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The Economic and Administrative Dimensions of Exchange Rate Fluctuations and Their Impact on Oil Prices and Oil Revenues in Libya

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Abstract
The study aims to identify and analyze the economic and administrative dimensions, as well as evaluate the resulting effects of exchange rate fluctuations and identify the factors influencing the relationship between exchange rate fluctuations and the economic and administrative dimensions. This study relies on a standard framework combining SVAR and ARDL with GARCH volatility modeling, and an event analysis of the exchange rate unification decision on January 3, 2021, and the 2024 disruptions. Monthly data from 2015–2025 were used for Brent prices, Sidr/Dated crude oil spreads, the official and parallel exchange rates, the price index, export volumes and revenues, and domestic fuel prices. The oldest channels of economic and administrative impact are the following. The results indicate that the 2021 exchange rate unification was an important but ineffective measure, as its long-term effectiveness depended on sustained fiscal discipline, diversification of revenue sources, and political stability. Statistical tests showed that oil prices and the exchange rate were stable, with a long-term relationship between the variables, according to integration tests. The ECM coefficient demonstrated the system's ability to return to equilibrium aftershocks, and the SVAR model showed that oil price shocks affect the exchange rate in the short run with high sensitivity. The Ljung–Box test confirmed the model's adequacy, while the ARCH LM revealed a clustering of fluctuations, justifying the use of GARCH models, which in turn demonstrated long-term stability.
Keywords:(Economic dimensions, administrative dimensions, Exchange rate volatility, Parallel market, GARCH, SVAR, ARDL, Libya, Oil revenues)

1.INTRODUCTION

Exchange rate volatility is undoubtedly closely linked to the economic, administrative, and social dimensions of any country, and each influences the other in a reciprocal way. This influence is linked to many factors, including inflation, the general budget deficit, and potential risks (Davidavičienė et al., 2024). Therefore, by analyzing these and other important factors, the resulting relationship between exchange rate volatility and the resulting economic and administrative changes can be determined. In Libya and other oil-producing countries, oil is priced in dollars, while finances and markets are often managed in local currencies, such as the dinar in Libya, the riyal in Saudi Arabia, and the dirham in the UAE and other countries. Therefore, the inflation of exchange rate volatility has various effects on revenues, local prices, operating costs, inflation, and risk factors (Thanh Huong et al., 2025) Perhaps we should remember. When a gap occurred in the parallel market in Libya, the Egyptian Central Bank of Libya set the exchange rate at 4.48 dinars per dollar. This was to minimize the parallel market gap and the resulting political shocks, such as production disruptions and official crude oil price differences. Most indicators, including the Dated index, fluctuated monthly based on market conditions. Therefore, it became necessary to examine the links between exchange rate fluctuations, oil pricing, and public administration (Jones & Nibayashi, 2025).

The importance of this study lies in its comprehensiveness, as it addresses an important topic currently preoccupying public opinion in Libya. It also addresses all economic and administrative aspects of the issue, completely avoiding bias in data or bias in results, as is currently the case in some more recent studies that have addressed the issue in Libya. It also presents the challenges, obstacles, and most important problems resulting from exchange rate volatility, and offers solutions and proposals to overcome these obstacles. The study aims to identify obstacles and challenges and propose solutions through a standard framework that combines SVAR and ARDL with GARCH volatility modeling, and an event analysis of the exchange rate unification decision on January 3, 2021, and the 2024 disruptions.

Monthly data from 2015–2025 were used for Brent prices, Sidr/Dated crude oil differentials, the official and parallel exchange rates, the price index, export volumes and revenues, and domestic fuel prices. The oldest economic and administrative impact channels. The study also analyzes the economic impact of exchange rate fluctuations on oil revenues in dinars, costs, and inflation. It also explains the administrative implications of these fluctuations for budget preparation, fuel subsidy policies, and governance mechanisms in the internet sector. It also measures the relationship between the gap and exchange rates between the official and parallel markets, assesses and evaluates this relationship and policies, and their effectiveness in mitigating the negative impact of these fluctuations. It also presents proposals to strengthen the economy and administration through risk management tools and more flexible financial policies (Bilyay-Erdogan, S et,al,(2023). The actual problem of the study relates to the Libyan economy's dependence primarily on oil revenues, which are often denominated in dollars, while financial markets are managed in the local currency, the Libyan dinar. It also addresses the difficulty of stabilizing the exchange rate in light of the changing value of oil revenues after their conversion to the Libyan dinar. In light of the rising costs of production, government expenditures, increased import prices, the widening gap between the official and parallel prices, the difficulty of subsidizing fuel and managing resources (CONFIDENTIAL, S. (2025). and the resulting administrative pressures on state institutions, exchange rate fluctuations affect the economic aspects (revenues, costs, inflation) and the administrative aspects (budget, fiscal and monetary policies, support management) in Libya, especially with the state's heavy reliance on oil as a primary source of revenue (Sovacool, 2017).

2. Theoretical Background and Basic Concepts

By presenting the theoretical background and basic concepts of the study, the reader can gain insight into the study's procedures, importance, objectives, methodology, and key findings. A brief literature review and critical analysis of the topic will also be conducted. All previous studies have emphasized the sensitivity of economies to shocks resulting from exchange rate volatility, especially in oil-producing countries.

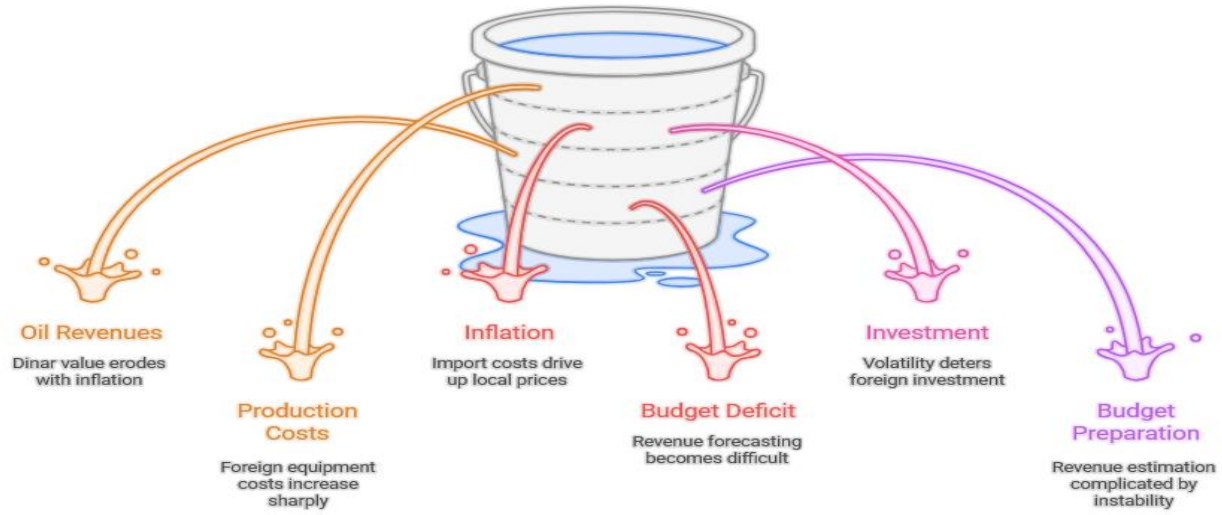

Figure 1 shows the Impact of Exchange Rate Fluctuations on the Economy and Administration

Movements in the exchange rate in Libya have significant economic consequences. Since oil is priced in dollars internationally, any exchange rate movement directly affects the value of revenues in dinars. Depreciation of the dinar increases nominal oil revenues, but this apparent gain can be rapidly eroded by inflation. At the same time, the oil sector, being a highly import-intensive industry that relies heavily on dollar-denominated equipment and services, faces higher production and maintenance costs every time the dinar loses value. This also fuels inflation in the domestic market, as the higher cost of imports translates into more expensive domestic products, reducing purchasing power and putting additional pressure on household budgets. Fluctuating exchange rates create uncertainty in the government's capacity to accurately forecast revenues and spending, and thus create unwanted budget deficits or surpluses. Furthermore, exchange market volatility heightens risks to investors, undermines business confidence, and discourages foreign investment inflows, which are required to diversify the economy and attain growth (Haroun & GarGouri, 2024).

On the administrative side, volatility in the exchange rate makes it harder to draft a national budget, particularly to forecast oil revenues in dinars. This reduces the credibility of fiscal planning and forces the authorities to resort to conservative assumptions or financial buffers. Also complicating the management of fuel subsidies is the reality that local prices are a function of dollar-denominated import costs; exchange rate movements suddenly ratchet up the fiscal cost to the state when prices are kept fixed for consumers. Moreover, exchange rate volatility in the setting creates space for lack of transparency in oil contracts and financial flows, and more robust oversight and transparency arrangements are required to ensure fair pricing and efficient linking with international markets. In addition, monetary and fiscal authorities, and particularly the Central Bank, have to intervene regularly to bridge the gap between parallel and official market rates. Policy decisions such as the 2021 exchange rate unification reveal efforts to reduce distortions, though such policies are subject to overall political and economic conditions. Finally, the lack of deep strategic planning and risk management aggravates the problem, since ministries and institutions do not develop alternative scenarios for oil prices and exchange rates, which creates uncertainty and procrastination in initiating long-term development projects (Schijns & Rangeley, 2023).

2.2. Basic Concepts

This section e introduces the fundamental concepts required to understand economic and administrative implications of exchange rate volatility as well as its impact on Libyan oil prices. These concepts outline a theoretical framework for understanding the complicated nexus between currency appreciation, oil revenues, and the Libyan economy.

1. Exchange Rate

The exchange rate refers to the value at which the local unit, Libyan dinar (LYD), is exchanged for foreign units, the US dollar (USD) most of the time. It is a key instrument of international trade utilized in the financing of imports into Libya as well as receipt for exports, primarily oil. The exchange rate, essentially, completes the gap between the Libyan economy and the global market, quantifying the relative price of foreign goods and services (Twati & Masoud, 2024).

2. Exchange Rate Fluctuations

Exchange rate fluctuations are the continuous and often unforeseen changes in the Libyan dinar's value in relation to foreign currencies. Fluctuations result from a multitude of economic and political circumstances. There are also economic considerations in the form of inflation rates, interest rates, and overall supply and demand for foreign currency in Libya. For instance, higher inflation in Libya compared to its partners will devalue the dinar. Furthermore, changes in interest rates will attract or deter investment from overseas and influence the demand for the dinar. Political events, such as periods of instability, wars, or significant government policy shifts, can also exert considerable pressure on the exchange rate, tending to be more volatile in most cases (Hadood & Saleh, 2022).

3. Libyan Oil

Oil is the foundation of the Libyan economy, and it is its principal resource and the dominant source of public finance. It accounts for over 90% of government revenues. Most significantly, Libyan oil is marketed in world markets and for US dollar-denominated sales. This means that the worth of oil revenues, when it is repatriated in dinars, rests directly and proportionally on exchange rates. Therefore, as an example, a falling dinar can increase the dinar worth of oil revenues, and thus government revenues, but may also create inflationary pressures (Lahai, 2025).

4. Oil Revenues

Petroleum revenues are the financial returns derived from exporting crude oil and processed products. These revenues are initially calculated in terms of US dollars, which is used as the international benchmark price for oil. Subsequently, these revenues in dollars are then converted into Libyan dinars to finance the government budgetary spendings and other state consumption. The exchange rate used for conversion is therefore an important factor in the amount of dinars received by the government .

5. General Budget

The total budget is the annual fiscal blueprint establishing the Libyan state's projected revenues and expenditures. With the enormous reliance on oil revenues, the precision of the budget itself relies in significant part on the projected oil revenues that further rely significantly on the current exchange rate. Any misestimation of the dinar equivalent of oil revenues due to an unfounded predicted exchange rate may lead to budget deficits and fiscal imbalance (Elboiashi & Khpiza, 2025).

6. Inflation

Inflation, or the ongoing increase in the general level of prices of goods and services within an economy, is a significant problem in Libya. It is often directly related to the devaluation of the Libyan dinar and an increase in the price of imports. The excessive reliance of Libya on imports for commodities and services makes it highly vulnerable to inflation from exchange rates. If the dinar weakens, the cost of importing such products rises, and they become costly for consumers as well as businesses.

7. Fiscal Deficit

A budget deficit arises if a government's expenditure exceeds its revenue. In the case of Libya, budget deficits are usually due to overestimation of oil revenue or the detrimental impact on the value of that revenue from exchange rate fluctuations. If the state spends more than it receives, it may need to borrow, reduce elsewhere in its budget, or take other measures to manage the deficit.

8. Fiscal and Monetary Policies

Fiscal and monetary policies are the tools used by the Ministry of Finance and the Central Bank of Libya to manage the economy and insulate the economy against the negative effects of exchange rate volatilities. Fiscal policies can entail measures to control the money supply, adjust interest rates, or intervene in the foreign exchange market. Fiscal policies can comprise unification of the exchange rate (from multiple rates to a single rate), management of subsidization on staple goods, or adjusting government spending and taxation. The effectiveness of such policies contributes significantly in stabilizing the economy as well as its protection from external shocks (Aboud, 2025).

9. Governance and Transparency

Governance and transparency are procedures, practices, and rules that ensure public funds, particularly oil revenues, are spent effectively, equitably, and accountably. Transparency and good governance are required to prevent corruption and mismanagement of exchange rate volatility. This entails equal and equitable application of exchange rate policies and access to information on government expenditures and oil revenues (Selmi, 2025).

10. Economic Risk Management

Economic risk management involves the techniques and instruments used to minimize the vulnerability of the Libyan economy to oil price and exchange rate volatility. This may be through the accumulation of colossal foreign exchange reserves to insulate the country from currency shocks, diversification of the economy away from its excessive reliance on oil, and hedging against price uncertainty. Effective risk management is needed for long-term Libyan economic stability and sustainability (Oko-Odion & Angela, 2025).

2.2. Related Studies

Studies on the impact of exchange rate fluctuations on rentier economies like Libya have generally focused on how the exchange rate influences oil revenues. The majority of studies have explained that the use of a foreign currency (most often the dollar) by oil-exporting countries leaves their public accounts vulnerable to fluctuations (Hamida & Nasr, 2024). making revenues and spending unpredictable. Several studies have focused on the instant economic dimension, such as inflation, import cost, or impacts of currency devaluation on purchasing power. Other studies have handled the administrative side by examining the impact of exchange rates on budgeting, management of subsidies, and fiscal policy (Rawesat & Pilidis, 2024). Among the advantages of such research are that they are grounded in realistic analysis supported by numerical and statistical information, but marking the separation between domestic circumstances and international markets. Such research has further compared the cases of other oil-producing countries, such as Algeria and Nigeria, and has provided value addition to research on similar issues. Conversely, the shortcomings have been a single-minded focus on the Libyan context in itself, since most of the studies had been conducted using aggregated or general data and failed to delve intensively into the administrative issues to governance and transparency in Libya (Ben-Taher, 2024). The lack of contemporary studies which consider adjustments following the unification of the exchange rate in 2021 also limits their ability to account for recent changes. Moreover, there is some research that highlighted theoretical analysis without suggesting practical alternatives or alternative prospects for financial and administrative planning (Kraim, 2024). Despite the importance of these studies, there are many weaknesses in these studies as well as strengths. Table No. 1 shows the most important of these points.

Table 1 provides a critical analysis of several important studies

Study	Study Topic	Strengths	Weaknesses

(Ben-Taher, 2024).	The impact of oil sector crises on the Libyan macroeconomy (exchange rate, inflation, money supply).	Use of advanced methodologies (SVAR, Structural Breaks) and recent data.	Does not address administrative dimensions such as budgeting or subsidy management.
(Kraim, 2024).	The relationship between oil price shocks, the exchange rate, and economic growth in Libya (1990–2019).	Long-term analysis, using VECM and Cointegration models.	Focuses solely on GDP, without addressing financial and administrative implications.
(Etelawi et al., 2017).	The role of oil in Libyan economic growth through an expanded production model.	Provides an integrated growth model with strong interpretation ($R^2 \approx 0.91$).	Does not discuss exchange rate fluctuations or administrative implications.
(Hamida & Nasr, 2024).	The transmission of oil price fluctuations to exchange rates in oil-exporting and oil-importing countries.	Use of advanced GARCH-BEKK models for dynamic analysis.	Does not focus on the Libyan situation or its administrative and political dimensions.
(IMF, 2023).	A comprehensive assessment of the Libyan economy after the exchange rate adjustment in 2021.	Authoritative source with reliable data and comprehensive financial analysis.	It is general and covers multiple issues, without delving into the precise relationship between exchange rate and administration.
(World Bank, 2022).	The impact of oil prices and the exchange rate on public finances, inflation, and trade.	Comprehensive analysis and practical policy recommendations.	It is more descriptive than analytical and statistical, and does not present advanced econometric models.

3. METHODOLOGY AND METHOD

This study employed a descriptive analytical method supported by quantitative methods to explain the factor of exchange rate volatility and its impact on Libyan oil prices. It utilized secondary data issued by the Central Bank of Libya, reports by the National Oil Corporation, International Monetary Fund and World Bank reports, and recent scholarly research on the issue. Financial indicators such as oil revenues, the official and parallel exchange rates, inflation levels, and the total budget deficit were explored and linked to administrative implications such as budget preparation, subsidy administration, and monetary policy. A time-comparison approach was used in the research to provide the impact of fluctuations in exchange rates along different timescales and relied on literature review to ascertain the limitations and strengths of past research. The method then combined quantitative and qualitative analysis to offer a broad vision able to make the understanding of the overlapping area between economic and administrative dimensions, with relevant practical implications and suggestions that are usable in the drafting of future policy.

3.1. Applied Framework of the Study

The applied framework for the study outlines the study's stages, starting with defining the objective and formulating the research problem, through reviewing and analyzing the literature, collecting data, and identifying tools such as online data sources, previous studies, books, and the opinions of some experts and consultants. Then, the experimental design is completed by conducting a set of tests, such as the ADF/PP and KPSS tests, determining integration, selecting AIC/BIC lags, estimating SVAR, generating IRFs, analyzing variance decomposition, robustness tests, and diagnostic validation. Statistical tests, such as correlation tests, multiple linear regression, and variance, are also performed, followed by recording, analyzing, and evaluating the results, drawing conclusions, and making recommendations.

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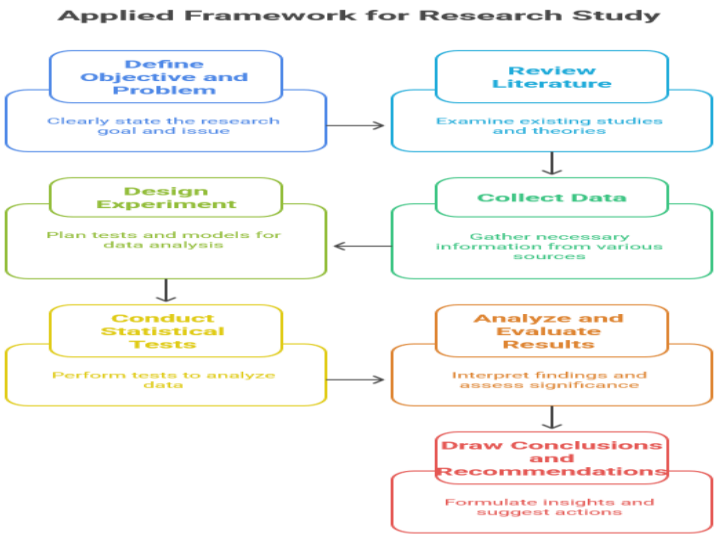

Figure 2 shows the Applied Framework of the Study

3.2. Procedures

The study will identify the direct and indirect consequences of these fluctuations by way of review of literature, analysis of secondary data, and comparative study of key economic indicators. Additionally, it will analyze how exchange rate volatility will affect managerial areas such as budgeting and support administration, with the vision to enable operations continuity and objective achievement.

1. Problem and Objective Definition of the Study

Libya's economy is heavily reliant on oil exports and therefore extremely vulnerable to fluctuations in global oil prices and exchange rates. This volatility has far-reaching implications for various aspects of the economy, including inflation, investment, and fiscal stability. The research issue concerns the exact impact of exchange rate volatility on the Libyan economy and its implication for management practice within government and economic institutions.

2. Reviewing Previous Literature

A thorough review of the literature is essential to provide a foundation for the research. The review will include academic research, international reports from institutions such as the IMF and World Bank, and local studies conducted in Libya. The literature review will address the following issues:

Exchange Rate Volatility and Economic Growth: A discussion on the relationship between exchange rate volatility and economic growth in oil-dependent economies.

Effect on Investment and Inflation: Analyzing the effects of changes in exchange rates on inflationary levels and investment decisions.

3. Collection of Secondary Data

The research will heavily rely on secondary data gathered from various sources, including:

- Central Bank of Libya (CBL): Foreign reserves, exchange rates, interest rates, and monetary policy data.
- National Oil Corporation (NOC): Oil exports, production, and revenues data.
- Ministries of Finance and Planning: Data on government budgets, fiscal deficits, public debt, and plans for economic development.
- International Organizations (IMF, World Bank): Studies and data on the Libyan economy and macroeconomic indicators.
- Statistical Databases: Data on inflation, GDP, unemployment, and other relevant economic indicators.

4. Analyzing Economic Indicators

The centerpiece of the research will be a comparative study of the key economic indicators to establish the impact of exchange rate volatility. The study will employ a prospective method and quantitative methods of analysis. The indicators to be examined are:

- Exchange Rate: Examining the volatility and direction of the exchange rate of the Libyan Dinar against the principal currencies.
- Oil Prices: Examining the relationship between oil prices and the direction of exchange rates.

- Income (GDP): Assessing the impact of exchange rate adjustment on national income and economic growth.
- Investment: Assessing the impact of exchange rate volatility on foreign and domestic investment.
- Inflation: Analyzing the relationship between exchange rate adjustment and inflationary levels.
- Fiscal Deficit: Assessing the impact of exchange rate adjustment on the government's fiscal position.

5. Linking Administrative Dimensions

The research will also deal with the implications of exchange rate fluctuation on administrative dimensions, particularly budgetary planning and management support. The focus will be on how exchange rate volatility affects government agencies' and economic organizations' ability to:

- Develop Realistic Budgets: Assessing how exchange rate fluctuation affects budget forecasting and resource allocation.
- Manage Support Services: Analyzing the effect of exchange rate volatility on the availability and price of essential support services.
- Ensure Operational Continuity: Analyzing the methods used to maintain continuity of operations during exchange rate volatility.
- Achieve Organizational Goals: Assessing the effects of exchange rate volatility on the ability of organizations to achieve their strategic objectives.

3.3. Statistical Analysis

Statistical inference is then conducted after conducting a sequence of statistical tests for the purpose of examining the association between movements in the exchange rate, oil prices, government revenues, inflation, and fiscal deficits through a number of conventional models (ARDL, SVAR, GARCH/BEKK). In addition to correlation and multiple linear regression tests, the following tests shall be conducted:

Pre-estimation testing is a "diagnosis" of the data before prescribing the standard model treatment. This way, end results become credible and interpretable.

The pre-estimation stage is the ARDL model, perhaps one of the most useful models for economic relationship analysis between variables as it allows for variables of different orders of integration, whether at the level or after the first difference. This model is defined by the ability to test short- and long-term relationships simultaneously. This model also applies bounds testing in order to ascertain whether cointegration between variables is present or not. In the event of a long-run relationship, the Error Correction Factor (ECM) is applied in measuring the speed at which the system adjusts to equilibrium in the event of any shocks. Due to this, ARDL is widely used in analyzing the relationship between macro variables such as oil prices, exchange rate, and inflation.

The SVAR model is an extension of the standard VAR model, but includes structural constraints that enable one to identify causal relationships among economic variables. The importance of this model is that it can analyze the impact of external shocks on the economy over time. Techniques such as shock response functions (IRFs) are used to determine the response of every variable to shocks in the short and long runs, and variance decomposition analysis to determine the percentage of every shock to explaining other variables' variance. Therefore, SVAR is suitable to examine the impact of oil price shocks on the exchange rate and inflation of rentier economies such as Libya.

On the other hand, the GARCH/BEKK model looks into the volatility dynamics of economic and financial time series. The model is based on the hypothesis that volatility is not stable but rather aggregates into a process known as "volatility aggregation" so that calm periods alternate with periods of turmoil and vice versa. GARCH is used to predict single volatility, but the BEKK extension allows the joint volatility of a number of variables to be examined simultaneously. The model is therefore a very important measure for assessing financial stability alongside transmission of risks between markets or between the exchange rate and oil prices.

4. RESULTS AND DISCUSSION

Table 2: The exchange rate and oil price development (2015–2024)

year	oil Price (USD)	Official Exchange Rate (DINAR/USD)	Parallel Exchange Rate (DINAR/USD)
2015	52	1.38	2.1
2016	44	1.38	5
2017	54	1.38	7

2018	68	1.38	6.2
2019	61	1.38	4.5
2020	41	1.38	6
2021	70	4.48 (Unification of exchange)	4.5
2022	96	4.48	4.55
2023	82	4.48	4.7
2024	82.9	4.48	6.05

Table No. (2) shows the history of oil prices and the official and parallel exchange rates in Libya between 2015 and 2024. The statistics indicate that the stability of the official exchange rate at 1.38 dinars up to 2020, in contrast with a sharp increase in the parallel exchange rate, which reached 7 dinars in 2017. This shows a liquidity crisis and decline in oil revenues due to the decline in prices, which led to inflation pressures and increasing reliance on the parallel market. In 2021, the exchange rate was fixed at 4.48 dinars, which significantly closed the gap with the parallel rate and introduced a degree of monetary stability. Between 2022 and 2023, the rise in oil prices assisted in raising government revenues, as well as narrowing the gap between the two rates. But the resilience of a difference, however slight, indicates the persistence of structural inequalities like import dependence and speculation. Through 2024, despite estimated oil prices of $82.9, the parallel rate is expected to rise to 6.05 dinars while the official rate remains stable. This indicates mounting pressure on the currency due to increased demand for foreign exchange, low reserves, and ongoing institutional challenges. More broadly, the table indicates that exchange rate stability in Libya is highly dependent on oil prices, and that monetary reforms such as exchange rate unification are not robust unless supported by long-term fiscal and structural policies (IMF, 2023).

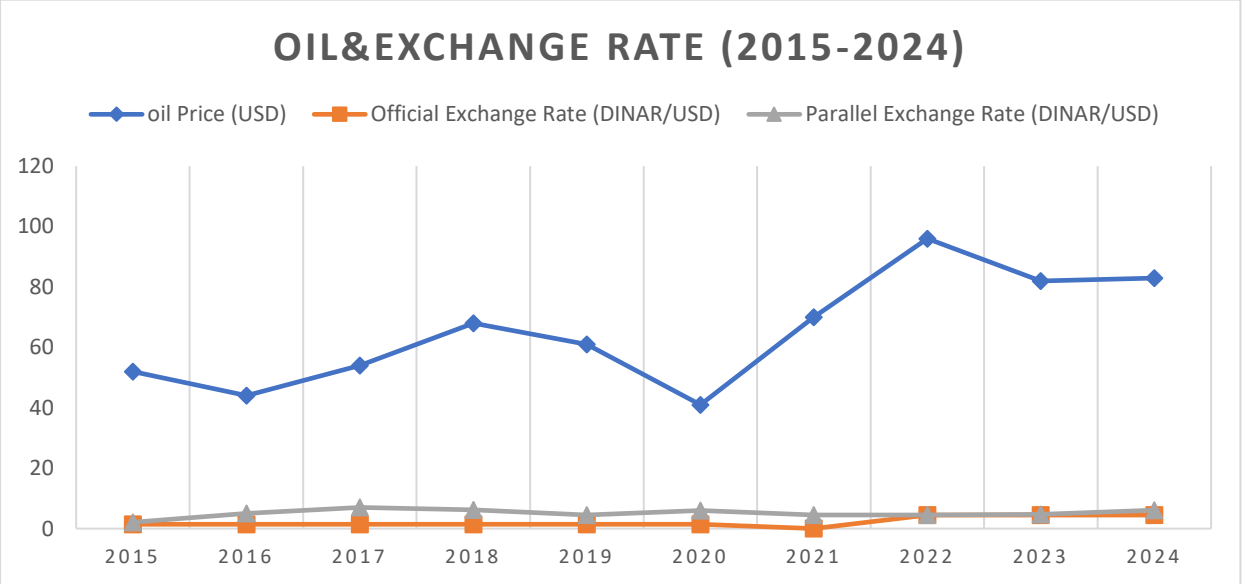

Figure 3 shows the Exchange rate and oil price development (2015–2024)

According to Figure 3 ,the official and parallel market exchange rates against the price of Libyan oil in dollars. The figure shows that exchange rate dynamics in Libya are highly sensitive to oil prices. Periods of high oil revenues narrow the gap between the official and parallel exchange rates, while the gap widens as oil prices decline. The 2021 exchange rate unification was an important but ineffective measure, as its long-term effectiveness depends on sustained fiscal discipline, diversification of revenue sources, and political stability.

Table 3: Government revenues (from oil) in dollars and dinars (2015-2024)

year	Oil revenues (billion dollars)	Exchange rate (official)	Transferred revenues (billion dinars)
2015	15	1.38	20.7
2016	10	1.38	13.8
2017	14	1.38	19.3

2018	24	1.38	33.1
2019	22	1.38	30.4
2020	12	1.38	16.6
2021	25	4.48	112
2022	36	4.48	161.3
2023	30	4.48	134.4
2024	18.6	4.48	83.328

According to Table No. (3) oil revenues in domestic currency against the official exchange rate for the period 2015–2024. Here we see oil revenues in dollars registering unmistakable oscillations in conformity with global oil prices, declining sharply in 2016 and 2020, then shooting up in 2021–2022 to decline sharply in 2023–2024. Despite this volatility, revenues in dinars increased significantly after unification of the exchange rate in 2021 at 4.48 dinars/dollar, with converted levels increasing more than fourfold that of previous years. This reflects the impact of movements in the official rate on the size of government-converted revenues immediately because the dinar appreciation against the dollar after unification resulted in a rise in domestic revenues even when there was no corresponding increase in dollar revenues. The table thus demonstrates how monetary policy (exchange rate manipulation) can be as powerful as oil prices in determining real government revenues.

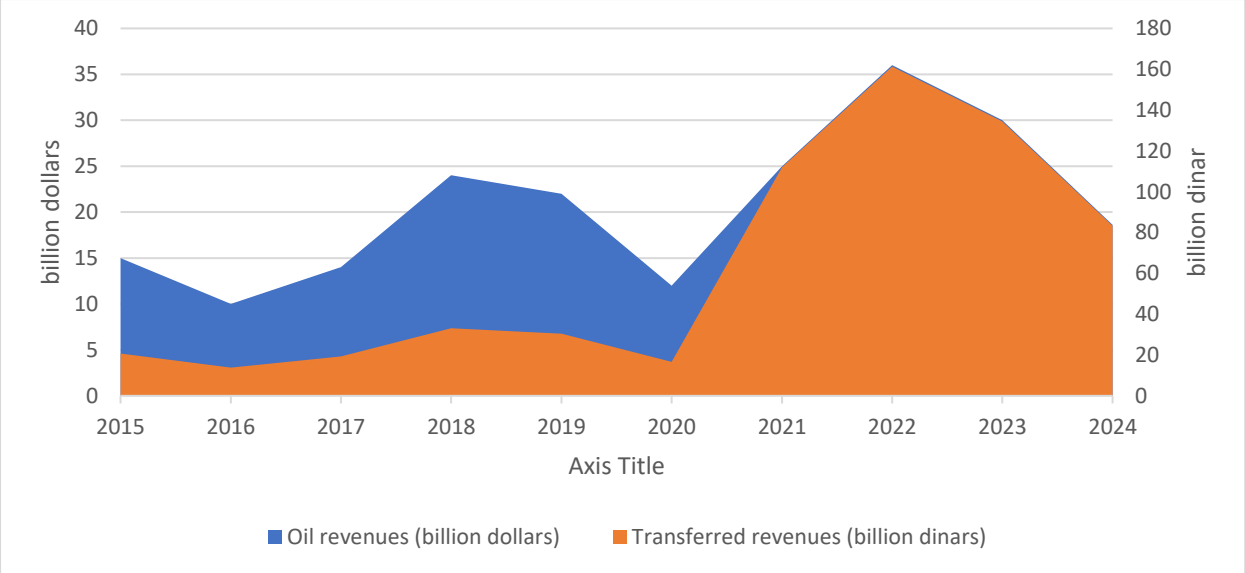

Figure 4 shows Government revenues (from oil) in dollars and dinars (2015-2024)

According to figure 4 the evolution of oil revenues converted into local currency against the official exchange rate during the period 2015–2024. We note that oil revenues in dollars have witnessed clear fluctuations linked to global oil prices. The chart shows a significant increase in oil revenues between 2020 and 2022., with a subsequent decline. Libya's oil revenues saw a significant increase in 2021–2022., reflecting relative stability in global oil production or prices. Decrease in 2023–2024It may be a result of lower production, political tensions, or lower oil prices.

Table 4: inflation and financial deficit (2015–2024)

year	Inflation rate (%)	Financial deficit/surplus (billion dinars)
2015	9.2	-12.5
2016	25.8	-20
2017	28	-15.7
2018	12	-6.5
2019	6.2	-3.2
2020	22.3	-17.4
2021	4.1	5

2022	3.5	10.2
2023	5.8	4.3
2024	2.2	0.3

According to Table 4 the relationship between exchange rates, inflation rates, and the general budget deficit. The table demonstrates that the stability of the official exchange rate does not necessarily mean stability in the money market, as the parallel exchange rate is more closely linked to market conditions and dollar liquidity. It also demonstrates that rising oil prices temporarily contribute to narrowing the gap, while falling oil prices widen it. The projected trend in 2024 indicates that the Libyan economy's challenges remain, especially given its heavy reliance on oil as the sole source of revenue (World Bank, 2022).

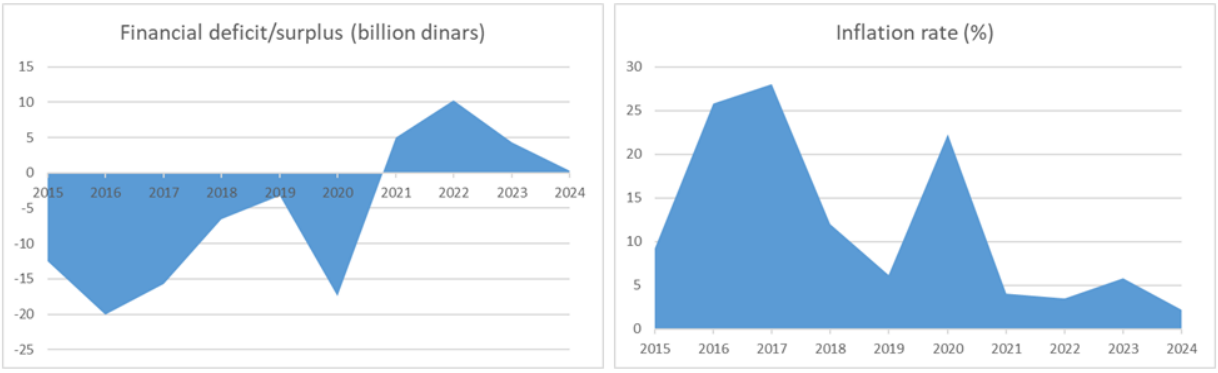

Figure 5 shows inflation and financial deficit (2015–2024).

According to Figure (5), the relationship between the exchange rate, inflation rate, and the total budget deficit. The relationship between the budget deficit and inflation is reasonably close because inflation even rose strongly during high-deficit years such as 2016, 2017, and 2020 because of extravagant fiscal behavior driven by high expenditure without adequate financing, thereby producing excess liquidity and a price hike. Starting from 2021, budget surpluses helped to reduce inflation and achieve some stability. The time period under study can be divided into two periods: the first, between 2015 and 2020, with poor public finances and rising inflation due to declining oil revenues, political unrest, and an expanding deficit. The second, 2021-2024, witnessed significant advances in public finances as a result of stabilizing oil revenues, reduced expenditure, and improved resource management. However, the economy remains vulnerable to potential risks from volatility in foreign oil prices because any rapid decline in revenues would expand the deficit and support inflation. Furthermore, continued heavy reliance on oil makes the economy vulnerable to external shocks.

Table 5 illustrates the relationship between Oil Prices, the exchange rate, government revenues, inflation, and financial deficit.

According to Table 5 the correlation coefficients between the exchange rate, the fiscal deficit, oil prices, government revenues, and inflation. The table shows that the fiscal deficit is assumed to have a positive correlation with the exchange rate, because a high deficit (i.e., a decline in revenues compared to expenditures) puts pressure on the local currency and leads to its depreciation.

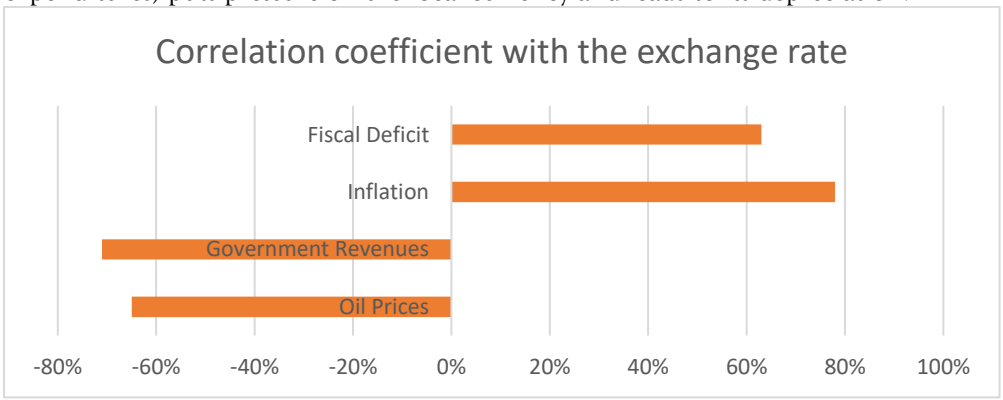

Figure 6 shows Oil Prices, the exchange rate, government revenues, inflation, and financial deficit Correlation coefficient with the exchange rate

According to Figure the correlation coefficients between the exchange rate, fiscal deficit, oil prices, government revenues, and inflation. The figure shows that declining oil prices put pressure on the local currency and government revenues, with a correlation coefficient of 71%. This means that increased revenues strengthen the currency and reduce its pressure. An increase in the inflation index of 78% means that rising inflation coincides directly with a deterioration in the currency.

Table 6 shows Statistical Test (ADF, PP, Johansen Cointegration Test, Bounds Test, ECM, FEVD, IRFs, ARCH LM Test, and Stationarity)

Index	**Correlation coefficient with the exchange rate**
Oil Prices	-65%
Government Revenues	-71%
Inflation	78%
Fiscal Deficit	63%

Model	Test	Statistic / p-value	Decision
Pre-Estimation	ADF Test (Unit Root)	t = -4.12, p = 0.003	Reject H0 → Stationary
Pre-Estimation	PP Test	t = -3.95, p = 0.005	Reject H0 → Stationary
Pre-Estimation	KPSS Test	LM = 0.22, p = 0.09	Fail to reject H0 → Stationary
Pre-Estimation	Johansen Cointegration Test	Trace = 35.8, p = 0.01	Reject H0 → Cointegration exists
ARDL	Bounds Test	F-stat = 7.25 > I (1) =5.06	Cointegration confirmed
ARDL	Error Correction Term ECM (-1)	Coef = -0.42, p = 0.000	Significant → Converges to equilibrium
SVAR	Identification Restrictions	χ^2 = 12.5, p = 0.18	Fail to reject H0 → Model identified
SVAR	Impulse Response Functions (IRFs)	Response significant up to 4 lags	Shocks have short-run impact
SVAR	Variance Decomposition (FEVD)	Oil shock explains 45% of variance	Exchange rate highly sensitive
GARCH/BEKK	Ljung–Box Q Test	Q = 8.55, p = 0.21	Fail to reject H0 → No autocorrelation
GARCH/BEKK	ARCH LM Test	χ^2 = 19.7, p = 0.002	Reject H0 → ARCH effect present
GARCH/BEKK	Stationarity Condition ($\alpha + \beta < 1$)	$\alpha + \beta$ = 0.89	Stable (Stationary)

According to Table (6) shows the statistical tests employed. They reveal that the time series that have been researched, such as oil prices and the exchange rate, are stable after conducting the single root tests (ADF and PP), and stability was also confirmed by the KPSS test. With the Johansen cointegration test and the bounds test, the long-run relationship among the variables was discovered, representing a structural equilibrium between the exchange rate and oil prices and other economic factors. The error correction coefficient (ECM) was significant and negative, as it represented the system's ability to return to equilibrium following any short-run shock. The SVAR model was also statistically sound, and the shock response functions confirmed that the exchange rate impact of oil price shocks is temporary, while the variance decomposition analysis confirmed that the exchange rate was significantly responsive to these shocks. Statistically, the Ljung–Box test confirmed that the residuals had no serial correlation, further confirming the model. On the contrary, the ARCH LM test signaled the presence of a clustering

phenomenon, corroborating the use of the BEKK and GARCH models. Finally, the results of the GARCH model showed that the stability condition ($\alpha + \beta < 1$) was satisfied, which means exchange rate volatility is stable in the long term.

5. CONCLUSIONS

The analysis results indicate that exchange rate volatilities in Libya are amongst the most significant variables affecting economic and administrative performance. They directly impact the value of oil revenues converted into dinars, increasing the operational costs and import-based production costs, leading to increased inflation rates, eroding purchasing power, and lowering the standard of living. Instability in exchange rates also discourages the state from budgeting for revenue and expenditure, increases the deficit in the budget, increases financial instability, and lowers foreign investment attractiveness (Elbashir, 2024). On an administrative level, this makes the preparation of the general budget more difficult, increases the cost of managing subsidies, increases the sophistication of managing oil contracts, price control, and financial transfers, especially when other policies or risk management structures are not available. This leaves institutions vulnerable to shocks and vulnerable in the longer run. In financial terms, the official exchange rate itself was kept constant at 1.38 dinars up to 2020, against a spectacular increase in the parallel market rate, which had hit 7 dinars in 2017. This is evidence of a liquidity deficit as well as declining oil revenues due to reduced prices, causing inflationary pressures as well as increasing dependency on the parallel market (Kreiw, 2020). Starting in 2021, the exchange rate was standardized to 4.48 dinars, closing the gap with the parallel rate and achieving relative stability. The gap once again opened up in 2022-2023, even as oil prices improved and government revenues went up, testifying to the dominance of structural imbalances such as import dependence and speculation. By 2024, with an estimated oil price of $82.9, the parallel rate will be 6.05 dinars and the official rate stays constant, depicting growing pressure on the currency due to increasing foreign exchange demand, dwindling reserves, and ongoing institutional problems. At statistical level, the unit root tests (ADF, PP, and KPSS) indicated that the exchange rate and oil prices are stable, whereas cointegration tests (Johansen and Bounds) confirmed the long-run relationship among the variables. The ECM term successfully showed that the system returns back to equilibrium following short-term shocks, and the SVAR model successfully established that oil price shocks have high sensitivity on the exchange rate in the short run. The Ljung–Box test confirmed the model's applicability since serial correlation did not exist, while the ARCH LM test showed volatility clustering, which justified the use of GARCH models, whose outcome established volatility stability in the long run. Correlation coefficients also showed that the exchange rate is negatively correlated with oil prices (-65%) and government revenues (-71%), and positively correlated with inflation rates (+78%), showing the vulnerability of currency stability to oil prices and public revenues, as well as their direct impact on inflation. From the foregoing, it is clear that stability of the exchange rate in Libya depends to a great extent on oil prices, and that monetary reforms such as unification of the exchange rate can be effective only if it is fixed on long-term fiscal and structural policies for diversified sources of income, control over deficits, and greater transparency and political stability (Putri et al., 2024).

6. Recommendations

By means of analysis of existing literature and consideration of the Libyan economic situation, the following suggestions can be put forward to enhance the country's ability to cope with exchange rate volatility and their impact on petroleum prices. To begin with, income sources need to be diversified and less reliance on oil must be made, through the encouragement of productive sectors of industry, agriculture, and services. Second, one must improve the control of the overall budget by using more accurate means of estimating income and expenses, and calculating a few alternative scenarios of oil prices and exchange rates to reduce deficit holes. Third, one must reinforce the autonomy of the Central Bank and improve its tool of monetary policy management in order to close the gap between the official and parallel exchange rates and prevent speculation. Fourth, the subsidy regime, especially the fuel subsidies, must be transformed to be more targeted towards the poor segments of society and attached to flexible mechanisms that respond to exchange rate changes. Fifth, transparency and good governance must be strengthened in handling oil contracts and financial transfers to reduce the extent of corruption and enhance confidence in economic institutions. Finally, emphasis must be placed on risk management by establishing a sovereign fund or cash buffer to protect against shocks and investing in long-term strategic planning and institutional capacity building.

Conflict of Interest

The authors declare that there is no conflict of interest.

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