Available online at https://www.asjp.cerist.dz/en/PresentationRevue/85

Economic Researcher Review

ISSN: 2335-1748, EISSN: 2588-235X VOL 14,N^{O}1 ..(2026),PP306-326

The Impact of the Parallel Exchange Market Premium on Foreign Exchange Reserves in Algeria: An Econometric Study for the Period 1977–2024

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Received:07 /09 /2025 ;**Accepted:**06/ 26/2026;**Published:**06/30 /2026

Abstract :

This study aims to investigate the relationship between the parallel exchange rate premium and foreign exchange reserves in Algeria over the period 1977–2024. The analysis employs the Autoregressive Distributed Lag (ARDL) model within the framework of cointegration analysis using the Bounds Testing approach. The empirical findings reveal a statistically significant and negative long-run impact of the parallel market premium on foreign exchange reserves at the 5% significance level, underscoring the detrimental role of distortions in the informal exchange market in depleting reserve assets. Additionally, the results indicate a significant and positive long-run effect of both international oil prices and the official exchange rate on reserve accumulation. Conversely, no statistically significant relationships were observed in the short run, suggesting the presence of delayed and complex transmission mechanisms, particularly in an economy heavily reliant on the hydrocarbon sector, The study puts forward a set of key recommendations aimed at enhancing external stability and ensuring fiscal sustainability. Chief among these are the gradual acceleration of exchange rate system reform, narrowing the gap in the parallel market, diversifying the economic base by supporting non-oil sectors, and strengthening the effectiveness of relevant institutional and regulatory frameworks.

Keywords: parallel exchange market premium; foreign exchange reserves; Oil price; Official exchange rate.
Jel Classification Codes :F31; Q43.

How to cite this article by the APA method:
Hadid.S.H, Recham .K (2026), ***The Impact of the Parallel Exchange Market Premium on Foreign Exchange Reserves in Algeria: An Econometric Study for the Period 1977–2024,*** *Economic Researcher Review,*Volume14(01.),Algeria: University of skikda, pp306-326

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1. Introduction :

Against the backdrop of an economic environment marked by sharp exchange rate fluctuations and ongoing structural challenges in monetary policy management, the phenomenon of the parallel currency market stands out as a prominent and persistent feature in many developing economies, most notably the Algerian economy. This phenomenon refers to the persistent gap between the official exchange rate and the rate prevailing in the informal market, commonly known as the "parallel exchange rate premium." At its core, this premium reflects structural imbalances within the macroeconomic framework and serves as an indicator of the level of confidence in the institutional framework and adopted economic policies, particularly monetary policy.

In the Algerian context, the phenomenon of the parallel currency market is characterized by a high degree of complexity, largely due to the nature of the rentier economy, which relies primarily on the export of natural resources chief among them hydrocarbons. This reliance makes the state heavily dependent on oil revenues as the principal source of foreign currency. Despite the absence of accurate official data on the volume of transactions within this informal market, available estimates suggest that the parallel market occupies a significant portion of economic activity and constitutes a substantial share of foreign exchange transactions. This reflects both the depth and the breadth of this market beyond the regulatory framework of the state. At times, the parallel market premium has reached levels exceeding 300%, a figure that signals severe pressures on official foreign currency reserves. It also represents one of the most pressing challenges undermining the effectiveness of monetary policy and constraining the authorities' ability to regulate the exchange market and ensure macroeconomic stability

The exchange rate regime in Algeria has undergone successive transformations, beginning with rigid fixed-rate systems, followed by phases of managed float, and eventually evolving toward more flexible policies.However, these policies still lack sufficient transparency and full integration into global markets. Despite the implementation of gradual liberalization measures, the official market has failed to meet the aggregate demand for foreign currency, leading to the emergence of a strong and entrenched parallel market. This situation is closely linked to a set of structural and institutional determinants, including the weakness of the banking infrastructure, restrictions on currency transfers, and a pervasive lack of confidence in official economic policies.

In this context, foreign exchange reserves hold a central role in maintaining overall macroeconomic stability.They serve as a fundamental tool in the hands of monetary authorities to absorb external shocks, cover trade balance deficits, and ensure the stability of the national currency's value. These reserves also represent a core indicator of an economy's strength and its capacity to withstand crises—particularly given the Algerian economy's exposure to fluctuations in oil prices. Consequently, any decline in these reserves—whether driven by internal or external factors—constitutes a direct threat to monetary and financial stability.

Primary Research Question :

Hence, the central research problem of this study revolves around the following question: How does the parallel exchange market premium affect Algeria's foreign exchange reserves over the period 1977-2024?

Secondary Research Questions :

of the identified research problem, which centers on the impact of the parallel exchange rate premium on Algeria's foreign exchange reserves, there arises a need for a deeper analysis of the various dimensions of this complex relationship.This involves deconstructing the phenomenon into its different components and understanding the mechanisms through which it interacts within the economic reality. Such an endeavor requires the formulation of a set of sub-questions that allow for a more comprehensive exploration of the issue, helping to develop a clear analytical perspective on the interrelated variables and their mutual effects. Accordingly, the following sub-questions have been proposed:

- What is the strength of the statistical relationship between the parallel exchange market premium and Algeria's foreign exchange reserves?

- To what extent does the oil price explain the variations in Algeria's foreign exchange reserves?
- What is the statistical significance of the official exchange rate's impact on Algeria's foreign exchange reserves, under the adopted exchange rate regime during the period 1977–2024?
- Does the balance of payments contribute to moderating the impact of the parallel market premium on foreign exchange reserves?

Research Hypotheses:

To answer the research questions posed, the following hypotheses have been formulated:

- There is a statistically significant relationship between the parallel market premium and Algeria's foreign exchange reserves.
- Oil prices significantly explain the variations in Algeria's foreign exchange reserves.
- The official exchange rate has a statistically significant impact on Algeria's foreign exchange reserves under the adopted exchange rate regime during the period 1977–2024.
- The balance of payments plays a moderating role in the relationship between the parallel market premium and Algeria's foreign exchange reserves.

Significance of the Study

The significance of this study arises from the complex economic context currently facing the Algerian economy, particularly in light of the persistent gap between the official exchange rate and the parallel market rate, and the resulting pressures this disparity places on foreign exchange reserves. Analyzing the relationship between these two variables from an econometric perspective represents a critical step toward understanding the mechanisms of mutual influence and providing quantitative indicators that contribute to assessing the effectiveness of monetary policy and gauging the level of macroeconomic stability.

The significance of this study is also reflected in its broad temporal scope (1977–2024), which enables the tracking of the phenomenon's evolution across various phases of economic policy, thereby imparting both historical depth and analytical richness to its findings.

This study also contributes to filling a clear research gap in Algerian economic literature by employing econometric tools to analyze an indirect and structurally embedded relationship that has not been sufficiently examined.

Objectives of the Study

This study aims to achieve the following objectives:

1. To analyze the evolution of both the parallel exchange rate premium and foreign exchange reserves in Algeria over the period from 1977 to 2024.
2. To identify the economic and structural factors that have contributed to the shifts in the trajectories of both variables over the past four decades.
3. To test the econometric relationship between the parallel market premium and foreign exchange reserves using the ARDL (Autoregressive Distributed Lag) approach.
4. To examine the transmission mechanisms through which the parallel market affects official reserves and to assess the degree of mutual influence between the two variables.
5. To propose practical recommendations aimed at curbing the expansion of the parallel market and enhancing the effectiveness of monetary policy in maintaining external stability.

Contribution of the Study

This study aims to provide an in-depth economic and econometric analysis of the relationship between the parallel market exchange rate premium and the level of foreign exchange reserves in Algeria. It relies on a long time series spanning from 1977 to 2024 and employs the Autoregressive Distributed Lag (ARDL) model. The added value of this paper lies in its treatment of an issue that has not yet been sufficiently addressed in Algerian economic literature, despite its critical importance. It sheds light on one of the indirect channels through which foreign exchange reserves may erode and highlights the complex interaction between the parallel market and broader macroeconomic policies.

Beyond theoretical exposition or quantitative modeling, this study seeks to formulate evidence-based, practical recommendations for policymakers. These are aimed at fostering a more efficient and sustainable exchange rate policy that enables Algeria to contain the risks posed by the parallel market, strengthen its capacity to preserve foreign exchange reserves, and thereby ensure higher levels of economic resilience and macroeconomic stability over the medium and long term.

2. Literature Review :

The parallel exchange market is a complex economic phenomenon that continues to attract renewed academic interest, particularly in developing countries experiencing balance of payments imbalances or implementing exchange rate controls. It has been examined from multiple perspectives, including its impact on trade, inflation, and economic growth, across various geographic regions and time periods. Despite the richness of the existing literature, the topic remains highly relevant due to shifting economic conditions and advances in analytical tools. Accordingly, we have selected a set of key reference studies to help identify the research gap this paper seeks to address. These studies are as follows:

Elbadawi's (1997) study, "The Parallel Market Premium for Foreign Exchange and Macroeconomic Policy in Sudan" is considered one of the earliest analytical attempts to examine the behavior of the parallel market premium for foreign exchange and its implications for macroeconomic performance in Sudan. The study revealed clear negative effects of the rising premium on official exports and tax revenues derived from foreign trade, in addition to its role in stimulating capital flight. It further demonstrated that the widening exchange rate differential and the expansion of the black market for foreign currency can have profound fiscal and trade-related consequences, including the erosion of the tax base associated with external trade and the proliferation of large-scale rent-seeking activities. The study also indicated that the exchange rate gap exacerbates the debt crisis and foreign currency shortages by directly influencing capital outflows. Moreover, it concluded that the growing premium negatively impacts remittances from Sudanese expatriates, thereby compounding the country's overall macroeconomic challenges.(Elbadawi, 1997)

Degefa's (2001) study, "The Parallel Foreign Exchange Market and Macroeconomic Performance in Ethiopia" presents an in-depth analysis of the relationship between the parallel foreign exchange market premium and macroeconomic performance in Ethiopia, viewing it as a phenomenon resulting from strict foreign exchange controls in developing economies facing severe structural imbalances. The study adopts a flow-stock analytical framework to identify the determinants of the parallel market premium, assess its impact on merchandise exports, and examine the causal relationship between inflation and the parallel exchange rate. The empirical findings indicate that the parallel market premium exerts a significantly negative effect on merchandise exports. In the long run, its key determinants include real money balances, the real effective exchange rate, and external aid inflows, while terms of trade shocks have only a temporary adverse effect. The study further confirms a unidirectional causal relationship running from inflation to the parallel exchange rate, suggesting that inflation was a major driver of the premium during the study period. This research is particularly important as it offers a comprehensive analytical framework for understanding the complex interactions between rigid monetary policies, parallel exchange market dynamics, and macroeconomic performance especially in developing economies operating under stringent exchange rate controls. (Degefa, 2001)

Belhachem and Ghazi's (2018) study, titled "The Impact of the Parallel Exchange Market Premium on Economic Performance (Economic Growth, Inflation, Exports): An Econometric Study of Algeria (1977–2014) ", This study provides an in-depth analytical assessment of the impact of the parallel exchange market premium on key economic performance indicators in Algeria over the period 1977–2014. Employing the Autoregressive Distributed Lag (ARDL) model, the authors investigate the dynamic relationships between economic growth, inflation rates, and export volumes in both the short and long run. The estimation results indicate that an increase in the parallel market premium is associated with higher inflation and a decline in export performance. Interestingly,

however, it shows a positive impact on economic growth, which partially deviates from conventional theoretical expectations. This finding reflects the complexity of the Algerian economic context, particularly under conditions of monetary instability. In light of these results, the study underscores the importance of developing sound economic policies aimed at narrowing the gap between official and parallel exchange rates, as a means to promote macroeconomic stability and enhance the competitiveness of export-oriented sectors.(Belhachem & Ghazi, 2018)

Ebaidalla's (2019) study, "Determinants and Macroeconomic Impact of the Parallel Exchange Rate Premium in Sudan" This study provides an in-depth analysis of the determinants of the parallel exchange rate premium in Sudan over the period 1979–2014, with a particular focus on its macroeconomic implications. The researcher employed the Autoregressive Distributed Lag (ARDL) model to estimate the dynamic relationship between the premium and three key economic variables: economic growth, inflation, and export performance. The findings reveal that the parallel market premium is influenced by several macroeconomic policy-related factors, most notably the real exchange rate, trade openness, and the money supply. Additionally, expectations of currency devaluation, fiscal deficits, and foreign aid flows emerged as significant determinants of the premium in the parallel market. Regarding the economic effects, the results indicate that a widening of the parallel market premium has a negative impact on economic growth and export performance, while it is positively associated with inflation, reflecting its role in undermining overall macroeconomic stability. The study concludes that narrowing the gap between the official and parallel exchange rates is a key policy instrument to curb inflationary pressures, enhance export competitiveness, and create a more conducive environment for sustainable economic growth.(Ebaidalla, 2019)

The study conducted by Samira Ouaret and FaridYaici (2020) titled " The Management Of Foreign Exchange Reserves In Algeria"examined the foreign exchange reserves management policy in Algeria, with a particular focus on analyzing the evolution of these reserves, which peaked in 2013 at approximately $194 billion before sharply declining to $73 billion by the first quarter of 2019 as a result of falling global oil prices. The study adopted a theoretical framework supported by descriptive analysis. It concluded that Algeria pursued a conservative policy characterized by a preference for the U.S. dollar as a reserve currency, the early repayment of external debt, and the establishment of the Revenue Regulation Fund. The study highlighted shortcomings in the transparency of reserve management and limited diversification of investment instruments. It recommended allocating a portion of the reserves to a sovereign wealth fund, medium-risk financial securities, and financing domestic investment projects to support the national economy and promote sustainable development. This paper represents a significant contribution to understanding reserve management practices in rentier economies, particularly in the context of the limited documentation available on Algeria.(Ouaret & Yaici, 2020)

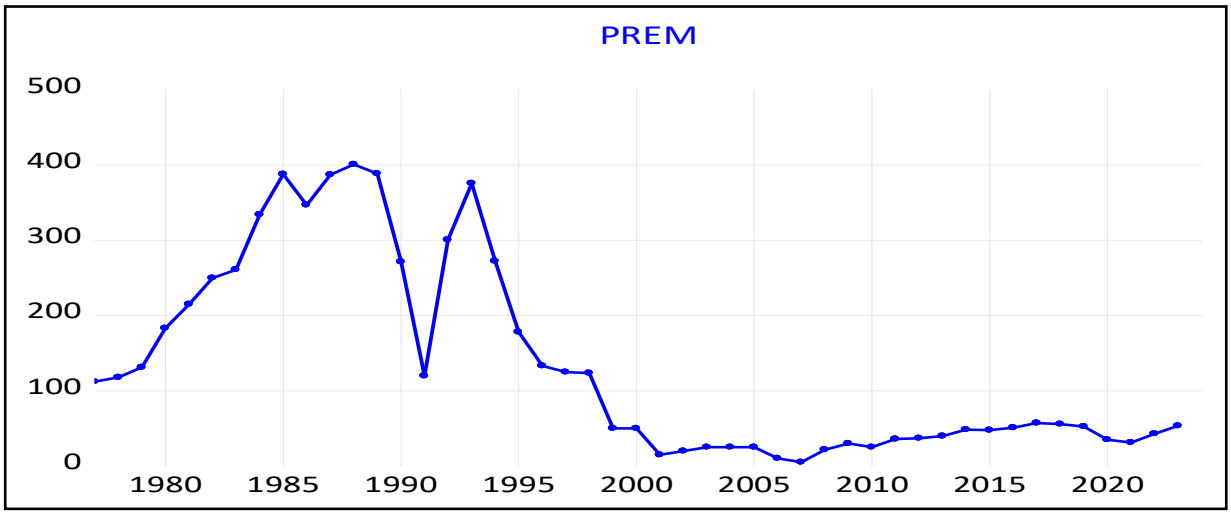
A comparative review of the previous studies reveals two main research streams, The first focused on the macroeconomic effects of the parallel exchange market premium, particularly its impact on inflation, exports, economic growth, and macroeconomic stability (Elbadawi, 1997; Degefa, 2001; Belhachem& Ghazi, 2018; Ebaidalla, 2019), The second examined the management and evolution of Algeria's foreign exchange reserves without considering the role of the parallel exchange market (Ouaret&Yaici, 2020), Despite the valuable contributions of these studies none directly investigated the impact of the parallel exchange market premium on Algeria's foreign exchange reserves, Therefore, the present study fills this gap by examining both the short-run and long-run effects of the parallel exchange market premium on foreign exchange reserves in Algeria during 1977–2024 using the ARDL bounds testing approach.

3. Historical Evolution of the Parallel Market Exchange Premium in Algeria (1977–2024):

The parallel market exchange rate premium represents the gap between the exchange rate in the parallel (black) market and the official exchange rate, and it indicates the extent of restrictions on foreign currency transfers and access, as well as the level of confidence in government monetary policies.

Analyzing this phenomenon in the Algerian context is of particular importance due to the unique characteristics of the country's economic system and the nature of foreign exchange management policies adopted over several decades. The following section presents an analysis of the historical trajectory of the parallel market exchange rate premium in Algeria over the period from 1977 to 2024.

Figure 01: Evolution of the Parallel Market Exchange Premium in Algeria (1977–2024)



Source: Author's elaboration based on annual data using EViews 12

Based on the general trend of Parallel Market Exchange Premium in Algeria, as illustrated in Figure (1), we have classified the trajectory of their evolution into the following stages :

3.1.Phase One: The Escalation Phase (1977–1985)

In the early years of the studied period, the parallel market exchange rate premium experienced an upward trend, rising from relatively moderate levels to exceeding 300%. This sharp increase reflects growing imbalances in the foreign exchange market,In the late 1970s and early 1980s, the Algerian economy followed a state-directed model marked by strict regulation of the exchange market. The authorities imposed a fixed exchange rate system and enforced stringent controls on foreign transactions and currency transfers. These measures led to a shortage of foreign currency in the official market, prompting individuals and businesses to turn to the parallel market to meet their needs. Consequently, the parallel market premium increased significantly.

3.2.Phase Two: The Peak and Period of Sharp Volatility (1985–1995)

This phase witnessed record-high levels of the parallel market premium, reaching peaks of over 400%. This sharp escalation coincided with a deep economic crisis in Algeria, which began with the collapse of oil prices in 1986, leading to a severe decline in government revenues. At the same time, domestic demand remained high, and the external debt crisis worsened, exacerbating the trade deficit.In response to these conditions, the government tightened restrictions on the use of foreign currency.Under such circumstances, access to foreign exchange through official channels became nearly impossible for many economic agents, resulting in an explosion in demand for the parallel market and widening the gap between official and parallel exchange rates.Moreover, the initial implementation of structural adjustment programs in cooperation with the International Monetary Fund (IMF) created further distortions in the exchange market. The austerity measures imposed by the IMF significantly reduced public spending and limited the availability of foreign currency in the official banking system. Although these measures were necessary to restore macroeconomic balance, they added short-term pressure on the parallel market.

3.3.Phase Three: Gradual Adjustment and Sharp Decline (1995–2000)

The second half of the 1990s witnessed a marked decline in the parallel market premium, dropping from levels exceeding 350% in the early part of the decade to approximately 50% by 1999 and 2000. This decline was closely associated with the reform policies implemented by Algeria under the Structural Adjustment Program. One of the most significant of these reforms was the

gradual liberalization of the foreign exchange market, initiated in 1994, alongside a substantial devaluation of the Algerian dinar intended to align it more closely with its actual market value.Although this devaluation generated inflationary effects, it played a critical role in narrowing the gap between the official exchange rate and the parallel market rate. Additionally, major institutional reforms were introduced, including the modernization of the banking system, enhancement of foreign exchange management mechanisms, and simplification of procedures for accessing foreign currency for legitimate commercial purposes. These measures collectively contributed to restoring confidence among economic agents in official channels and reducing their reliance on the parallel market.

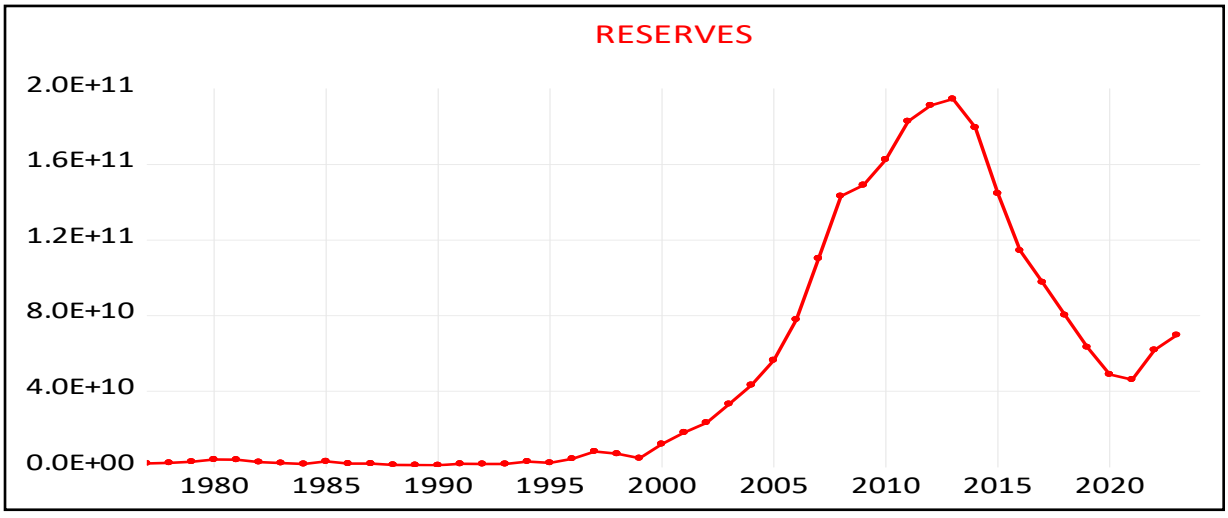
3.4.Phase Four: Relative Stability with Limited Volatility (2000–2024)

This phase was characterized by a decline and relative stabilization of the parallel exchange market premium at moderately low levels, ranging between 20% and 60%, with periodic fluctuations tied to broader macroeconomic conditions. During the oil boom period (2000–2014), the premium fell to its lowest levels, reflecting a relative abundance of foreign currency and improved confidence in economic policy. This decline was supported by the accumulation of substantial foreign exchange reserves, which exceeded USD 190 billion by 2013. This surplus enhanced the central bank's capacity to inject foreign currency into the market and maintain exchange rate stability, thereby reducing the attractiveness and utility of resorting to the parallel market.However, following the sharp decline in oil prices in the second half of 2014, the premium began to rise gradually once again though it remained within relatively moderate bounds compared to earlier periods. This resurgence signaled renewed pressure on the foreign exchange market due to reduced hydrocarbon revenues and declining foreign reserves. Moreover, import restriction policies contributed to a reactivation of the parallel market and a widening of the gap between the official and parallel exchange rates.

4. Historical Analysis of the Evolution of Foreign Exchange Reserves in Algeria (1977–2024)

Foreign exchange reserves are among the most critical macroeconomic indicators, reflecting the strength of an economy and its capacity to absorb external shocks and finance essential imports. In the case of Algeria, foreign exchange reserves hold particular significance due to the distinctive structure of the national economy, which relies almost entirely on hydrocarbon revenues. What follows is an analytical overview of the historical trajectory of Algeria's foreign exchange reserves over the extended period from 1977 to 2024.

Figure 02: Evolution of the Foreign Exchange Reserves in Algeria (1977–2024)



Source: Author's elaboration based on annual data using EViews 12

Based on the general trend of foreign exchange reserves in Algeria, as illustrated in Figure (2), we have classified the trajectory of their evolution into the following stages :

4.1.Phase One: The Period of Weakness and Relative Stability (1977–2000)

This period, which extended for over two decades, was marked by low and relatively stable levels of foreign exchange reserves, remaining near minimal thresholds. These characteristics reflect the impact of a combination of structural and circumstantial crises that Algeria faced during this time. In the 1980s, the country experienced a severe external debt crisis due to the sharp decline in global oil prices and the accumulation of external debt, which led to the depletion of available reserves used to service foreign obligations. As a result, the Algerian authorities were compelled to enter into negotiations with the International Monetary Fund (IMF) to implement structural adjustment programs. These programs involved strict austerity measures and deep economic reforms aimed at restoring macroeconomic balance. The security crisis that engulfed Algeria during the 1990s also had a profound impact on overall economic performance. It led to a decline in both domestic and foreign investment, reduced productivity, and a significant increase in public spending on security and defense(Laframboise et al., n.d.), These combined factors prevented the accumulation of adequate foreign exchange reserves and left the Algerian economy in a state of persistent vulnerability to external shocks.

4.2.Phase Two: The Period of Gradual Recovery (2000–2008)

This phase witnessed the beginning of a gradual improvement in the level of foreign exchange reserves, rising from low levels to more acceptable thresholds. This recovery was driven by a set of positive developments in both the domestic and external economic environments. On the domestic front, Algerian authorities were able to achieve a degree of political and economic stability following the resolution of the security crisis that had peaked between 1991 and 1992. This stabilization contributed to a more favorable business climate and attracted some investment, particularly in the energy and infrastructure sectors. Furthermore, since 1994, Algeria had launched a series of economic and structural reform programs with the support of the International Monetary Fund (IMF). These reforms focused on reducing the fiscal deficit by controlling public spending, liberalizing foreign trade, reforming the banking system, and devaluing the Algerian dinar by 40% in 1994 to improve export competitiveness. In addition, efforts were made to restructure public enterprises through the privatization of certain industrial companies, and to modernize the legal and regulatory framework in order to attract investment(Cyril Desponts et al., 2023). On the external front, global oil markets experienced a gradual improvement in prices, which positively impacted the value of Algeria’s exports and, consequently, its foreign exchange reserves.

4.3.Phase Three: The Accumulation Phase (2008–2014)

This period represents the most remarkable phase in the history of Algeria’s foreign exchange reserves, marked by substantial growth that peaked at approximately USD 200 billion between 2013 and 2014. This exceptional increase was a direct result of the global oil boom during this period, when international oil prices surged to record levels—exceeding USD 100 per barrel for extended durations, The sharp rise in hydrocarbon export revenues significantly boosted Algeria’s income, enabling the country to achieve considerable surpluses in its balance of payments. These surpluses played a central role in the substantial accumulation of foreign exchange reserves. During this period, the Algerian authorities adopted a fiscally cautious strategy by establishing the Revenue Regulation Fund, which aimed to accumulate oil surpluses for use during periods of price decline (*Algeria Oil Cash Down*, 2015), In parallel, ambitious public investment programs were implemented, covering infrastructure, housing, and human development projects. These efforts contributed to stimulating economic growth and improving living standards.

4.4.Phase Four: The Collapse and Sharp Depletion Phase (2014–2020)

This phase marked a critical turning point in the trajectory of Algeria’s foreign exchange reserves, which experienced a steep and accelerated decline from approximately USD 200 billion to less than USD 40 billion. This sharp drop was a direct result of the global collapse in oil prices that began in the second half of 2014. Oil prices fell from levels above USD 100 per barrel to below USD 30 at certain points, leading to a dramatic fall in government revenues and the emergence of a large fiscal deficit (*Algeria Oil Cash Down*, 2015), Given Algeria’s near-total dependence on hydrocarbon revenues, the authorities were unable to quickly identify alternative sources of income.

Under these conditions, the Algerian government was forced to rely on foreign exchange reserves to finance the budget deficit and maintain public spending levels, particularly in the areas of subsidies and wages. Public investment expenditures also continued without adjustment in line with falling revenues, further accelerating the depletion of reserves. In addition, this crisis revealed the fragility of Algeria's economic structure and its limited capacity to adapt to external shocks. Despite efforts made to diversify the economy during the oil boom period, non-hydrocarbon sectors failed to develop sufficiently to provide alternative sources of foreign exchange.

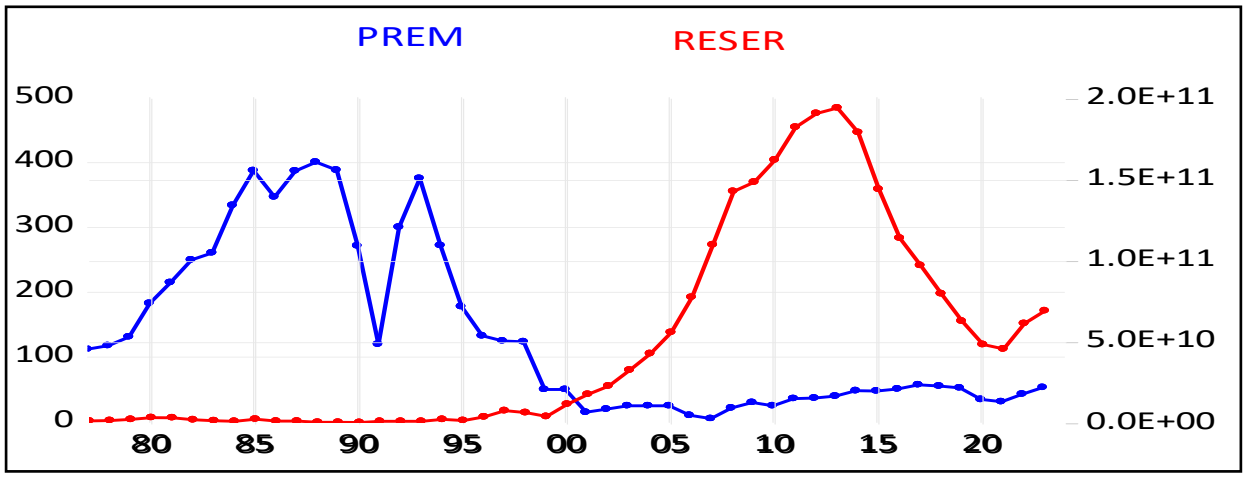
4.5.Phase Five: The Phase of Relative Stabilization (2020–2024)

This most recent phase has been characterized by a relative stabilization in the level of foreign exchange reserves, with a slight improvement bringing them to approximately USD 50–60 billion. This stability resulted from a set of corrective and reform-oriented measures adopted by the Algerian authorities in response to the crisis. Among the most notable were the implementation of strict austerity policies, including reductions in public spending, restructuring of the subsidy system, and wage controls in the public sector. Additionally, reforms were introduced in the banking and financial system, alongside improved public debt management and the development of monetary policy instruments. On the external front, the relative improvement in oil prices during certain periods of this phase contributed to easing the pressure on foreign exchange reserves. Algeria also benefited from some positive developments in global natural gas markets, particularly in the context of the Ukrainian crisis and the subsequent shifts in global energy supply routes (Daniel Richards, 2022).

5. Analyzing the Relationship Between Foreign Exchange Reserves and the Parallel Exchange Market Premium in Algeria :

After analyzing the evolution of the parallel exchange market premium and the development of foreign exchange reserves in Algeria, we now turn to the theoretical foundation of the relationship between these two variables through an examination of the following graph :

Figure 03: Evolution of the Parallel Market Exchange Premium and Foreign Exchange Reserves in Algeria (1977–2024)



Source: Author's elaboration based on annual data using EViews 12

In light of the quantitative developments presented for both the parallel exchange market premium and foreign exchange reserves in Algeria, this stage of the study aims to frame the relationship between the two variables within a theoretical context. Graph 03 serves as an initial visual entry point for exploring potential interaction patterns between the trajectories of the premium and reserves, and for analyzing the extent to which this relationship aligns with conventional economic hypotheses.

The graph above provides a preliminary visual representation of both the trajectory of the parallel exchange rate premium and the level of foreign exchange reserves. This pattern of transformation suggests an initial indication of potential interactive dynamics between developments in the informal currency market and the official stock of reserves. From this

perspective, the relationship between the premium and reserves does not appear to be linear or direct; rather, it is characterized by complexity and lagged effects that require in-depth analysis to understand the transmission mechanisms within the Algerian economic context.

The inverse relationship between foreign exchange reserves and the parallel market premium reflects the fundamental interplay of supply and demand forces in the currency market. When reserves are abundant, the central bank is capable of meeting the demand for foreign currency through official channels, thereby alleviating pressure on the parallel market and reducing the magnitude of the premium. Conversely, when reserves decline, a shortage in official supply emerges, prompting individuals and institutions to turn to the parallel market, where prices rise due to heightened risk and constrained supply.Moreover, ample reserves empower the central bank to adopt a flexible monetary policy that preserves the stability of the official exchange rate and bolsters confidence in the national currencyfactors that diminish the appeal of the parallel market and contribute to a decline in the premium. In addition, high levels of liquidity in the banking system enable commercial banks to satisfy foreign currency demand without restrictions, thereby reducing the reliance on informal channels.

In the Algerian context, this relationship takes on a distinctive character due to the rentier nature of the economy, which is heavily reliant on hydrocarbon exports. During oil boom periods particularly between 2000 and 2013, foreign exchange reserves accumulated to substantial levels, peaking at over $200 billion. This enabled the monetary authorities to exert full control over the official exchange market. As a result, the parallel market contracted significantly, and its premium declined to minimal levels, reflecting notable monetary stability and growing confidence in the official exchange channels. At that time, there was no compelling economic incentive for market participants to resort to the parallel market, given the ease of access to foreign currency through legitimate channels at competitive rates.

The economic behavior of market participants emerges as a decisive factor in this relationship, as individuals and firms tend to act rationally by considering the “opportunity cost.” When foreign exchange reserves are high, confidence in the banking system’s ability to meet foreign currency needs increases, which reduces reliance on the parallel market, where transactions entail an additional cost. Conversely, during periods of declining reserves and tightened bureaucratic restrictions, confidence in the formal system weakens, prompting a greater resort to the parallel market despite its higher cost in order to meet urgent foreign currency requirements.

The temporal dimension of the relationship highlights the presence of cyclical patterns closely tied to fluctuations in hydrocarbon prices. During periods of rising oil prices, foreign currency inflows increase, strengthening reserves and gradually reducing the parallel market premium. Conversely, when prices decline, reserves begin to deplete and the parallel market expands once again. However, this effect is not immediateit tends to emerge after a period of accumulation or erosion, reflecting the existence of "time lags" in the transmission of economic impacts to the foreign exchange market.

While the general trend of the relationship is clear, certain periods have witnessed deviations from this pattern, underscoring the influence of non-economic factors such as political instability or weak credibility of economic policies. The premium may rise despite abundant reserves or remain low amid underlying crises, reflecting the critical role of economic agents’ expectations and their confidence in the stability of the institutional framework and the transparency of future economic orientations.

6. The Econometric Study :

6.1.Methodology, DataSources and the Model:

In order to study and analyze the impact of the parallel exchange market premium on foreign exchange reserves, we will rely on the Autoregressive Distributed Lag (ARDL) approach to test for cointegration (long-run equilibrium) , This methodology was developed by Pesaran and Shin (1999) and further extended by Pesaran, Shin, and Smith (2001).(Pesaran et al., 2001)

The choice of this approach is motivated by its important characteristics, most notably the fact that it can be applied regardless of the order of integration of the variables in the modelwhether they are stationary at level I(0) or become stationary after first differencing I(1), However, it requires that none of the variables be integrated of order two I(2). Accordingly, given the time series properties of the model variables, the choice of the ARDL Bounds Testing approach is considered the most appropriate. This is because it allows us to overcome the issue of the order of integration of the time series. The method can be applied whether the variables are stationary at level, integrated of order one after first differencing, or a combination of both. In addition, the Bounds Testing approach is particularly suitable for short time series. It also incorporates a sufficient number of lagged periods to extract the most relevant information from the underlying model, provides more reliable estimates of the long-run parameters, and allows for the analysis of both short-run and long-run relationships within a single equation.

This study adopts a macroeconometric approach to investigate the determinants of foreign exchange reserves in Algeria and to analyze the impact of the parallel exchange rate premium on the accumulation of these reserves over the period spanning from 1977 to 2024. The empirical analysis relies primarily on secondary data obtained from the World Bank's World Development Indicators (WDI) and from the official publications and statistical reports of the Bank of Algeria (BA). As for data related to the parallel exchange rate, it was compiled from the Reinhart database, as well as from digital platforms and mobile applications specialized in monitoring foreign currency buying and selling rates in Algeria's informal market.

In constructing the study's model, the variables were selected based on their theoretical relevance in explaining the dynamics of foreign exchange reserves, while taking into account the structural characteristics of the Algerian economy. Algeria is a rentier economy that has, for decades, relied almost entirely on hydrocarbon exports as its primary source of foreign currency. This mono-export structure renders the country's balance of payments highly sensitive to fluctuations in global energy prices. Furthermore, the Algerian economy suffers from significant distortions in the foreign exchange market.

The variables to be estimated and incorporated into the model are as follows:

- **Foreign Exchange Reserves (RES):** This variable constitutes the dependent variable of the present study, which seeks to investigate the existence of both long-term and short-term relationships between the parallel market exchange premium and foreign exchange reserves in Algeria. The international reserves considered — excluding gold — comprise Special Drawing Rights (SDRs), the International Monetary Fund (IMF) reserve positions held by member countries, as well as foreign currency balances managed under the supervision of monetary authorities. It is important to note that these reserves do not include gold holdings, and the data are expressed in current U.S. dollar values.
- **Parallel Market Exchange Premium(PREM):** This represents the primary independent variable in the present study. The parallel market exchange premium reflects the inefficiency of monetary policy and the prevalence of informal economic activities, both of which significantly impact the flow of foreign currency through official channels.

Control Variables:

- **Oil Prices(OIL):** A defining characteristic of the Algerian economy is its heavy dependence on the hydrocarbon sector. According to the latest official data, Algeria's revenues from hydrocarbon exports amounted to approximately USD 34 billion by the end of September 2024, and USD 50 billion in 2023, accounting for about 90% of the country's total foreign exchange earnings (Region, 2024). This underscores the country's substantial reliance on oil revenues as the primary source of hard currency. Consequently, oil prices represent a critical factor in determining the level of foreign exchange reserves in Algeria. Fluctuations in oil prices exert a direct impact on the country's external balance, thereby highlighting the structural fragility of the Algerian economy in the face of global energy market volatility.

- **Balance of Payments Position(BOP):** A deficit in the balance of payments leads to the depletion of foreign exchange reserves, as these reserves are used to finance import operations. Conversely, a surplus contributes to the accumulation of reserves. This is particularly relevant in the Algerian context, where balance of payments transactions are settled primarily in hard currencies—most notably the US dollar and the euro—due to the nature of the country's trade partners and the composition of its exports and imports.

Since the balance of payments variable contains negative values during certain years of the study period, it cannot be directly transformed using the natural logarithm as this would violate the mathematical properties of the logarithmic function؛ To address this methodological issue while preserving all observations in the sample a positive constant was added to the original balance of payments series prior to applying the logarithmic transformation. This adjustment ensures that all transformed values are strictly positive, thereby satisfying the mathematical requirements for the application of the natural logarithm without affecting the temporal pattern of the series or the relative variation among its original values

- **Official Exchange Rate(OER) :** Algeria adopts a managed official exchange rate regime, whereby the monetary authorities—represented by the Bank of Algeria—intervene using foreign exchange reserves to stabilize or guide the exchange rate of the Algerian dinar against foreign currencies. Consequently, any downward pressure on the official exchange rate (i.e., depreciation of the local currency) necessitates the use of foreign reserves to purchase dinars and support its value. Conversely, the accumulation of reserves typically reflects a surplus in the balance of payments or an increase in export revenues, enabling the authorities to reinforce the stability of the local currency through the official exchange market. Accordingly, the relationship between the two variables exhibits a potential causal direction from the official exchange rate to reserves, or vice versa, depending on the nature of the exchange rate regime and the extent of central bank intervention.

In light of the available data and in accordance with the objectives of the study, the model has been theoretically specified as follows:

$$\boldsymbol{RES = F(PREM, OIL, BOP, OER)}$$

This functional form reflects the hypothesized long-run relationship between foreign exchange reserves (RES) and the key explanatory variables, namely the parallel market premium (PREM), international oil prices (OIL), the balance of payments position (BOP), and the official exchange rate (OER).

Building upon the general functional form specified above, and in pursuit of empirical precision and alignment with contemporary econometric literature, the theoretical model has been transformed into a log-linear specification. This transformation serves not only to facilitate estimation but also to enhance the statistical properties of the model. The main advantages of this logarithmic transformation lie in mitigating the effects of heteroscedasticity, stabilizing the relationships among the variables, and enabling the interpretation of estimated coefficients as economic elasticities.

Accordingly, the estimable log-linear econometric model is specified as follows in equation (01):

$$\boldsymbol{LOGRES_t = B_0 + B_1\, LOGPREM_t + B_2\, LOGOIL_t + B_3\, LOGBOP_t + B_4\, LOGOER_t + \varepsilon_t} \quad \text{.....(1)}$$

where the coefficients B_1, B_2, B_3, B_4 represent the partial elasticities of foreign exchange reserves with respect to the explanatory variables, while the error term ε_t captures unexplained fluctuations attributable to random or unobservable factors.

Testing the Stationarity of Time Series

In order to select the appropriate econometric methodology, the stationarity properties of the time series were examined, as this represents a necessary methodological step in models based on time-series data.To this end, the variables under investigation were subjected to unit root tests—most notably the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test—in order

to determine the order of integration for each time series. The following table presents the results of these stationarity tests.

Table 1. Unit Root Test Results: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP)

UNIT ROOT TEST RESULTS TABLE (ADF) Null Hypothesis: the variable has a unit root						
Variable	**Level**			**First deference**		
	ADF statistics		**Result**	**ADF statistics**		**Result**
LOGRES	t-Statistic	1.479301 (no)	**NON-STATIONARY**	t-Statistic	-5.839509 (***)	**SATIONARY I(I)**
	Prob	0.9637		Prob	0.0000	
LOGPREM	t-Statistic	-0.565705 (no)	**NON-STATIONARY**	t-Statistic	-6.653303 (***)	**SATIONARY I(I)**
	Prob	0.4668		Prob	0.0000	
LOGOIL	t-Statistic	-1.975439 (no)	**NON-STATIONARY**	t-Statistic	-7.926647 (***)	**SATIONARY I(I)**
	Prob	0.2963		Prob	0.0000	
LOGBOP	t-Statistic	-3.030348 (*)	**SATIONARY I(0)**	-	-	-
	Prob	0.0393		-	-	
LOGOER	t-Statistic	-1.508625 (no)	**NON-STATIONARY**	t-Statistic	-4.321205 (***)	**SATIONARY I(I)**
	Prob	0.5204		Prob	0.0012	
UNIT ROOT TEST RESULTS TABLE (PP) Null Hypothesis: the variable has a unit root						
Variable	**Level**			**First deference**		
	PP statistics		**Result**	**PP statistics**		**Result**
LOGRES	t-Statistic	1.291208 (no)	**NON-STATIONARY**	t-Statistic	-5.892656 (***)	**SATIONARY I(I)**
	Prob	0.9481		Prob	0.0000	
LOGPREM	t-Statistic	-0.559057 (no)	**NON-STATIONARY**	t-Statistic	-6.698699 (***)	**SATIONARY I(I)**
	Prob	0.4696		Prob	0.0000	
LOGOIL	t-Statistic	-1.887807 (no)	**NON-STATIONARY**	t-Statistic	-8.033852 (***)	**SATIONARY I(I)**
	Prob	0.3350		Prob	0.0000	
LOGBOP	t-Statistic	-3.091185 (**)	**SATIONARY I(0)**	-	-	-
	Prob	0.0341		-	-	
LOGOER	t-Statistic	-1.202465 (no)	**NON-STATIONARY**	t-Statistic	-4.461357 (***)	**SATIONARY I(I)**
	Prob	0.6658		Prob	0.0008	
Notes: A- (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant B- Lag Length based on SC: Schwarz information criterion (SC) C- Probability based on MacKinnon (1996) one-sided p-values						

Source: Author's Computation Using EViews 12

As shown in Table (01), which presents the results of the unit root tests using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods, the null hypothesis (H_0) of the presence of a unit root cannot be rejected for the variables LOGRES, LOGPREM, LOGOIL, and LOGOER. However, this hypothesis is rejected after taking the first differences of these variables.On the other hand, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted in the case of the BOP variable, indicating that BOP is stationary at level I(0), while the variables LOGRES, LOGPREM, LOGOIL, and LOGOER are integrated of order one I(1).This combination in the order of integration of the time series allows for the testing of a cointegration relationship (long-run equilibrium) using the Bounds Testing Approach within the framework of the

Autoregressive Distributed Lag (ARDL) model**.** This approach is particularly appropriate for investigating both long-term and short-term relationships between the dependent variable and the explanatory variables, especially when the series exhibit a mixture of integration orders, specifically I(0) and I(1), but none are integrated of order two or higher.

The ARDL model used in this study can be expressed as follows in equation 2:

$$\mathbf{LOGRES_t} = \alpha_0 + \Sigma_{i=1}^{p} \alpha_i \mathbf{LOGRES_\{t-i\}} + \Sigma_{=0}^{\{q_1\}} \beta_1 \mathbf{LOGPREM_\{t-j\}} + \Sigma_{=0}^{\{q_2\}} \beta_2 \mathbf{LOGOIL_\{t-k\}} + \Sigma_{=0}^{\{q_3\}} \beta_3 \mathbf{LOGBOP_\{t-l\}} + \Sigma_{=0}^{\{q_4\}} \beta_4 \mathbf{LOGOER_\{t-m\}} + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:

- **p**: Number of lags for the dependent variable LOGRES
- $\mathbf{q_1}$: Number of lags for the variable LOGPREM
- $\mathbf{q_2}$: Number of lags for the variable LOGOIL
- $\mathbf{q_3}$: Number of lags for the variable LOGBOP
- $\mathbf{q_4}$: Number of lags for the variable LOGOER
- $\boldsymbol{\alpha_0}$: Intercept term
- $\boldsymbol{\alpha_i}$: Coefficients of the lagged dependent variable
- $\boldsymbol{\beta_{ij}}$: Coefficients of independent variables and their lagged values
- $\boldsymbol{\varepsilon_t}$: Random error term

6.2.RESULTS AND DISCUSSION

a. Testing for Cointegration Using the Bounds Testing Approach

The cointegration relationship is examined using the Bounds Testing approach by computing the F-statistic within the framework of the Wald Test. This procedure tests the null hypothesis (H_0), which posits that there is no long-run cointegration relationship among the variables of the model, against the alternative hypothesis (H_1), which asserts the existence of a long-run cointegration relationship among the model's variables. The test involves estimating an ARDL model and evaluating the joint significance of the lagged level variables. The calculated F-statistic is then compared to the critical bounds values provided by (Pesaran et al., 2001), The following table presents the results of the Bounds Test for cointegration :

Table (02): Results of the Cointegration Test Using the Bounds Testing Approach

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.853517	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Author's Computation Using EViews 12

Through the analysis of the data presented in the cointegration test table using the Bounds Testing approach, it is observed that the calculated F-statistic value (F-statistic = 5.853517) exceeds the upper critical bounds I(1) at all conventional significance levels (1%, 2.5%, 5%, and 10%). This leads to the rejection of the null hypothesis (Null Hypothesis: No levels relationship) in favor of the alternative hypothesis (H1), thereby confirming the existence of a long-run equilibrium relationship (cointegration) among the variables included in the model.

b. The Long-Run Relationship (Long-Run Equilibrium Parameters):

Having established the existence of a cointegration relationship between foreign exchange reserves, the parallel market premium, and the control variables included in the model, we proceed to estimate the long-run relationship within the framework of the ARDL model. This is achieved by obtaining the long-run parameter estimates, as presented in the following table :

Table (03): Results of Estimated Long Run Coefficients

ARDL(1, 1, 3, 2, 4) selected based on (AIC): Dependent variable is RESERVES

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGPREM	-0.412210	0.194627	-2.117948	0.0435
LOGOIL	1.082152	0.219898	4.921143	0.0000
LOGOER	0.862152	0.170896	5.044907	0.0000
LOGZBOP	0.346238	0.205183	1.687460	0.1030
C	17.28633	1.980646	8.727622	0.0000

EC = LOGRES - (-0.4122*LOGPREM + 1.0822*LOGOIL + 0.8622*LOGOER + 0.3462*LOGZBOP + 17.2863)

Source: Author's Computation Using EViews 12

The table presents the estimated long-run coefficients of the variables included in the model, which investigates the impact of the parallel exchange market premium on Algeria's foreign exchange reserves, alongside the key determinants of the latter. Based on the analysis of the results, the following conclusions can be drawn:

– The coefficient of the parallel exchange market premium is negative (–0.412210) and statistically significant at the 5% level in the long run (Prob = 0.0435). This indicates an inverse relationship between the parallel market premium and foreign exchange reserves. In other words, a 1% increase in the parallel market premium leads to a 0.412% decrease in foreign exchange reserves. These findings are consistent with economic theory, which posits that rising risk indicators are typically associated with the deterioration of a country's external financial position. This inverse relationship can be explained through multiple transmission channels, most notably the confidence channel. An increase in the parallel market premium undermines the confidence of both foreign and domestic investors in the national economy, thereby reducing the country's ability to attract foreign direct investment (FDI), weakening capital inflows, and intensifying pressure on foreign exchange reserves.

– The coefficient of oil prices is positive (1.082152) and statistically significant at the 1% level in the long run (Prob = 0.0000), indicating a strong and elastic positive relationship between oil prices and Algeria's foreign exchange reserves. Specifically, a 1% increase in oil prices leads to a 1.082% increase in foreign exchange reserves. These statistical values are consistent with the rentier nature of the Algerian economy, which heavily relies on hydrocarbon revenues to finance its foreign currency reserves. This strong positive relationship is primarily explained through the export revenue channel, whereby rising oil prices boost the value of hydrocarbon exports—accounting for over 85% of Algeria's total exports—thereby improving the balance of payments position and supporting reserve accumulation. However, the fact that the elasticity exceeds one indicates an excessive sensitivity of foreign exchange reserves to fluctuations in oil prices. This exposes Algeria's financial system to external shocks and underscores the urgent need to diversify sources of foreign currency and reduce dependence on hydrocarbons in order to ensure long-term external financial stability.

– The coefficient of the official exchange rate is positive (0.862152) and statistically significant at the 1% level in the long run (Prob = 0.0000). This indicates a positive and elastic relationship between the official exchange rate of the Algerian dinar and foreign exchange reserves. Specifically, a 1% increase in the official exchange rate (a depreciation of the Algerian dinar) leads to a 0.862% increase in foreign exchange reserves. This finding aligns with economic theory and can be explained primarily through the competitiveness channel. A depreciation of the domestic currency enhances the price competitiveness of Algerian exports —particularly non-hydrocarbon exports— while making imports more expensive, thereby improving the trade balance and supporting reserve accumulation.

Additionally, the foreign investment channel further supports this relationship, as a weaker local currency renders Algerian assets relatively cheaper for foreign investors. This can stimulate an inflow of foreign direct investment and capital, thereby contributing to the build-up of foreign exchange reserves.

–The coefficient of the balance of payments surplus is positive (0.346238), indicating a direct relationship between the balance of payments and foreign exchange reserves in Algeria. In other words, a 1% increase in the balance of payments leads to a 0.346% rise in foreign exchange reserves. However, this relationship is statistically insignificant (Prob = 0.1030). The lack of statistical significance in the theoretically expected positive relationship between the balance of payments and foreign exchange reserves in Algeria can be attributed to a complex set of factors characterizing the Algerian economy. Most notably, the economy is excessively dependent on the hydrocarbon sector, which exposes both the balance of payments and foreign exchange reserves to sharp and irregular fluctuations tied to oil prices, as witnessed during the 2014–2016 period. Additionally, the weakness of the agricultural and industrial sectors necessitates the continued importation of essential goods (such as foodstuffs, raw materials, and machinery), regardless of the state of the balance of payments, thereby reducing the expected elasticity of the relationship between the two variables. Moreover, direct government intervention in the management of foreign exchange reserves to finance the fiscal deficit, along with inconsistent monetary and fiscal policies—particularly the persistence of state subsidies on essential goods and fuel—disrupts the natural mechanisms linking the two variables and contributes to the depletion of reserves at rates that are misaligned with balance of payments dynamics. Efforts to maintain exchange rate stability through ongoing central bank intervention, in the context of parallel currency markets, further contribute to distortions that weaken the expected long-term equilibrium relationship between the two variables. These factors collectively help explain the statistical insignificance of the estimated coefficient in the model.

–The constant term is positive, with a value of (17.28633), and statistically significant (Prob = 0.0000), reflecting the stability of this baseline level over the study period. It represents the long-run equilibrium level of foreign exchange reserves when all independent variables are equal to zero. Within the framework of the logarithmic model, this constant corresponds to a value of approximately e^17.28633 ≈ 32.1 million USD. This value can be regarded as a benchmark indicator for reserve adequacy and serves as a foundational reference for the formulation of monetary and fiscal policies.

c. Short-Run Relationship Estimation and Error Correction Model :

Following the confirmation of a long-run relationship among the model variables, it becomes necessary to estimate the Unrestricted Error Correction Model (ECM) to capture the short-run dynamics of the relationship.

Error Correction Model (ECM)

Table (04): Results of the Error Correction Model (ECM)

ARDL Error Correction Regression
Dependent Variable: D(LOGRES)
Selected Model: ARDL(1, 1, 3, 2, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPREM)	-0.024390	0.085387	-0.285637	0.7773
D(LOGOIL)	0.181027	0.117498	1.540678	0.1350
D(LOGOIL(-1))	-0.226474	0.142161	-1.593080	0.1228
D(LOGOIL(-2))	0.188655	0.108914	1.732141	0.0947
D(LOGOER)	0.422575	0.290061	1.456848	0.1567
D(LOGOER(-1))	-0.909549	0.302495	-3.006822	0.0057
D(LOGZBOP)	0.037252	0.057558	0.647206	0.5230
D(LOGZBOP(-1))	-0.147441	0.063399	-2.325622	0.0278
D(LOGZBOP(-2))	-0.202555	0.061659	-3.285082	0.0028
D(LOGZBOP(-3))	-0.143354	0.059285	-2.418051	0.0226

CointEq(-1)*	-0.469003	0.072694	-6.451745	0.0000

R-squared	0.685446	Mean dependent var	0.067827
Adjusted R-squared	0.587147	S.D. dependent var	0.361759
S.E. of regression	0.232443	Akaike info criterion	0.135822
Sum squared resid	1.728954	Schwarz criterion	0.586361
Log likelihood	8.079835	Hannan-Quinn criter.	0.301967
Durbin-Watson stat	2.153928		

* p-value incompatible with t-Bounds distribution.

Source: Author's Computation Using EViews 12

The estimated Error Correction Model (ECM), based on the ARDL(1, 1, 3, 2, 4) specification, provides an advanced analytical framework for examining the short-term dynamics of foreign exchange reserves. The model incorporates an automatic adjustment mechanism for deviations from the long-run equilibrium path through the error correction term, CointEq(-1), which has an estimated coefficient of -0.469003, statistically significant at the 1% level (p-value = 0.0000), with a t-statistic of -6.451745. This confirms the presence of a strong and stable cointegrating relationship. The coefficient indicates that 46.9% of any deviation from the long-run equilibrium is corrected within one year, reflecting a moderate adjustment speed. This result is consistent with the theoretical literature, which considers error correction coefficients in the range of 0.2 to 0.8 to be both economically reasonable and statistically acceptable. Moreover, the strong statistical significance of this coefficient enhances the credibility of the model and confirms its ability to capture the true dynamics of the economic relationships under study within the framework of cointegration theory and error correction models.

Analysis of Short-Run Dynamics

−The parallel exchange market premium exhibits a weak and statistically insignificant coefficient of -0.024390 (p-value = 0.7773), indicating that changes in the parallel market premium have no immediate effect on foreign exchange reserves in the short run.

−The impact of oil prices in the current year, with a one-year lag, and with a two-year lag, shows inconsistent coefficient signs, yet all remain statistically insignificant. This suggests a lack of a clear pattern in the short-run influence of oil prices on foreign exchange reserves.

−The official exchange rate exhibits a positive coefficient of 0.422575; however, it is not statistically significant (p-value = 0.1567). In contrast, the one-year lagged exchange rate variable shows a statistically significant negative effect at the 1% level, with an estimated coefficient of -0.909549 (p-value = 0.0057). This result indicates that a 1% increase in the exchange rate in the previous year leads to an approximate 0.91% decline in foreign exchange reserves in the current period. This strong negative effect reflects the delayed impact of exchange rate fluctuations on economic stability.

−The immediate effect of the balance of payments surplus shows a weak coefficient (0.037252) with no statistical significance (p-value = 0.5230), indicating that foreign exchange reserves do not exhibit a tangible immediate response to current changes in the balance of payments. However, the situation differs when considering the lagged effects at one, two, and three years, where the corresponding coefficients are (-0.147441, -0.202555, -0.143354), all statistically significant with p-values of (0.0278, 0.0226, and 0.0226), respectively. This reveals a delayed and cumulative transmission mechanism through which balance of payments imbalances affect the level of reserves. These findings suggest that changes in the balance of payments take between one and three years to translate into substantial and statistically significant effects on foreign exchange reserves. This reflects the complex and lagged nature of economic relationships in this context.

6.3.Statistical Evaluation of the Model :

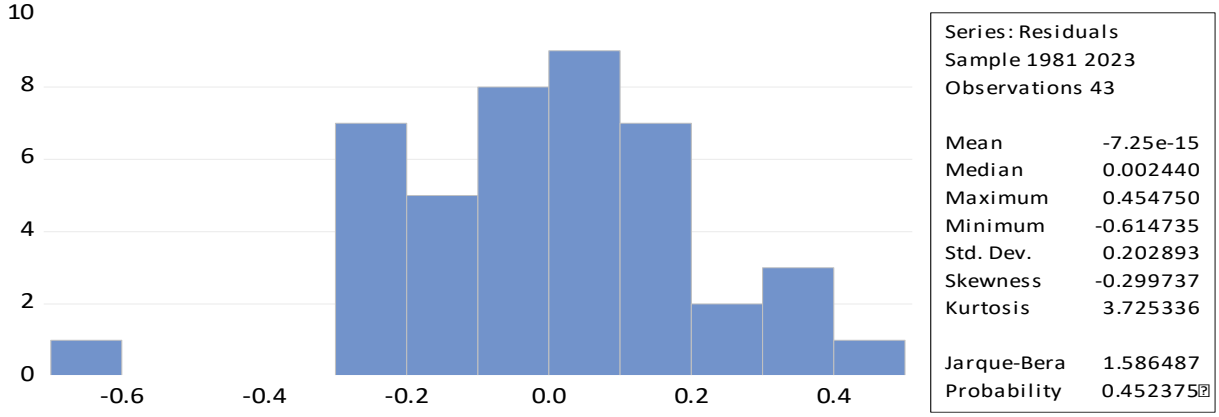
The estimated coefficient of determination (R-squared), valued at 0.685446 or 68.54%, indicates a relatively high explanatory power for the estimated econometric model. It suggests that the explanatory variables included in the Error Correction Model account for nearly two-thirds of the total variation in the dependent variable (foreign exchange reserves). This level of explanatory strength is considered statistically acceptable and economically satisfactory in econometric analysis.

From a methodological standpoint, the adjusted R-squared, which stands at 0.587147 or 58.71%, indicates that the model retains its explanatory power even after adjusting for degrees of freedom. This enhances the model's specification quality and reduces the risk of overfitting. Furthermore, the relatively narrow gap between the R-squared and the adjusted R-squared—approximately 9.8 percentage points—reflects a well-balanced trade-off between model complexity and predictive capability. This suggests that the model effectively captures the underlying structural patterns without falling into the trap of excessive fitting to historical data at the expense of generalizability.

a. Diagnostic Tests of the Residuals :

Normality of Residuals :

Figure 04: Normality Test Result



Source: Author's Computation Using EViews 12

The table shows that the Jarque-Bera statistic has a value of 1.586 with a probability of 0.45, which is greater than the critical value at the 5% significance level. This leads to the acceptance of the null hypothesis, indicating that the residuals are normally distributed.

Serial Correlation of the Residuals

Table (05) : Serial correlation LM test

Breusch-Godfrey Serial Correlation LM Test	
F-statistic : 0.381011	Prob. F(1,26) : 0.5424
Obs*R-squared : 0.621033	Prob. Chi-Square(1) : 0.4307

Source: Author's Computation Using EViews 12

The results of the Breusch-Godfrey LM test indicate that the residuals are independent. The calculated F-statistic is 0.381011 with a p-value of 0.5424, while the Obs*R-squared statistic recorded a value of 0.621033 with a p-value of 0.4307. Since both p-values exceed the 5% significance level, we fail to reject the null hypothesis of no first-order serial correlation in the residuals. This result suggests that the estimated model does not suffer from the problem of direct serial correlation between successive periods, meaning that the current-period random errors are not directly correlated with those of the previous period.

Heteroskedasticity of the Residuals

Table(06): Heteroskedasticity test

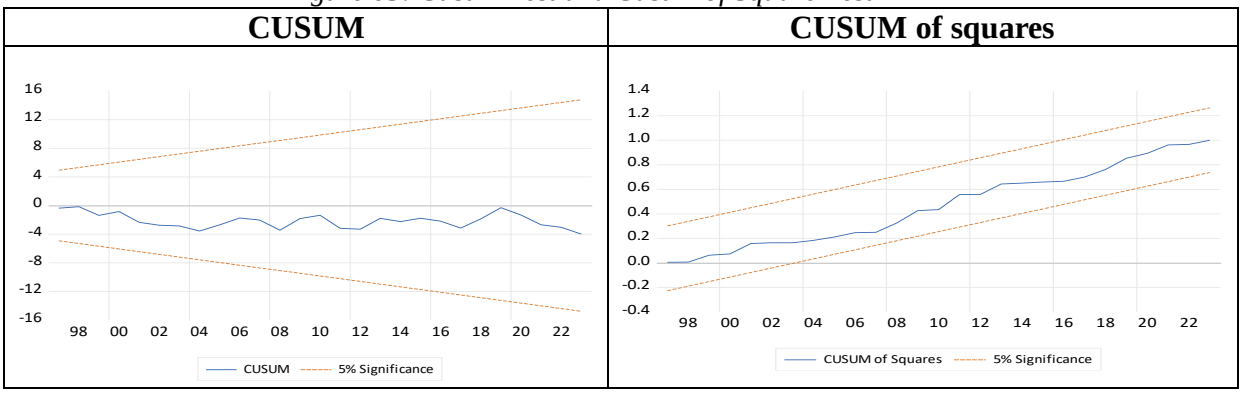
Heteroskedasticity Test: Breusch-Pagan-Godfrey	
F-statistic : 1.009804	Prob. F(15,27) : 0.4741
Obs*R-squared : 15.45360	Prob. Chi-Square(15) : 0.4193
Scaled explained SS : 8.302526	Prob. Chi-Square(15) : 0.9111

Source: Author's Computation Using EViews 12

The results of the Breusch-Pagan-Godfrey test indicate that the model satisfies the assumption of homoskedasticity in the residuals. The F-statistic is 1.009804 with a probability value of 0.4741, which exceeds the 5% significance level. Similarly, the Obs*R-squared statistic is 15.45360 with a p-value of 0.4193, further supporting the null hypothesis of homoskedastic residuals. This conclusion is reinforced by the Scaled Explained SS statistic, which recorded a value of 8.302526 with a probability of 0.9111.

b. Structural Stability Tests of the Model

Figure 05: Cusum Test and Cusum of Square Test



Source: Author's Computation Using EViews 12

The empirical results of the structural stability tests, using the CUSUM and CUSUM of Squares statistics, reveal that both test paths remain within the critical bounds at the 5% significance level. This provides strong empirical evidence of the structural stability of the estimated model and the absence of any statistically significant structural breaks in the estimated relationships. These diagnostic results validate the model's dynamic specification and confirm the statistical consistency of its structure throughout the study period. They also reinforce the coherence and alignment between the long-run relationship estimates and the short-run adjustments.

Conclusion :

This study analyzed the impact of the parallel exchange market premium on Algeria's foreign exchange reserves using an advanced econometric framework based on the ARDL bounds testing approach and error correction modeling. The results indicate that the parallel market premium does not exert a statistically significant effect in the short term, reflecting the limited immediate responsiveness of official reserves to fluctuations in the informal exchange market. However, the long-term impact is more pronounced and negative, as an increase in the premium contributes to the depletion of reserves due to the leakage of foreign currency outside official channels. Furthermore, the findings highlight the significance and influence of other key macroeconomic variables—particularly oil prices and the official exchange rate—in shaping the long-term dynamics of reserves. These results reveal the presence of complex and delayed transmission mechanisms in an economy heavily dependent on the hydrocarbon sector and persistently exposed to external shocks.

Policy Recommendation :

In light of the findings of this study, there emerges an urgent need for a comprehensive reassessment of foreign exchange and reserve management policies, particularly within an economic context marked by deep structural imbalances and an excessive dependence on the hydrocarbon sector. The empirical evidence demonstrates that the parallel exchange market does not exert an immediate effect on foreign reserves; however, over the long term, it contributes significantly to their erosion, primarily due to the diversion of foreign currency outside official channels. This necessitates the adoption of a multidimensional reform-oriented approach by policymakers—one that addresses the root causes of these vulnerabilities while ensuring

macroeconomic stability and the long-term sustainability of foreign exchange reserves. Accordingly, the study concludes with the following key policy recommendations:

- Restructuring the exchange rate regime to progressively narrow the gap between the official and parallel market rates through a gradual move toward exchange rate unification, thereby enhancing transparency and curbing speculative practices and financial leakage.
- Coordinating monetary and fiscal policies by fostering greater policy integration to support macroeconomic stability and alleviate pressure on reserves, with a particular emphasis on rationalizing public spending and directing it toward productive sectors.
- Modernizing payment systems and strengthening banking infrastructure to promote the adoption of electronic payment methods, which would contribute to reducing the scale of the parallel market and integrating economic activity within formal channels—ultimately improving the effectiveness of monetary policy and increasing transparency in financial transactions.
- Broadening the sources of foreign currency revenues to reduce the economy's overreliance on hydrocarbons by supporting non-oil exports and developing promising sectors such as agriculture, industry, tourism, and services.
- Reforming institutional and regulatory frameworks by embedding principles of good governance, enhancing transparency in reserve management, and fostering a business-friendly environment that bolsters investor confidence and encourages private sector engagement.
- Upgrading statistical and monitoring systems to ensure the availability of high-frequency data, thereby enhancing the capacity of statistical institutions to monitor economic developments in real time and improve the accuracy of forecasting and decision-making.
- Developing predictive tools for reserve management that are responsive to fluctuations in international markets particularly oil prices thus ensuring monetary security and reinforcing the country’s preparedness for potential economic shocks.

Suggestions and Future Research Directions

Given the limitations and scope of the present study, several promising avenues for future research can be proposed:

- **Sectoral Analysis**: Future studies could investigate how specific components of the current account (such as the trade balance, service balance, and workers’ remittances) contribute to the accumulation of foreign exchange reserves, particularly in the context of their interaction with the dynamics of the parallel exchange market.
- **Modeling Alternative Exchange Rate Regimes**: Structural macroeconomic models could be employed to simulate various scenarios under alternative exchange rate regimes, such as a crawling peg or a managed float, with the aim of assessing their potential implications for the sustainability of foreign exchange reserves.
- **Incorporating Political Economy Variables**: Integrating qualitative indicators such as institutional quality, the credibility of monetary policy, and political risk can provide deeper insight into market behavior and expectations, and their influence on both official and parallel exchange rates.

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