.86		Adjusted R ² : 0.77		
Variables	ARDL Long-run			
	Coefficient	Std. Error	t-Statistic	Prob.
RER	19.59593	74.39507	0.236404	0.7961
GDP	-1.71E-09	6.64E-09	-0.257258	0.8007
TO	14.95504	58.35561	0.256274	0.8015
MS	25.39670	98.07596	0.258949	0.7994
C	-4428.815	17024.96	-0.260137	0.7985

Source: Author's estimation using EViews 13.

The short-run estimates reveal that both the real exchange rate (RER) and money supply (MS) have a statistically significant and positive effect on inflation at the 1% significance level, indicating that short-term fluctuations in these variables are quickly transmitted to domestic prices. Trade openness (TO) also exerts a positive and significant impact on inflation at the 5% level, suggesting that changes in external trade conditions influence price dynamics in the short run. In contrast, the short-run effect of GDP is statistically insignificant, implying that output changes do not immediately influence inflation.

The coefficient of the error-correction term, CointEq(-1), is negative and highly significant (-0.0458; $p < 0.01$), confirming the presence of a stable long-run equilibrium relationship. The magnitude indicates that approximately 4.6% of any deviation from the long-run equilibrium is corrected each period, implying a relatively slow speed of adjustment.

In the long run, however, none of the explanatory variables display statistically significant effects on inflation, as evidenced by their high p-values. This suggests that persistent changes in the real exchange rate, GDP, trade openness, or money supply do not have a meaningful long-term impact on the inflationary trend during the study period. The high R^2 (0.86) and adjusted R^2 (0.77) for the short-run model indicate a good overall fit.

3-4 Model Validation and Robustness Checks

Before drawing policy implications from the ARDL estimates, it is essential to assess the reliability and robustness of the model. This section reports the diagnostic tests for

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

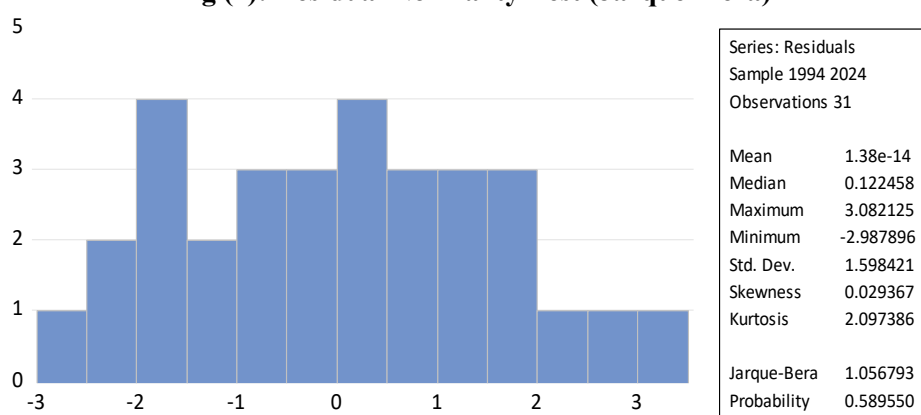
heteroskedasticity, serial correlation, and normality of residuals, as well as the stability of the estimated coefficients. These tests ensure that the statistical inferences drawn from the model are valid.

Table (5): Model Validation and Diagnostic Tests

Heteroskedasticity Test: ARCH			
F-statistics	0.085410	Prob. F(1,28)	0.7722
Obs*R-squared	0.091233	Prob. Chi-Square(1)	0.7626
Breusch- Godfrey Serial Correlation LM Test: Null hypothesis: No Serial Correlation at up to 2 lags			
F-statistics	1.028385	Prob. F(2,12)	0.3871
Obs*R-squared	4.535884	Prob. Chi-Square(2)	0.1035

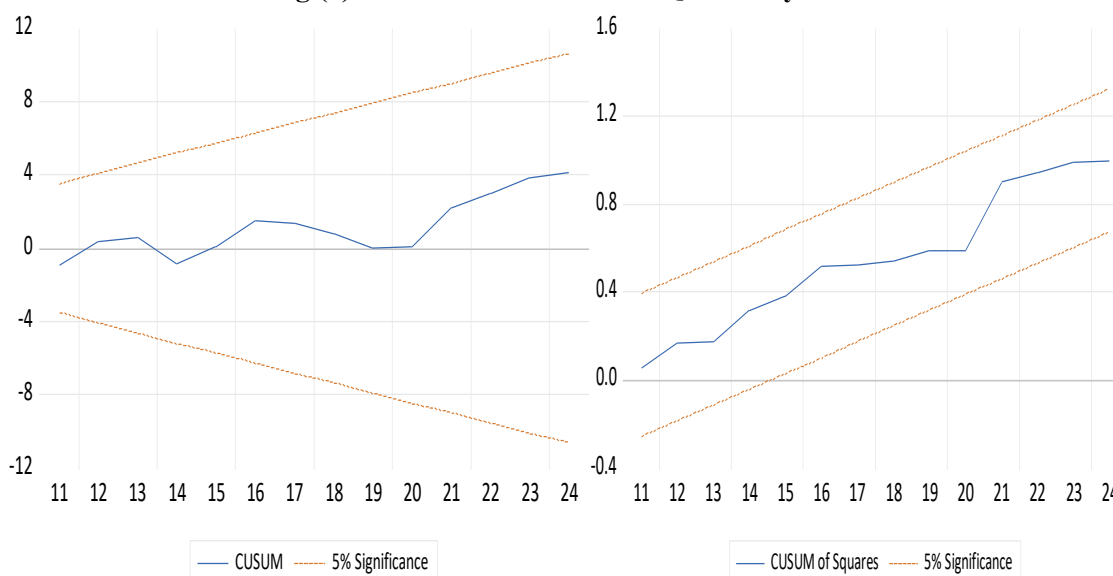
Source: Author's estimation using EViews 13.

Fig (2): Residual Normality Test (Jarque–Bera)



Source: Author's estimation using EViews 13.

Fig (3): CUSUM and CUSUMSQ Stability Tests



Source: Author's estimation using EViews 13.

The diagnostic results reported in Table 5 confirm the adequacy of the ARDL model. The ARCH test yields an insignificant F-statistic ($p = 0.77$), indicating the absence of heteroskedasticity in the residuals. Similarly, the Breusch–Godfrey LM test shows no evidence

of serial correlation up to two lags ($p = 0.39$ for the F-statistic and $p = 0.10$ for the Chi-square statistic).

The residual normality test (Figure 2) further supports the model's validity, as the Jarque–Bera statistic of 1.0568 is associated with a high p-value (0.5896), failing to reject the null hypothesis of normally distributed residuals.

Finally, the CUSUM and CUSUM of Squares (Figure 3) plots remain within the critical bounds at the 5% significance level, providing strong evidence that the estimated coefficients are stable over the study period. Taken together, these results confirm that the ARDL model is well-specified and statistically robust for analyzing the relationships among the variables under study.

3-5 Interpretation of Findings

The empirical findings of this study reveal that short-run inflation dynamics in Algeria are largely driven by exchange rate fluctuations and monetary expansion, as indicated by the significant positive effects of the real exchange rate and money supply, alongside a smaller but notable influence of trade openness, while output growth appears to play no immediate role. This pattern reflects Algeria's structural dependence on imports and the sensitivity of domestic prices to external shocks, particularly under conditions of exchange rate depreciation and monetary accommodation. Such evidence is broadly consistent with previous Algerian studies, notably Azzou (2023), Gassem et al. (2024), and the Bank of Algeria (2022), which highlighted the strong short-term pass-through of exchange rate changes to domestic prices, as well as the role of liquidity growth in fueling inflation. It also echoes international findings for other resource-dependent or import-intensive economies, such as those of Burstein, Eichenbaum, and Rebelo (2003), Ha, Stocker, and Yilmazkuday (2019), and Kayamo (2021), which show that weaker monetary anchors and reliance on imports amplify short-term price pressures.

The statistically insignificant long-run coefficients, despite the confirmation of a stable cointegration relationship, suggest that persistent shifts in exchange rate, money supply, trade openness, or GDP do not exert a lasting influence on Algeria's inflation trend during the study period. This outcome contrasts with the evidence of Tahraoui and Benelbar (2015), who reported a stronger long-run link between exchange rate and prices, yet it is more in line with Bouhassoun (2024) and Hellal, Brahmia, and Gueddouche (2025), who describe the pass-through effect as largely transitory and dampened over time by structural and policy factors. A plausible explanation lies in Algeria's longstanding policy of subsidizing basic goods, managing the exchange rate, and using fiscal tools to cushion external shocks, thereby reducing the persistence of exchange-rate-induced price pressures. The slow adjustment speed indicated by the significant negative error-correction term (about 4.6% per period) further points to rigidities in price and wage formation, as well as delays in policy transmission, which prolong the short-run effects but limit the establishment of a strong long-term elasticity.

Taken together, these findings suggest that Algeria's inflationary process remains primarily short-term and externally driven, highlighting the importance of prudent monetary management and credible exchange rate policies to stabilize prices in the near term, while structural reforms aimed at reducing import dependence and strengthening domestic production capacities are needed to dampen vulnerability to external shocks over the longer horizon. The evidence also points to the need for further research into possible nonlinearities or threshold effects in the pass-through mechanism, as documented by Mahfoud, Atil, and Benmazou (2022) and Valogo

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

et al. (2023), since exchange rate movements of different magnitudes or directions may have asymmetric effects.

Conclusion:

The findings of this study highlight that short-run inflation dynamics in Algeria are significantly influenced by real exchange rate fluctuations, money supply growth, and trade openness, reflecting the economy's structural dependence on imports and exposure to external shocks. In contrast, the long-run impact of these variables appears weaker, suggesting that policy interventions, such as exchange rate adjustments and liquidity management, have mitigated persistent inflationary pressures over time.

To achieve greater price stability, policymakers need to strengthen the coordination between monetary and exchange rate policies while improving the credibility and transparency of these measures. Limiting excessive liquidity growth, enhancing the efficiency of monetary transmission channels, and managing exchange rate volatility can help reduce the short-term pass through of external shocks to domestic prices. Furthermore, addressing structural constraints that amplify inflation, such as import dependency, remains a critical challenge.

In the medium to long term, promoting economic diversification, developing competitive domestic industries, and expanding non-hydrocarbon exports would help reduce the economy's vulnerability to external shocks and exchange rate fluctuations. Such structural reforms, combined with prudent fiscal and monetary management, would enhance Algeria's macroeconomic resilience and support sustainable price stability.

Bibliography List:

- Aid, L. & Benelbar, M. (2023). Study of the Standard Relationship between the Money Supply and the Exchange Rate in Algeria during the Period (1990/2020). *Financial Markets, Institutions and Risks*, 7(2), 56-71. [https://doi.org/10.21272/fmir.7\(2\).56-71.2023](https://doi.org/10.21272/fmir.7(2).56-71.2023)
- Aizenman, J., Hutchison, M., & Noy, I. (2008). Inflation targeting and real exchange rates in emerging markets (NBER Working Paper No. 14561). National Bureau of Economic Research. <https://www.nber.org/papers/w14561>
- Akosah, N., & Omane-Adjepong, M. (2017). Exchange rate and external trade flows: Empirical evidence of J-curve effect in Ghana (MPRA Paper No. 86640). University Library of Munich, Germany. <https://mpra.ub.uni-muenchen.de/86640/>
- Azzou, R. A. K. (2023). The impact of the exchange rate on inflation in Algeria. *Journal of Economic Growth and Entrepreneurship*, 6(3), 1-12. <https://asjp.cerist.dz/en/article/236218>
- Bank of Algeria. (2022). Inflation dynamics and determinants in Algeria: An empirical investigation (Working Paper No. 1-2022). <https://www.bank-of-algeria.dz/stoodroa/2022/12/INFLATION-DETERMINANTS-EN-NOV22.pdf>
- Beldjebel, A., & Hellal, A. (2024). ANALYZING THE RELATIONSHIP BETWEEN MONEY SUPPLY AND EXCHANGE RATE IN ALGERIA USING THE VAR MODEL: AN ECONOMETRIC STUDY FOR THE PERIOD 1990-2023. *International Journal of Professional Business Review*, 9(11), e05148. <https://doi.org/10.26668/businessreview/2024.v9i11.5148>
- Benkhelouf, R., & Sahed, A. (2024). Exchange prices shocks and inflation rate persistence for North African countries: A fractional cointegration relationship (Version 1) [Preprint]. Research Square. <https://doi.org/10.21203/rs.3.rs-4308266/v1>

- Berument, H., & Pasaogullari, M. (2003). Effects of the real exchange rate on output and inflation: Evidence from Turkey. *The Developing Economies*, 41(4), 401–435.
- Bouhassoun, H. (2024). Evaluating the effectiveness of the exchange rate channel in transmitting the impact of monetary policy to inflation in Algeria: From 1990 to 2017—An econometric study. *International Journal of Economic Performance*, 7(1), 222-233. hal-04678430f. <https://hal.science/hal-04678430v1>
- Burstein, A., Eichenbaum, M., & Rebelo, S. (2003). Large devaluations and the real exchange rate. In G. A. Calvo, C. Végh, & A. Razin (Eds.), *Festschrift in honor of Guillermo A. Calvo* (pp. 01–43).
- Dekkiche, D., Mimouni, Y., & Bouguetaia, S. (2022). The impact of the exchange rate on balance of payments in Algeria: An ARDL model approach. *Economic Themes*, 60(1), 95–117. <https://doi.org/10.2478/ethemes-2022-0006>
- Djorfi, Z., & Almi, H. (2025). Impact of exchange rate volatility on inflation in Algeria—Using MIDAS regressions. *Journal of Economic Papers*, 16(01), 116-131. <https://asjp.cerist.dz/en/article/267068>
- Emikönel, M., & Orhan, A. (2023). An empirical analysis on the relationship between exchange rates and inflation in fragile five countries. *Journal of Yaşar University*, 18(70), 237-251. <https://dergipark.org.tr/tr/pub/jyasar/issue/77831/1133520>
- Ferrara, L., Metelli, L., Natoli, F., & Siena, D. (2021). Questioning the puzzle: Fiscal policy, real exchange rate and inflation (CAMA Working Paper No. 38/2021). Centre for Applied Macroeconomic Analysis. <https://doi.org/10.2139/ssrn.3822101>
- Fofanah, P. (2020). Effects of Exchange Rate Volatility on Trade: Evidence from West Africa. *Journal of Economics and Behavioral Studies*, 12(3), 32–52. DOI: 10.22610/jebs.v12i3(J).3009
- Gassem, F., Zemri, B. E., & Imamali, Y. (2024). Unraveling inflation in Algeria: The impact of monetary and non-monetary forces. *Review MECAS*, 20(2), 94-106. <https://asjp.cerist.dz/en/article/257331>
- Ha, J., Stocker, M. M., & Yilmazkuday, H. (2019). Inflation and exchange rate pass-through (Policy Research Working Paper No. 8780). The World Bank, Macroeconomics, Trade, and Investment Global Practice.
- Haffaci, S., & Zitouni, I. (2025). The impact of exchange rate fluctuations on trade flows in Algeria: An econometric analysis using the ARDL model. *Indonesian Journal of Social Science Research*, 6(1), 78–94. <http://dx.doi.org/10.11594/ijssr.06.01.08>
- Hellal, A., Brahmia, N., & Gueddouche, N. (2025). Exchange rate pass-through and inflation dynamics in Algeria: A vector autoregression analysis of short- and long-term effects. *International Journal of Innovative Technologies in Economy*, 2(50). [https://doi.org/10.31435/ijite.2\(50\).2025.3329](https://doi.org/10.31435/ijite.2(50).2025.3329)
- Helmy, O., Fayed, M., & Hussien, K. (2018). Exchange rate pass-through to inflation in Egypt: A structural VAR approach. *Review of Economics and Political Science*, 3(2), 2-19. <https://doi.org/10.1108/REPS-07-2018-001>
- Hossain, A. (2002). Exchange Rate Responses to Inflation in Bangladesh. IMF Working Paper: WP/02/166, Authorized for distribution by Reza Vaez-Zadeh.
- Kayamo, S. E. (2021). Asymmetric impact of real exchange rate on inflation in Ethiopia: A non-linear ARDL approach. *Cogent Economics & Finance*, 9(1), 1986931. <https://doi.org/10.1080/23322039.2021.1986931>
- Lowe, A. B. (2019). The impact of exchange rate on inflation: A case study of The Gambia (1978–2016). *European Scientific Journal*, 15(10), 261-277. <http://dx.doi.org/10.19044/esj.2019.v15n10p261>

Exploring the Short- and Long-Run Effects of Real Exchange Rate on Inflation in Algeria: Evidence from 1990–2024

- Madesha, W., Chidoko, C., & Zivanomoyo, J. (2013). Empirical Test of the Relationship Between Exchange Rate and Inflation in Zimbabwe. *Journal of Economics and Sustainable Development*, 4(1), 52-58. <https://www.iiste.org/Journals/index.php/JEDS/article/view/4096>
- Mahfoud, B., Atil, A., & Benmazou, M. Z. (2022). The non-linear relationship between inflation, real effective exchange rate, and economic growth in Algeria: An econometric approach using threshold autoregressive model (TAR) over the period 1980–2020. *Journal of Economic Integration*, 10(4), 289–304. <https://asjp.cerist.dz/en/article/215468>
- Mbawambo, S. K., & Mchukwa, E. W. (2024). The effects of exchange rates volatility and inflation on Tanzania's trade balance: Evidence from J-curve effect. *East African Journal of Business and Economics*, 7(2), 343-357. <https://doi.org/10.37284/eajbe.7.2.2504>
- Mehibel, S., & Belarbi, Y. (2018). Inflation Dynamics in Algeria. *Journal of Economics and Behavioral Studies*, 9(6(J), 174-187. [https://doi.org/10.22610/jebbs.v9i6\(J\).2014](https://doi.org/10.22610/jebbs.v9i6(J).2014)
- Merieme, B., & Nouria, G. (2018). La relation empirique entre l'inflation et le taux de change parallèle : Approche de cointégration ARDL bound test. *Revue finance et marchés*, 4(8), 1-11. <https://www.asjp.cerist.dz/en/article/53150>
- Miller, R.L.; Benjamin, D.K. (2004). *The Economics of Macro Issues*; Boston, MA; Pearson - Addison Wesley, 2004.
- Mosbei, T., Samoei, S. K., Tison, C. C., & Kipchoge, E. K. (2021). Exchange rate volatility and its effect on intra-East Africa Community regional trade. *Latin American Journal of Trade Policy*, 4(9), 43–53. <https://doi.org/10.5354/0719-9368.2021.58790>
- Musa, N. (2021). Impact of exchange rate volatility on inflation in Nigeria. *Journal of Contemporary Research in Business, Economics and Finance*, 3(1), 26–38. <https://ideas.repec.org/a/ajp/jcrbef/v3y2021i1p26-38id99.html>
- Narayan, P. K., & Smyth, R. (2005). What Determines Migration Flows from Low- to High-Income Countries?', *The Journal of International Trade & Economic Development*, 14(2), 187–208. <https://doi.org/10.1093/cep/byj019>
- Narayan, P.K. (2004) Reformulating Critical Values for the Bounds F-Statistics Approach to Cointegration: An Application to the Tourism Demand Model for Fiji. Department of Economics, Discussion Papers, No.02/04, Monash University, Victoria 3800, Australia. <https://www.scirp.org/reference/referencespapers?referenceid=1442422>
- Nassif, A., Feijó, C., Araújo, E., & Leão, R. (2025). Inflation targeting and the real exchange rate trend: Theoretical discussion and empirical evidence for developed and developing countries. *Cambridge Journal of Economics*, 49(1), 159–188. <https://doi.org/10.1093/cje/beae039>
- Nkoro, E., Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: application and interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63–91. https://ideas.repec.org/a/spt/stecon/v5y2016i4f5_4_3.html
- Okoth, M. N. (2013). The effect of interest rate and inflation rate on exchange rates in Kenya (Unpublished master's thesis). University of Nairobi.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships', *Journal of Applied Econometrics*, 16(3), 289–326. <https://doi.org/10.1002/jae.616>
- Pétursson, T. G., (2008), How hard can it be? Inflation control around the world, *Economics*, Department of Economics, Central bank of Iceland. <https://cb.is/library/?itemid=d1a2d55e-25f9-4d01-abdc-e65ef1883513&type=pdf> (application/pdf).

- Pham, T. A., Nguyen, H. H., Nguyen, D. N., & Vu, L. M. (2022). Exchange rate pass-through and its heterogeneity under the pegged regime: a case of Vietnam. *Journal of the Asia Pacific Economy*, 29(2), 612–633. <https://doi.org/10.1080/13547860.2022.2035093>
- Rasool, H., Adil, M. H., & Tarique, Md. (2022). ARDL Approach to Drivers of Inclusive Growth In India. *The Indian Economic Journal*, 70(4), 615-634. <https://doi.org/10.1177/00194662221118320>
- Sarno, L., & Taylor, M. P. (2002). Purchasing power parity and the real exchange rate. *IMF Staff Papers*, 49, 65–105. <https://doi.org/10.2307/3872492>
- Smaili, N & Khelassi, A . (2021). The Relationship Between Public Expenditures And The Gdp-growth In Algeria: An Empirical Study Using The Ardl Model. *Journal of Economic Integration*, 9(4), 847-861. <https://asjp.cerist.dz/en/article/179580>
- Sirag, A. (2021). Modeling the effect of the parallel exchange rate on inflation dynamic. *Arab Monetary Fund*. <https://www.amf.org.ae/en/publications/economic-studies/modelling-effect-parallel-exchange-rate-inflation-dynamic>
- Sorsa, P. (1999). Algeria—the real exchange rate, export diversification, and trade protection (IMF Working Paper No. WP/99/49). International Monetary Fund.
- Tahraoui, F., & Benelbar, M. (2015). The impact of exchange rate on inflation and economic growth in Algeria – Econometric study. *Journal of Quantitative Economics Studies*, 1(1), 1–16. <https://asjp.cerist.dz/en/article/9981>
- Valogo, M. K., Duodu, E., Yusif, H., & Baidoo, S. T. (2023). Effect of exchange rate on inflation in the inflation targeting framework: Is the threshold level relevant? *Research in Globalization*, 6, 100-119. <https://doi.org/10.1016/j.resglo.2023.100119>
- Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press. <https://www.jstor.org/stable/j.ctt5hhcfr>