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An Econometric Analysis of the Relationship Between International Reserves and Foreign Direct Investment in Algeria (1990–2023)

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Abstract:
This study aims to measure the impact of foreign reserves on foreign direct investment during the period 1990-2023 using the Autoregressive Distributed Lag (ARDL) model. The study concluded that there is a direct and significant relationship between foreign reserves and foreign direct investment, whereby reserves have a positive impact on foreign direct investment in the long term, while in the short term there is a negative relationship. Accordingly, the concerned parties must take into account many other factors that affect foreign direct investment or what is known as the investment climate

Keywords: Foreign Exchange Reserves, Foreign Direct Investment, Long-run Relationship, ARDL Model, Algeria

JEL Classification: C22, F21, F31, F32

1. Introduction:

Specialists do not disagree on the necessity of forming foreign reserves at appropriate levels in order to achieve many economic advantages, the most important of which is the ability to avoid some economic and social policies - which may have many negative consequences on society - in order to confront economic crises, in addition to the fact that foreign reserves provide a kind of reassurance to foreign investors. Therefore, talk about foreign reserves is always linked to confronting economic crises in the first degree and attracting foreign direct investment in the second degree.

Oil countries, including Algeria, are considered among the countries that have a large volume of international reserves, especially during periods of high fuel prices. According to the theoretical framework, increasing international reserves leads to attracting foreign direct investment, but the practical reality may be consistent with the theoretical aspect, which is what we are trying to prove or not in this study by answering the following problem:

1.1. Research problem:

To what extent do foreign reserves in Algeria contribute to attracting foreign direct investment?

1.2. Research questions:

- Do foreign exchange reserves affect foreign direct investment (FDI) in Algeria?
- How does the impact of foreign exchange reserves on FDI differ between the short and long run ?

1.3. Research hypotheses:

- There is a statistically significant relationship between foreign exchange reserves and FDI
- Foreign exchange reserves have a positive effect on FDI in the long run
- Foreign exchange reserves have a negative effect on FDI in the short run

1.4. Study Methodology:

In order to address the subject, we relied on the descriptive analytical approach in order to analyze the reality of foreign reserves and foreign direct investment in Algeria through analyzing the statistics related to the study variables in addition to analyzing the legal frameworks for foreign direct investment in Algeria. Then we used one of the statistical tools represented by the Autoregression Distributed Lag (ARDL: Auto Regression Distributed Lag) model for distributed time gaps. This is based on the statistical program Eviews.12 in order to measure the statistical relationship between the increase in international reserves and foreign direct investment in Algeria.

1.5. Study content:

In order to understand the subject, we decided to divide the study into two axes. In the first, we discussed the theoretical framework for both foreign reserves and foreign direct investment, As for the second, it is related to the method and tools of the study, and in it the standard aspect was discussed, and this is through the statistical relationship between both foreign reserves and foreign direct investment in Algeria during the study period, which lasted from 1990-2022

2. The first axis:

The theoretical literature on international reserves and foreign direct investment.

Both international reserves and foreign direct investment are considered economic variables that concern all countries equally, especially developing ones.

This has many economic advantages for countries. It is important before discussing the reality of both international reserves and foreign investment in Algeria and the relationship between them, to address the theoretical foundations of these two variables**.**

2.1 Foreign reserves:

2.1.1. Its concept:

They are the assets that are easily available to the monetary authorities, and at the same time they have the ability to control them in order to directly finance payment imbalances and indirectly regulate the amounts of these imbalances by intervening in the exchange markets to influence the exchange rate markets or for other purposes[1]

International reserves usually consist of the following elements[2]

a. **Gold monetary reserve**: Gold was used as a monetary exchange mechanism from 1780 until the First World War, within the framework of what was known as the gold standard. However, after this period, the role of gold changed as a basis for monetary transactions when the official price of gold differed from its market price, and in our present time it is considered one of the most important components of foreign reserves for countries[3]
b. **Foreign currencies:** They are all the foreign currencies that the state owns, especially the central currencies, which include foreign banknotes and demand and time deposits in the currencies of this state. That is, they include, in addition to its assets in the currencies of other countries, any financial obligations on countries and international and regional bodies that can be converted into ready money[4]
c. **Special Drawing Rights:** This type of asset is considered relatively new compared to its predecessors, as it was created by the International Monetary Fund in 1969. These assets provide the liquidity needed to pay international obligations and are characterized by being accepted at any time and by any country, within a specific total value, provided that a currency convertible into liquidity is paid in return[5]

2.1.2. The importance of maintaining international reserves:

There are many reasons that prompt countries to maintain foreign exchange reserves[6]

- Creating a precautionary stock to protect the local economy from unexpected negative imbalances
- By the monetary authority owning foreign exchange reserves, it seeks to compensate for the opportunity cost of reserves, and this is done by managing these reserves and preserving them from erosion and employing part of them. - The central bank often needs a large volume of foreign currencies, buying and selling through open market operations, managing the cash cover, investing its foreign currency assets with sending banks abroad, and providing foreign currencies to commercial banks in order to fulfill their obligations towards various dealers. Accordingly, reserves are a source of liquidity[7]
- Financing remittances and returns for foreign investors who have projects in the country and produce in the local market

- Maintaining liquidity to avoid situations where access to borrowing or reducing loans is very costly
- Intervening in foreign exchange markets in order to support the exchange rate policy, whether with the aim of obtaining an independent exchange rate or maintaining the value of the currency. Therefore, all countries have international reserves in different foreign currencies, and experts prefer diversifying these currencies, in order to hedge against losses from exchange rate fluctuations
- Foreign reserves represent the first line of defense for the value of the currency to ensure the stability of its exchange rates, as well as to finance expected imbalances in the current account.

2.2. Foreign Direct Investment:

Since the emergence of foreign direct investment at the beginning of the twentieth century, interest in it has been increasing, and this is because it has contributed to achieving economic and social development for many countries in the year

2.2.1. Its concept:

Given the aforementioned importance of foreign direct investment on the global level as a whole, we find many definitions of it, whether from researchers in the field or even from international bodies and institutions such as the International Monetary Fund, the United Nations Trade and Development Organization, all of which agree that it is: the transfer of foreign entities to host economies and the transfer of funds to them for the purpose of investment, the latter of which may take several forms such as mergers, acquisitions, the establishment of new operations for existing companies[8]

2.2.2. Forms of Foreign Direct Investment:

There are many classifications of foreign direct investment that differ according to the criterion or the motive for investment, but the most common types of investment are:[9]

a- Joint Venture Foreign Direct Investment: This investment is based on the participation between two parties, the foreign party and the local party, and is not limited to capital only, but participation may be in management, trademark, patent... and it is the most preferred in developing countries

b- Wholly-Owned FDI: In which the foreign investor is responsible for managing the project because he is the owner of the capital of the company or investment project. It is considered one of the preferred types for multinational companies

c- Investment in Free Zones: This is the investment that aims to establish free zones in order to establish branches for export industries. Investment in these zones is not subject to the laws of the host country, but rather to special laws, as investments in free zones are exempt from all fees, taxes, and deductions of a fiscal and customs nature

3. Second axis:

Modeling and testing the relationship between foreign reserves and foreign direct investment in Algeria using the ARDL model During the period 1990-2023.

3.1 Study data and variables:

3.1.1. Study data:

In order to study the relationship between foreign reserves and foreign direct investment, we used annual data, Collected from the World Bank database.

3.1.2. Study variables:

We will explain the dependent variable and the independent variables as follows:

- **a.** Foreign Direct Investment: It is the dependent variable in this study and its symbols are B
- **b. Foreign Reserves**: It is the independent variable and its symbols are R
- **c. Inflation rate**: an independent variable, denoted by INF

FDI= $\boldsymbol{f}$ (R, INF)

The standard form of the model is as follows:

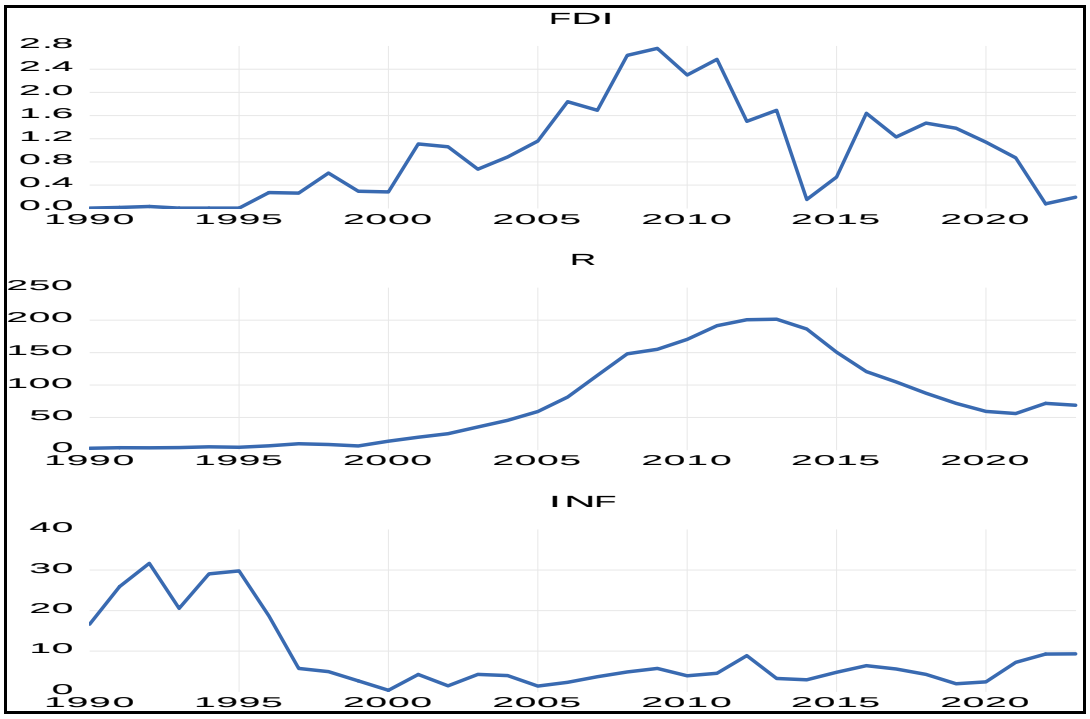
FDI$\boldsymbol{t}$=$\boldsymbol{c}$+$\boldsymbol{\beta 1}$ R $\boldsymbol{t}$ + $\boldsymbol{\beta}$2 INF $\boldsymbol{t}$+ $\boldsymbol{\mu t}$

$\boldsymbol{\mu}$: Random error, $\boldsymbol{c}$: Constant term, $\boldsymbol{\beta}$1, $\boldsymbol{\beta}$2: Model parameters that determine the extent of possible joint integration.

The appropriate mathematical formula for the model is the logarithmic formula, and can be represented as follows:

Ln FDI$\boldsymbol{t}$=$\boldsymbol{c}$+$\boldsymbol{\beta 1}$ ln R $\boldsymbol{t}$++ $\boldsymbol{\beta}$2 LN INF $\boldsymbol{t}$ +$\boldsymbol{\mu t}$

Fig. 1. Graphical representation of variables during the period 1990-2023



Source: Prepared by the researcher using the outputs of the Eviews program. 12

3.1.3. Description of study variables:

Table 1. Descriptive summary of study variables

	FDI	INF	R
Mean	0.950337	8.580815	73.32353
Median	0.876950	4.784447	59.30000
Maximum	2.760000	31.66966	201.4400
Minimum	1.00E-06	0.339163	2.700000
Std. Dev.	0.842267	8.895550	67.48953
Skewness	0.602515	1.531863	0.603768
Kurtosis	2.338859	4.006527	2.029164
Jarque-Bera	2.676370	14.82832	3.428672
Probability	0.262321	0.000974	0.178083
Sum	32.31146	292.4869	2493.000
Sum Sq. Dev.	23.41063	2613.017	150301.6
Observations	34	34	34

Source: Prepared by the researcher using the outputs of the Eviews program. 12

From Table . 1, we noticed that the sample size was 34 observations, which is considered a sufficient period to conduct a standard study. It also appears that the distribution of observations Jarque-Bera for the independent variable (foreign reserves) and the dependent variable (foreign direct investment) follow the normal distribution and their probability is greater than the significance level of 0.5%.

3.2. 2- Evaluation of the study model:

- Unit root test to measure the stationarity of time series variables(The Unit Root Test)

This test is performed to examine the properties of time series, with the aim of verifying whether the variables in the time series are stationary or non-stationary.

- Phillips and Perron (PP) unit root test and (ADF) test

Table 2. Results of the PP test and the ADF test

UNIT ROOT TEST TABLE (PP)					UNIT ROOT TEST TABLE (ADF)		
At Level					At Level		
		LNFDI	LNR	LNINF	LNFDI	LNR	LNINF
constant presence	t-Statistic	-2.1601	-1.8227	-2.5032	-2.4609	-1.6877	-2.6220
	Prob.	***0.2239***	***0.3634***	***0.1239***	***0.1339***	***0.4277***	***0.0988***
constant	t-Statistic	-2.2229	-0.1777	-2.4140	-2.5452	-3.5167	-2.5304

presence and general direction	***Prob.***	***0.4620***	***0.9909***	***0.3638***	***0.3060***	***0.0573***	***0.3125***
Without a constant and without a general direction	t-Statistic	-2.2071	0.6549	-1.2173	-2.4313	0.5899	-1.2472
	Prob.	***0.0238***	***0.8526***	***0.2003***	***0.0167***	***0.8378***	***0.1907***
At First Difference					At First Difference		
constant presence		d(LNFDI)	d(LR)	d(LNINF)	d(LNFDI)	d(LR)	d(LNINF)
	t-Statistic	-9.7106	-3.9820	-7.9344	-5.8170	-3.9402	-7.8782
	Prob.	***0.0000***	***0.0044***	0.0000	***0.0001***	***0.0049***	***0.000***
constant presence and general direction	t-Statistic	-10.8208	-4.4237	-8.8323	-5.7226	-4.4789	-7.9833
	Prob.	***0.0000***	***0.0070***	***0.0000***	***0.0003***	***0.0061***	***0.0000***
Without a constant and without a general direction	t-Statistic	-8.9811	-3.6927	-8.0487	-5.9096	-3.4101	-7.9941
	Prob.	***0.0000***	***0.0010***	***0.0000***	***0.0000***	***0.1442***	***0.0000***

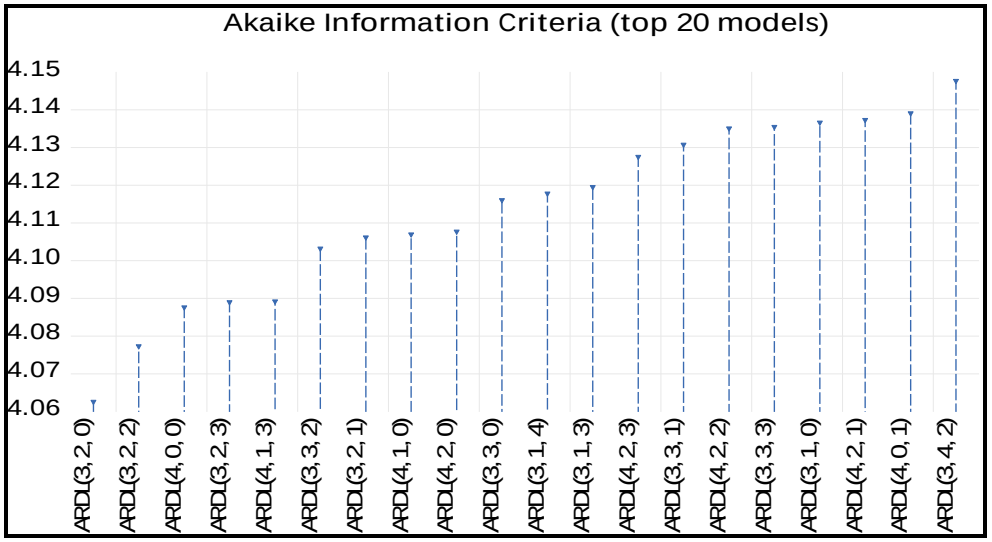
Source: Prepared by the researcher using the outputs of the Eviews program. 12

The results of unit root tests using the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests indicate that the variables LNFDI (foreign direct investment), LNR (foreign reserves), and LNINF (inflation) are not stationary at level (Level), as the probability values were higher than 0.05 in most cases, which requires testing them at first differences (At First Difference), so that all variables become stationary at first differences and the probability values became less than 0.05, which means rejecting the null hypothesis (H0) and accepting the hypothesis (H1) stating that there is no unit root at first difference, which indicates that the variables are of the first degree of integration (I(1), and based on these results, the ARDL model can be used to analyze the dynamic relationship between foreign reserves (LNR) and foreign direct investment (LNFDI).

- **Specify the number of gaps and slowdowns**:

Based on the fact that all series are stationary at first differences I(1), we determined the number of time lags for the model. By analyzing the graph, it appears that the lowest value of the (AIC) criterion is: ARDL (3.2.0), and the results are shown in the following figure.

Fig. 2. Optimal models of slowdowns



Source: Prepared by the researcher using the outputs of the Eviews program. 12

- **Co-integration test using the boundary methodology**

In order to test the existence of a long-term equilibrium relationship between the dependent variable (foreign direct investment) and the independent variable of the model (foreign reserves), there are several methods for testing the boundaries. We will conduct:

- **Bounds Test**: It depends on testing the validity of the two hypotheses

(H0): No long-term relationship, (H1): The existence of a long-term relationship.

And comparing the calculated F value with the values in the table, and the null hypothesis is rejected if the calculated F test value is less than the upper limit of the critical values previously determined at the 5% significance level

Table 3. Bounds test results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Morale level	I(0) minimum	I(1) ceiling
F-statistic	**12.97931**	(10%)	2.915	3.695
K Number of independent variables	2	(5%)	3.538	4.428
		(1%)	5.155	6.265

Source: Prepared by the researcher using the outputs of the Eviews program. 12

The results shown in Table 3 indicate that the F-statistic (12.97931) is higher than the upper critical limit at all levels of significance and K=2, which means rejecting the null hypothesis and accepting the alternative hypothesis H1 which indicates the existence of a long-run relationship between the variables. In general, the results support the existence of a long-run relationship between FDI, inflation and foreign reserves.

- Diagnostic tests:

a- Residual diagnostic test: is the process of evaluating the goodness and fit of the model by examining the residuals (errors) resulting from the model after estimating the coefficients

Fig. 3. Graph of actual values, expected values and residuals

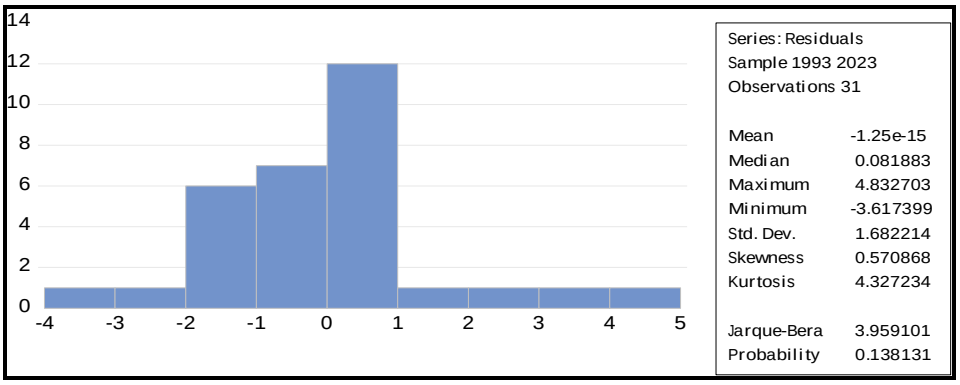


Source: Prepared by the researcher using the outputs of the Eviews program. 12

From the results of Figure 3, we notice that the expected values are close to the actual values of the variables, and this indicates the quality of the estimated model, and therefore it can be relied upon to interpret and analyze the results.

b- Normality Test: This test can be used to verify the hypothesis that the residuals follow a normal distribution. By reading the output of the Eviews.12 program as shown in the following figure:

Fig. 4. Normal distribution test



Source: Prepared by the researcher using the outputs of the Eviews program. 12

The results shown in Figure 4 indicate that the test is not significant ($\alpha > 0.05$) and the Jarque-Bera (J-B) value is equal to 3.959101, which means accepting the null hypothesis that the residuals follow a normal distribution

c- Test for autocorrelation problem: Lagrange multiplier LM Test

Table 4. LM Test

LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.006676	Prob. F(2,21)	**0.9933**
Obs*R-squared	0.019697	Prob. Chi-Square(2)	0.9902

Source: Prepared by the researcher using the outputs of the Eviews program. 12

To test the serial association, we use the LM Test as shown in Table 4. According to the test results, the probability value Prob F(0.9933) is greater than 0.05, so we accept the null hypothesis that there is no serial association, and reject the alternative hypothesis H1.

d- Heteroskedasticity Test (ARCH)

There are several tests to detect the problem of variance of the error term, one of which is the ARCH test.

Table 5. Test probability: ARCH

Heteroskedasticity Test: ARCH			
F-statistic	0.291171	Prob. F(1,28)	**0.5937**
Obs*R-squared	0.308758	Prob. Chi-Square(1)	0.5784

Source: Prepared by the researcher using the outputs of the Eviews program. 12

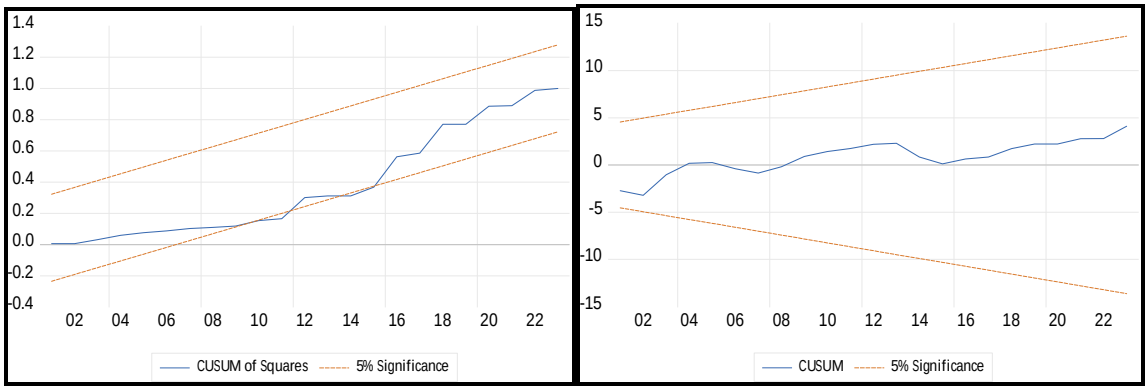
From the results of Table 5, the F statistic is not significant, as the probability of F is greater than 0.05, and therefore we accept the null hypothesis H0, which means that the estimated model is appropriate and does not suffer from the problem of variance of variance.

3.3. Structural stability test: Its aim is to test the structural stability of short-term and long-term transactions

a- **Model stability test:**

We will use the cumulative sum of residuals (CUSUM) test and the cumulative sum of squares (CUSUMSQ) test to identify structural changes in the data and to estimate the stability and consistency of the long-term parameters with the short-term parameters. The test results are as shown in the following figure:

Fig.5. Testing the stability of the model using (CUSUMSQ - CUSUM)



Source: Prepared by the researcher using the outputs of the Eviews program. 12

The results of Figure 4 indicate that all the graphs of (CUSUM) and (CUSUMSQ) statistics fall within the critical limits (upper and lower) at the 5% significance level, which means that all the coefficients in our error correction model are constant, and this indicates that the studied model is stable during the study period

3.4. Results of model estimation and economic analysis:

a- Testing the significance of the model and the correlation coefficient

Through Appendix No. (1), we conclude that the Fisher test (F-statistic = 17.13267) exceeds the table value, and that the value of (Prob (F-statistic = 0.0000 is less than (5%), and thus we reject the null hypothesis H0 and accept the alternative hypothesis H1, which confirms that the model is good and acceptable from a statistical point of view, and thus it can be relied upon in economic analysis

b- Adjusted coefficient of determination R^2 test

To test the extent of the explanation of the independent variables and their impact on the foreign direct investment variable, we use the adjusted coefficient of determination R2 = 0.790105. This means that the independent variables mentioned in this model explain 79.01% of the changes in foreign direct investment in Algeria, while the remaining percentage (21%) is explained by other variables

- **In the long term:** The long-run cointegration equation at the 5% significance level is:

LNFDI =(1.511039*LNR -2.3110914*LNINF-3.7211)

Table 6. Long-run transaction estimation results

Levels Equation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNR	1.511039	0.196275	7.698584	0.0000
LNINF	-2.3110914	0.305850	-7.555714	0.0000
C	-3.721137	1.101784	-3.377375	0.0026
EC = LNFDI – (1.511039*LNR -2.3110914*LNINF-3.7211)				

Source: Prepared by the researcher using the outputs of the Eviews program. 12

Table 6 shows a positive and statistically significant effect of foreign exchange reserves on FDI in the long run at a significance level of 5%, which is in line with economic theory, as the analysis indicates that every 1% increase in foreign exchange reserves is accompanied by a 1.51% increase in FDI. This positive effect reflects the confidence that investors place in the stability of the economy when foreign exchange reserves are high, which may be due to the improvement in the financial situation thanks to the rise in oil prices. Inflation also shows a negative effect on FDI, as the LNINF coefficient translates into a 2.31 decrease in FDI for each unit increase in the inflation rate. This indicates that high inflation rates may erode purchasing power and increase economic instability, which reduces the attractiveness of the country as a place to invest.

- **Estimating the relationship in the short term:** Our short-run model equation is

D (LNFDI) == -1.651784362750*(LNFDI (-1) - (1.51103911*LNR -2.31091361*LNINF (-1) - 3.72113717))

Table 7. Results of short-term relationship estimation (ECM)

ARDL Error Correction Regression				
Variables	Coefficient	Std. Error	t-Statistic	**Prob.**
D (LNFDI (-1))	0.718224	0.151431	4.742918	**0.0001**
D (LNFDI (-2))	0.588625	0.145819	4.036679	**0.0005**
D(LNINF)	-1.440377	0.476477	-3.022970	**0.0061**
D (LNINF (-1))	1.100096	0.482064	2.282056	**0.0321**
CointEq(-1)*	-1.651784	0.215613	-7.660877	**0.0000**

Source: Prepared by the researcher using the outputs of the Eviews program. 12

Table 7 shows that foreign exchange reserves do not contribute to attracting foreign direct investment in the short term, because foreign investments are often long-term. The study also indicates that inflation can reduce the attractiveness of foreign investment in the short term, as a 1% increase in the inflation rate leads to a 1.44% decrease in foreign investment. However, the error correction coefficient (ECM) shows strong statistical significance, and the negative sign of the parameter indicates its agreement with the

standard theory, as it represents the speed of adjustment from the short term to the long term, indicating that the system quickly returns to equilibrium after any deviations occur.

4. Discussion of results:

The results indicate that there is a long-term relationship between foreign reserves (LNR) and foreign direct investment (LNFDI), as the tests including the F-Bounds test showed an F-statistic value of 12.75050, which exceeds the critical values for all levels of significance, confirming the existence of a long-term equilibrium relationship between the variables.

- The previous analysis showed that all time series are stable at the first difference I(1) and that the data follow a normal distribution, and the test of the autocorrelation problem indicated that there is no problem with autocorrelation between the variables, as for the test of heteroscedasticity of variance, it was found that there is no problem with the stability of the variance of errors in the estimated model.
- The error correction parameter according to the ECM approach also indicates the speed of adjusting the defect within a period of less than a year.

The results indicate that there is a long-term direct relationship between foreign reserves and foreign direct investment, however, foreign exchange reserves do not contribute to attracting foreign direct investment in the short term, and inflation shows a statistically significant negative effect on foreign direct investment in the long and short term

.5. Conclusion:

The standard aspect of the study highlighted the existence of a direct relationship between foreign reserves and foreign direct investment in Algeria, which indicates that it is one of the most important variables that contribute to increasing foreign direct investment, but in the short term there is a negative relationship, which also indicates the existence of other factors that may affect the attraction of foreign direct investment or what is known as the investment climate, which was proven by the standard study in terms of the negative relationship between inflation and foreign direct investment, which proves from an economic point of view that Algeria is completely linked to oil, as international reserves increase with the rise in oil prices and decrease with their decrease, and foreign direct investment also increases with the rise in fuel prices because the majority of foreign investment projects are directed to this sector, and accordingly it is possible to suggest some recommendations:

- Work more to improve the business environment and investment climate in order to attract foreign direct investment.
- Reconsider the optimal size of foreign reserves, and this is by taking into account the cost of exceeding the safe limit of the size of international reserves.
- The need to search for an alternative source of income by investing the surplus of international reserves in local private projects arising from them.
- Conduct in-depth studies to identify the risks resulting from fluctuations Oil price volatility, and trying to implement alternatives such as investing in oil derivatives to avoid

losses resulting from this decline.

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7. Appendices

Appendix01:

Dependent Variable: LNFDI
Method: ARDL
Date: 08/04/24 Time: 23:13
Sample (adjusted): 1993 2023
Included observations: 31 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LNR LNINF
Fixed regressors: C
Number of models evalulated: 100
Selected Model: ARDL(3, 0, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNFDI(-1)	0.066439	0.170156	0.390461	0.6998
LNFDI(-2)	-0.129599	0.161909	-0.800444	0.4316
LNFDI(-3)	-0.588625	0.155748	-3.779346	0.0010
LNR	2.495911	0.471891	5.289164	0.0000
LNINF	-1.440377	0.557719	-2.582621	0.0166
LNINF(-1)	-1.276658	0.555558	-2.297974	0.0310
LNINF(-2)	-1.100096	0.557519	-1.973200	0.0606
C	-6.146516	2.002085	-3.070058	0.0054

R-squared	0.839081	Mean dependent var	-1.511177
Adjusted R-squared	0.790105	S.D. dependent var	4.193505
S.E. of regression	1.921224	Akaike info criterion	4.361438
Sum squared resid	84.89536	Schwarz criterion	4.731500
Log likelihood	-59.60229	Hannan-Quinn criter.	4.482069
F-statistic	17.13267	Durbin-Watson stat	1.780016
Prob(F-statistic)	0.000000		

Appendix02:

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNFDI)
Selected Model: ARDL(3, 0, 2)
Case 2: Restricted Constant and No Trend
Date: 08/05/24 Time: 01:39
Sample: 1990 2023
Included observations: 31

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.146516	2.002085	-3.070058	0.0054
LNFDI(-1)*	-1.651784	0.229402	-7.200377	0.0000
LNR**	2.495911	0.471891	5.289164	0.0000
LNINF(-1)	-3.817131	0.739402	-5.162459	0.0000
D(LNFDI(-1))	0.718224	0.161435	4.449004	0.0002
D(LNFDI(-2))	0.588625	0.155748	3.779346	0.0010
D(LNINF)	-1.440377	0.557719	-2.582621	0.0166
D(LNINF(-1))	1.100096	0.557519	1.973200	0.0606

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNR	1.511039	0.196275	7.698584	0.0000
LNINF	-2.310914	0.305850	-7.555714	0.0000
C	-3.721137	1.101784	-3.377375	0.0026

EC = LNFDI - (1.5110*LNR -2.3109*LNINF - 3.7211)

Appendix03:

ARDL Error Correction Regression
Dependent Variable: D(LNFDI)
Selected Model: ARDL(3, 0, 2)
Case 2: Restricted Constant and No Trend
Date: 08/05/24 Time: 01:41
Sample: 1990 2023
Included observations: 31

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFDI(-1))	0.718224	0.151431	4.742918	0.0001
D(LNFDI(-2))	0.588625	0.145819	4.036679	0.0005
D(LNINF)	-1.440377	0.476477	-3.022970	0.0061
D(LNINF(-1))	1.100096	0.482064	2.282056	0.0321
CointEq(-1)*	-1.651784	0.215613	-7.660877	0.0000

R-squared	0.699618	Mean dependent var	0.059543
Adjusted R-squared	0.653406	S.D. dependent var	3.069337
S.E. of regression	1.806988	Akaike info criterion	4.167890
Sum squared resid	84.89536	Schwarz criterion	4.399178
Log likelihood	-59.60229	Hannan-Quinn criter.	4.243284
Durbin-Watson stat	1.780016		