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Article

Using the ARDL Model to Diagnose the Impact of Foreign Reserves on Iraq Foreign Investment

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Abstract: This study investigates the relationship between Iraq's foreign reserves and direct investment from 2004 to 2023, using the Autoregressive Distributed Lag (ARDL) model. While prior research has highlighted the role of oil in Iraq's economy, there remains limited understanding of how foreign reserves and investment interact over time. This study aims to fill this gap by analyzing both short-term and long-term correlations between these variables. The findings reveal a complementary relationship between foreign reserves and direct investment, with oil prices playing a crucial role. Specifically, higher oil prices lead to increased state revenues, which, in turn, boost foreign reserves. These results underscore the importance of oil investments in strengthening Iraq's financial stability and offer policy implications for managing reserves and fostering sustainable economic growth.

Keywords: Foreign Reserves, Foreign Direct Investment, ARDL, Iraqi Investment, Correlation, Autoregressive

1. Introduction

The import of crude oil is a significant contributor to Iraq's GDP and one of the country's primary sources of income. The stability of Iraq's economy is greatly affected by its reliance on foreign reserves. This points to the growth of long-term economic prosperity. Consequently, foreign reserves are crucial for maintaining a stable local currency and creating an investment-friendly economic climate. But there are a lot of factors that affect this kind of investment, such as the quantity of foreign reserves and the consistency of oil prices [1].

One of the basic things that the Iraqi economy depends on is oil as well as foreign reserves, which strengthen the economy and develop Iraqi currency and put it in a high economic environment. Many researchers have studied this aspect, Mirza & Obiang Study (2019): Oil Price Shocks and Foreign Reservations in Oil-Dependent Economies This paper examined the impact of oil price shocks on foreign reserves in oil-dependent economies. The results showed that positive shocks in oil prices lead to a significant increase in foreign reserves, while negative shocks reduce economic stability and increase dependence on external debt. The study recommended flexible fiscal policies to deal with oil price volatility. Camps & Carmine (2020): Foreign Reservations and FDI Attraction in Emerging Markets The study examined the relationship between foreign reserve levels and attracting FDI in emerging markets using a structural equation model [2].

The study found that foreign reserves have a positive impact on foreign investors' decisions, enhancing currency stability and reducing the risk of sudden economic changes.

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Ameer & Ahmed (2020): Economic Diversification and its Impact on Foreign Investment in Oil-Based Economies This study reviewed the impact of economic diversification on FDI flows in oil-dependent countries. The results indicated that economies that rely less on oil revenues and attract investments in non-oil sectors are more sustainable in attracting foreign investment, reducing the impact of oil price volatility on the economics. IMF (2022): External Sector Report: Balancing Sustainability and Growth in Oil Export Countries The report focused on oil exporting countries' strategies to balance economic growth with the sustainability of foreign reserves [3].

The report noted that high foreign reserves play a pivotal role in boosting investor confidence, but need effective fiscal policies to protect them from being affected by oil price shocks. World Bank (2023): Iraq Economic Monitor: Challenges and Opportunities in a Volatile Oil Market examined the impact of oil price volatility on Iraq's economy, stressing the importance of foreign reserves in protecting the economy from crises. He recommended that the economy should be diversified and the business environment improved to attract FDI and reduce oil dependence as a major source of income. Research into the relationship between foreign reserves, oil prices and FDI is vital and renewed in economic literature, where issues of financial stability and economic volatility overlap with investment attractions [4]. This study contributes to multiple scientific additions such as the dynamic linkage between the three variables and its careful analysis of the interaction between oil prices as a major source of foreign reserve formation, and the role of these reserves in improving the FDI environment.

Although there have been previous studies on each variable individually, linking variables provides a dynamic perception using the ARDL model. Most studies have touched on the relationship between oil prices and foreign reserves in oil-exporting countries, the current study focuses on Iraq as a unique situation characterized by a highly oil-dependent economy, with political and economic challenges. This study highlights the extent to which foreign reserves and investment flows are responsive to oil price fluctuations in the context of Iraq's economy. The study provides practical strategies and policies to address the challenges resulting from oil price volatility. By focusing on economic diversification, enhancing financial transparency and managing foreign reserves efficiently, the study makes specific recommendations that could be applied in Iraq's economy and similar oil states.

Research problem:

Studying the impact of foreign reserves on FDI in Iraq faces several research challenges. The most prominent of these are the availability and quality of data, as data may be incomplete or inaccurate. In addition, the relationship between reserves and investment requires careful analysis of time lags to interpret future effects. The Iraqi economy is also affected influenced by variables beyond of our control, such national politics and changes in the price of oil, which calls for introducing control variables to avoid bias. Moreover, Iraq has witnessed major structural transformations such as wars and sanctions, which may lead to changes in the relationship between variables over time. Finally, issues of data consistency and causal relationships between variables should be addressed to ensure accurate results, taking into account the impact of government policies on FDI flows [5].

Research Importance:

Highlights a central issue in the Iraqi economy, especially given the high reliance on oil revenues and the need to diversify sources of income and makes practical recommendations based on scientific analysis to support decision makers in building sound economic policies.

Research Objective:

Using cutting-edge standard and quantitative methodologies, this study will examine the interplay between Iraq's foreign reserves, oil prices, and FDI in order to shed light on the difficulties confronting the country's economy and provide policymakers with information they can use to craft more effective measures for achieving financial stability and luring long-term FDI [6].

Research hypothesis:

Improving foreign reserves makes Iraq's economy more appealing to foreign direct investment (FDI), according to the study hypothesis, which is based on the idea that oil prices have a positive long-term association with FDI [7].

2. Materials and Methods

This research examines the link between Iraq's foreign direct investment (FDI), oil prices, and foreign reserves from 2004 to 2023 using quantitative analytical techniques based on the ARDL model.

Framework for research (1.7): Studies focus on two dimensions: -Framework of Concepts (Reserves, Oil Prices, Foreign Direct Investment, and Relationship). Applying the ARDL dispersed periods' self-degradation model to the 2004–2023 Iraqi financial market to determine the effect of oil prices and foreign reserves on foreign direct investment

Conceptual Framework (Foreign Reserves, Oil Prices and FDI)

Concept (foreign reserves, oil prices, FDI)

International reserves are defined in various ways, but one common understanding is that they are "accessible" external assets that central banks can use for direct funding or indirect regulation of external payments imbalances (e.g., by intervening in exchange markets to affect the exchange rate) or any number of other purposes. According to the International Monetary Fund (2000:2) was once known as gold held by the Central Bank, foreign currency bonds, foreign currency, and foreign liquid assets [8]. Another defined it as the foreign assets immediately available to the government in foreign currency in a country or monetary authority effectively held by Bussiere.M, 2013:8). Oil prices are an important element in shaping the global economy. They are influenced by supply and demand forces, as well as economic and political factors [9]. The Brent Oil Standard is one of the most important global oil pricing indicators. More than 70% of the world's crude oil prices are determined by it. The price of oil is affected by a number of things:

a. Economic and political volatility
b. Changes in global demand
c. Technological Development

To invest in a foreign nation is to engage in foreign direct investment (FDI), with the aim of establishing businesses or acquiring tangible assets, such as factories or property. FDI goes beyond the mere transfer of capital, encompassing actual oversight of administrative processes and decisions in targeted enterprises. FDI is a key tool for stimulating economic growth, enhancing productivity, and transferring technology and management expertise among countries [8].

Relationship between foreign reserves, oil prices and foreign direct investment

The relationship between foreign reserves, oil prices and foreign direct investment (FDI) is a key economic issue, especially in oil-exporting richer countries, including Iraq. Oil prices have a central role in determining levels of foreign reserves, as oil revenues are the main source of formation of these reserves. In turn, foreign reserves affect macroeconomic stability, an attractive factor for foreign investors. Oil prices are positively associated with foreign reserve levels in countries dependent on oil exports. When oil

prices rise, oil revenues increase, allowing the government to increase foreign reserves. On the contrary, lower oil prices erode foreign reserves, which could harm international investors' confidence. According to a study [9], fluctuations in oil prices directly affect financial stability in oil-exporting countries, highlighting the importance of foreign reserves as a stabilizing factor, large foreign reserves enhance domestic currency stability and strengthen the state's financial position in the face of economic crises.

This strengthens foreign investors' confidence, assuring the state of its ability to meet its financial obligations and ensure the stability of the business environment. It also indicates [10] that foreign reserves are an indicator of a state's resilience to external shocks, making them more attractive to FDI. The interaction between variables indicates a dynamic relationship between the three variables. According to a study [11], foreign reserves and oil prices together contribute to determining FDI flows to Iraq. The relationship between variables depends on the stability of the State's economic and political environment, where high foreign reserves enhance Iraq's ability to attract foreign investment, especially in non-oil sectors.

Analysis of the relationship between foreign reserves, oil prices and FDI using the ARDL self-degradation model in Iraq (2004-2023)

Research variables and Dali description

The ARDL model is a model for measuring the relationship between the variables in the short and long term and requires that the variables be static either I (0) or I (1) or both, in order to test the research hypothesis and achieve its objectives, independent and follow-up variables have been identified and as follows: -

RE	Foreign Reserves	Independent Variable
OP	Oil Prices	Independent Variable
FDI	Foreign Direct Investment	Dependent Variable

According to the theoretical framework of the research, it is presumed to test the following dual relationship:-

FDI =a+b1 RE + b2 OP+ui

"RE" is a foreign reserve, while "OP" is an oil price, and "FDI" is a net Foreign Direct Investment.

3. Results and Discussion

Unit root test

Table 1. Unit Root Test (ADF)

UNIT ROOT TEST RESULTS TABLE (ADF) Null Hypothesis: the variable has a unit root				
At Level				
		FDI	**RE**	**OP**
With Constant	t-Statistic	-1.4506	-1.2914	-2.3993
	Prob.	0.5359	0.6083	0.1549
		n0	n0	n0
With Constant & Trend	t-Statistic	-2.6436	-2.6368	-2.356
	Prob.	0.2676	0.2701	0.3877
		n0	n0	n0
Without Constant & Trend	t-Statistic	-1.0605	1.185	-0.2259
	Prob.	0.2503	0.9321	0.5916

		n0	n0	n0
At First Difference				
		d(FDI)	d(RE)	d(OP)
With Constant	t-Statistic	-3.1673	-3.607	-4.1761
	Prob.	0.0393	0.0173	0.0052
		**	**	***
With Constant & Trend	t-Statistic	-3.0496	-3.4308	-4.0353
	Prob.	0.1469	0.0804	0.0269
		n0	*	**
Without Constant & Trend	t-Statistic	-3.222	-2.9867	-4.2867
	Prob.	0.003	0.0053	0.0002
		***	***	***

Table of the researcher's preparation accredited the results of the analysis of the program (Eviews 9)

After conducting the unit root test for search variables and through table (1) we show that all variables stabilized at the first difference i.e. grade I (1), [12] we are best suited to follow any of the methods or standard models and we will choose the ARDL method and now we will proceed to choose the optimal slowing period as follows:-

Table 2. Slowing Period Limitation

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-193.0928	NA	2098053	23.06974	23.21678	23.08436
1	-163.7883	44.81872*	197658.5	20.68097	21.26912	20.73944
2	-156.351	8.749752	270224.4	20.86482	21.89408	20.96713
3	-137.7817	15.29238	126216.8*	19.73902*	21.20940*	19.88518*

Table of the researcher's preparation accredited the results of the analysis of the program (Eviews 9)

Through Table (2) we show that the optimal slowing period of the model is Lag 3.

Joint Integration ModelARDL

Table 3. Joint Integration Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
FDI(-1)	1.004837	0.252608	3.977843	0.0073
FDI(-2)	-1.09738	0.393107	-2.791559	0.0315
FDI(-3)	0.915191	0.318016	2.87781	0.0281
RE	0.003231	0.063518	0.050867	0.9611
RE(-1)	-0.144884	0.097675	-1.483327	0.1885
RE(-2)	0.299044	0.11728	2.549824	0.0435
RE(-3)	-0.167213	0.083604	-2.000056	0.0924
OP	0.022455	0.048791	0.460217	0.6616
OP(-1)	0.040773	0.045522	0.895676	0.4049
OP(-2)	-0.168857	0.051447	-3.28213	0.0168
C	7.005885	4.201052	1.66765	0.1464

R-squared	0.92		Adjusted R-squared	0.80
F-statistic	7.790723		Durbin-Watson stat	2.574964

Table of the researcher's preparation accredited the results of the analysis of the program (Eviews 9)

Table (3) shows us the results of the distributed self-deceleration model note that the interpretive capability of R-squared was (92R2 = 0.) That is, the two independent variables in the estimated model explain 92% of the changes in the dependent variable and 8% are due to other variables outside the model and the value (Adjusted R-squared 0. 80), and the value of F-statistic calculated (7.790723) was moral at the level of 5% i.e. the model is moral i.e. we reject the hypothesis of nowhere and we accept the alternative hypothesis [13].

Border Test

Table 4. Border Test (Bounds Test)

Test Stat.	**Value**	**K**
F- Stat	5.329698	**1**
Signi.	**I0 Bound**	**I1 Bound**
%5	3.79	4.85

Table of the researcher's preparation accredited the results of the analysis of the program (Eviews 9)

Table (4) showing the results of the boundary test finds that the calculated value (F-statistics) was (5.329698) and is greater than the small and large values at a morale level of 5%. Therefore, the impact of foreign reserves and oil prices on FDI has a long-term impact [14].

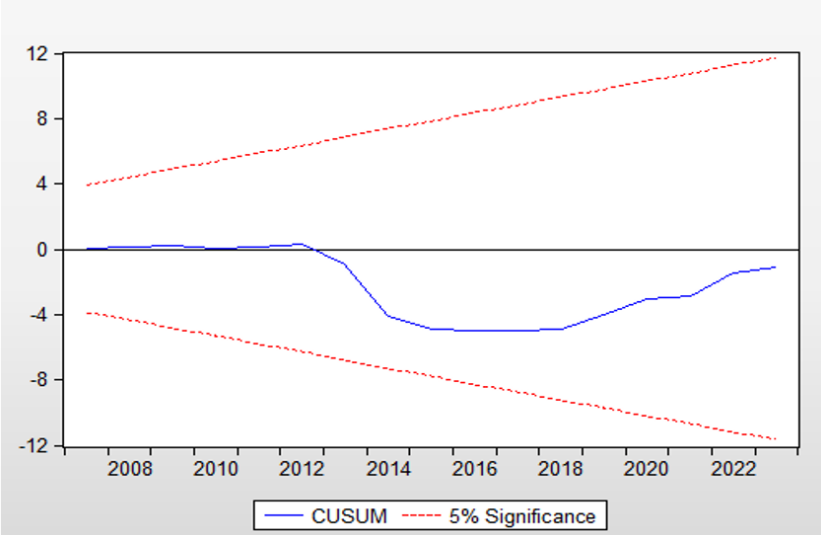
Test the problem of self-association and heterogeneity of contrast

Table 5. Serial correlation test and heterogeneous contrast

Breusch-Godfrey Serial Correlation LM Test			
F- statistic	0.347357	Prop . F	0.7259
Obs*R-squared	2.515627	Prob. Chi-Square	0.2843
Heteroskedasticity Test: ARCH			
F-statistic	0.600116	Prob. F	0.4514
Obs*R-squared	0.657657	Prob. Chi-Square	0.4174

Table of the researcher's preparation accredited the results of the analysis of the program (Eviews 9)

From Table (5) after the Breusch-Godfrey Serial Correlation LM Test it is clear to us that the model is sound and free of the self-correlation problem since its Chi-Square value is immoral at the level of 5%, as well as the model is free from the problem of heteroskedasticity [15].



Form 1. Quench Test

The form of the researcher's preparation by adopting the results of the analysis of the program (EViews 9).

Through the shape (2) it is clear to us that the model is stable that the chart is located within the upper and lower boundaries [16].

Estimate ECM error correction model

Table 6. Error Correction Model

Short-term error correction model ECM				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI(-1))	0.182189	0.361205	0.504394	0.632
D(FDI(-2))	-0.915191	0.318016	-2.87781	0.0281
D(RE)	0.003231	0.063518	0.050867	0.9611
D(RE(-1))	-0.299044	0.11728	-2.549824	0.0435
D(RE(-2))	0.167213	0.083604	2.000056	0.0924
D(OP)	0.022455	0.048791	0.460217	0.6616
D(OP(-1))	0.168857	0.051447	3.28213	0.0168
CointEq(-1)	-0.177352	0.425849	-0.416468	0.6916
Long-Term Error Correction Model ECM				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RE	-0.05538	0.208124	-0.266092	0.7991
OP	-0.595592	1.806679	-0.329661	0.7529
C	39.502611	115.271251	0.342693	0.7435

Table of the researcher's preparation accredited the results of the analysis of the program (Eviews 9)

Table 6 shows the following:

The relationship between short-term variables The result indicates that the change in FDI during previous periods does not have a moral effect in the current period the value of probabily.06320, and indicates a morally negative relationship between FDI in previous periods a negative correlation with the value of probability 0.0281 [17]. Foreign reserves have a moral impact on FDI in the short term, with a negative effect in the first period (D (RE (-1))) and a positive effect in the second period, D (RE (-2)). Oil prices have a positive impact on FDI in the short term, as the impact of oil prices in previous periods (D (OP (-1))) has a positive moral effect on value (0.0168) [18]. The result suggests that there is the slowest integration process between variables, but the probability value (0.6916) suggests that this adjustment is not of strong statistical significance [19].

As for the long-term integration of the foreign reserves coefficient in the long term is -0.0554, it does not show a strong moral impact on FDI the value of probability 0.7991, and the coefficient of oil prices is- 0.5956 , and in turn it does not show a strong moral impact on FDI in the long term also the value of probability 0.7529. The C fixed coefficient in the model is 39.5026, but it also does not show a significant moral impact on FDI [20,21]. Although there are some negative or positive impacts among the variables in the short term, long-term results suggest that there is a weakness in the moral impact of both foreign reserves and oil prices on FDI [22]. Foreign reserves do not show a strong long-term impact on FDI attraction, and this may reflect that other factors such as Iraq's economic policies or investment environment may play a greater role in quantifying foreign investment [23,24]. While oil prices, despite their positive short-term impact, do not show a moral long-term impact, suggesting that oil is not the only factor affecting foreign investment flows in Iraq [25].

4. Conclusion

This study highlights the significant short-term and long-term complementary relationship between oil prices, foreign reserves, and foreign direct investment (FDI) in Iraq. The findings reveal that fluctuations in oil prices have a direct and sustained impact on Iraq's foreign reserves, with rising oil revenues enhancing the country's reserve levels and, by extension, boosting investor confidence. Foreign reserves, in turn, play a crucial role in attracting FDI, serving as a key indicator of the country’s financial stability. However, the research also underscores Iraq’s overreliance on oil, which exposes the economy to external shocks such as volatile oil prices. This dependency calls for urgent policy action to diversify Iraq's income sources and reduce its vulnerability to oil market fluctuations. Future research should explore the potential of non-oil sectors in stabilizing the economy and enhancing FDI inflows, as well as the role of broader financial reforms in improving Iraq's economic resilience.

Recommendations

1. Strengthen foreign reserves management and the Iraqi government should improve foreign reserves management strategies to ensure that they are used effectively in the face of economic and monetary fluctuations, as well as enhance local currency stability.
2. Diversification of the national economy as Iraq should diversify its national income sources through the development of non-oil sectors such as agriculture, industry and services. This helps reduce the impact of oil price volatility on the economy and attract more FDI.
3. Improving the business environment and attracting investments, Iraq's investment environment must be improved by streamlining administrative procedures and providing incentives for FDI. Financial transparency must be strengthened and the banking system reformed to ensure the flow of external investments.

4. Investing in infrastructure and the private sector in Iraq focuses on infrastructure development, such as transport and energy, as well as supporting the private sector to become a major driver of economic growth rather than relying on oil revenues. 5-Managing the risks of oil price fluctuations. The Iraqi Government should develop effective strategies to deal with oil price fluctuations by building additional financial reserves during periods of high prices and using them as a shield against economic shocks in periods of low prices.

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