
International funding sources and their impact on supporting economic growth in Algeria
Econometric study of the relationship between variables during the - period(1990-2023)

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Abstract

Through this research paper, we aim to study the impact of international financing sources on economic growth in Algeria over the period from **1990** to **2023**. Based on theoretical frameworks and previous studies, international financing sources, represented by foreign direct investment and migrant remittances, can have a positive or negative impact on economic growth, depending on the nature of a country's economic structure.

The study indicates a short-term positive relationship between foreign direct investment and migrant remittances on economic growth, while in the long term the relationship between the variables was negative.

Keywords:foreign direct investment, migrantremittances,economic growth,algerian economy,VECM model.

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introduction:

Most countries, whether developed or underdeveloped, strive to improve their economic performance to keep pace with changes in the current international environment, through domestic or external funding sources. Therefore, international finance is concerned with studying of capital flows between different countries, and these flows include both financial and real flows. Here, most economic theorists have emphasized that international finance refers to the transfer of capital between countries in the form of direct and indirect investment, loans, transfers, gifts, and aid that occurs between residents of one country and residents of another. In their view, this term refers to the existence of countries characterized by a scarcity of capital and other countries characterized by the presence of a density of capital.

One of the most important objectives of international financing sources is increasing national exports through granting loans from the exporting country to the importing country. These loans are required to be spent on purchasing goods and services from the donor country. Another important objective is providing a sufficient amount of international liquidity to treating countries suffering from poverty. This is represented by various currencies such as the dollar, the euro, the pound sterling, and the yen.

Among the most prominent types of informal sources of international financing are migrant remittances and bank loans.

Algeria has recently increased its interest in economic growth as it contributes to formulating national strategies represented by economic programs and reforms aimed at ensuring a better standard of living and investment. However, they have not adopted a policy to attract foreign direct investment as these are not considered the primary source of external financing and an important means of addressing the savings problem that plagues most countries.

The economic role of our research paper aims to demonstrate the selected international financing sources (FDI, migrant remittances, and bank loans) according to the vector error correction model (VECM) in Algeria. To this end, the paper is divided into three main components: the first component is an analysis of the theoretical literature related to the variables under study; the second component is addressing the most prominent previous studies that demonstrated the relationship between the variables under study; and the final component is conducting a simulation to measure the impact of the variables under study on the dependent variable (foreign direct investment and migrant remittances) during the period 1990-2023.

Foreign direct investment and migrant remittances: *Research hypothesis* variables affect economic growth in Algeria during the study period, reflecting international financing sources.

The main problem: Do international financing sources represented by foreign direct investment and migrant remittances affect economic growth in Algeria during the period (1990-2023)?

I. Theoretical framework and previous studies

In the first part of our research paper, we will address the theoretical framework of international finance and its sources, as well as the most prominent previous studies that addressed the variables under study and the theoretical study model.

1. The theoretical framework of the variables under study

1.1. International finance: «International finance» is a branch of financial economics that deals with the overall economic phenomena between two countries and their monetary transactions. Its most prominent elements include: exchange rates, foreign direct investment, and migrant remittances, including the prevailing currency in trade. All of these fall under this type of finance (Levi M. D., 2007, p. 80).

1.1.1. Foreign Direct Investment (FDI): there are many definitions of foreign direct investment, we mention the definition (World Investment Report, 2007, p. 245) «It is an investment based on a long-term relationship that aims to achieve permanent control by the parent entity (foreign direct investor or parent company) in the host country (foreign direct investment enterprise, subsidiary or foreign affiliate). (World Investment Report, 2007, p. 245) confirmed that «Foreign direct investment» is the type of investment provided by a foreign investor (directly or indirectly) to a company in the form of capital towards the host company. Foreign direct investment consists of three main components: equity capital -reinvested earnings - intra-company loans.

According to the (OECD, 1999, p. 08), a foreign direct investor is: "an individual, a public or private institution, registered or unregistered, or a government, or a group of related companies, registered and/or unregistered, that has a direct investment enterprise operating in the country of residence of the foreign direct investor".

1.1.2. Migrant Remittances (MR): According to (World Migration Report, 2022, p. 125) "migrant remittances" are financial or in-kind transfers sent by migrants to their families or communities of origin (local). Here we see that for the (Ratha, n.d, p. 76), migrant remittances mean "the economic situation when migrants send a portion of their income back to their home countries, whether in cash or goods. These remittances, known as worker or migrant remittances, have witnessed rapid growth in recent years and now represent the largest source of foreign income in many countries around the world. "In fact, it is difficult to estimate the actual size of migrant remittance flows because many of them pass through informal channels. Many experts believe that unrecorded financial flows through informal channels account for at least 50% of recorded financial flows. Not only are remittances large but they are also more evenly distributed among developing economies than capital flows, including foreign direct investment. Remittances are especially for low-income countries and account for nearly 4 percent of their GDP, compared with about 1.5 percent of GDP for middle-income countries. Amid political crises and social unrest, migrant remittances represent a lifeline for poor economies. The World Bank estimated remittances in 2017 at 31% of GDP, and in some extremely poor regions, such as Somalia, they represent as much as 70% of GDP.

1.1.3. Economic Growth Rate (EGR): "Economic growth", according to (Dragoi, 2020, p. 03), is the increase in the quantity of goods and services produced during a specific period of time. The rate of increase in the production of goods and services can be maintained or kept constant by improving the quality of education, technology, or the added value of goods and services produced within the economy. namely that "This definition explains to us important points «Economic Growth»: is

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- *Economic growth* (EG) represents the growth in a country's real output over a specific period of time;
- *Economic growth* (EG) does not take into account income generated from the informal economy (total unregistered economic activities);
- We can include *economic growth* (EG) among the indicators of economic development of a country;
- The *economic growth* of a country (EG) is reflected in the size of its gross domestic product (GDP);
- *Economic growth* (EG) refers to the annual growth of a country's gross domestic product (GDP) or gross national product (GNP), expressed as a percentage.
- *Economic growth* (EG) has many measurement indicators, the most prominent of which is the difference between per capita income from one year to another.

2. Previous studies

2.1. Previous studies that demonstrated the impact of foreign direct investment on economic growth

2.1.1. A study by (Abdelhakem, 2017, p. 89) showed that foreign direct investment is one of the most important aspects of globalization. Foreign direct investment has witnessed unprecedented growth in the form of establishing production units abroad or acquiring existing units, achieving continuous growth in recent years. Here (Abdelhakem, 2017) sees that many studies have highlighted how foreign direct investment affects economic growth in the economic literature through different channels through which it can exert **direct and indirect positive effects** on growth, the most important of these aspects are: technology transfer, capital flow, introduction of new processes, production gains and returns, and opening up new market opportunities. Moreover, developing countries view it as the most important channel for facilitating technology diffusion, as the development of foreign direct investment generally plays a positive role in stimulating economic growth in host countries. In the same context, (Benhabib, 2013, p. 05) believes that a group of studies conducted on China have observed that foreign direct investment plays a positive and significant role in supporting long-term economic growth, through its impact on technological change. Also, through the models of **Lee & Barendszi** in 1998, according to them, the degree of technological progress played the role of the main determinant of growth more than the contribution of local investment. Here it must be emphasized that the majority of field studies have stated that foreign direct investment, if linked to other determinants, has a positive impact on the economic growth of host countries (Benhabib, 2013, p. 05).

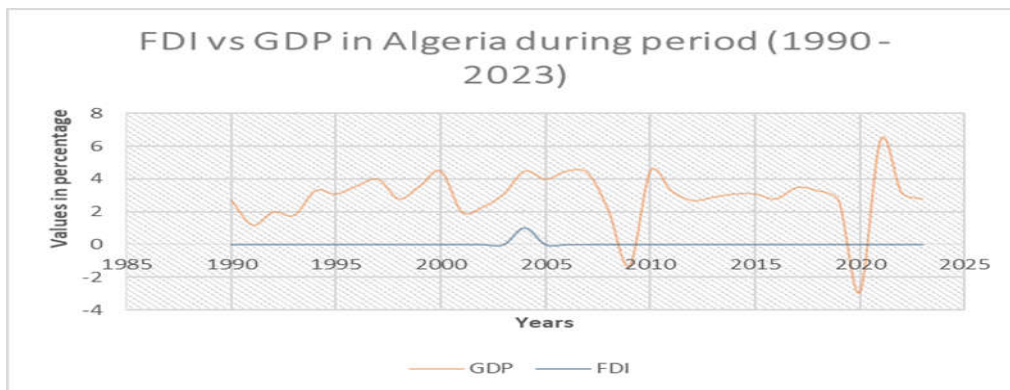
2.1.2. However, contrary to what was mentioned previously, in terms of the “quality ladder”, (Sandrine, 2002, p. 02) argue that the presence of foreign companies leads to a reduction in the cost of current capital goods for the host country, and this would create a **negative** relationship between foreign direct investment and establishment costs in the host country.

2.1.3. Moreover (Selma, 2013, p. 31) believes that the net benefits achieved from foreign direct investment do not automatically generate benefits. Concerns often arise as a result of relying on investments. Such as fears of losing national sovereignty and other potential negative consequences. This type of foreign investment have centered on sensitivity to foreign FDI Disagreements over inward. Negative consequences local industries as well as traditional crafts that carry the cultural aspect of the host control of country. Also for (Selma, 2013, p. 32) many theorists are skeptical that foreign direct investment does

not necessarily create net jobs in the host country's labor market. Here, an example is given of a **Japanese** car company in the **United States**. The jobs created by this investment were replaced by jobs lost by **American** companies that lost market share to their **Japanese** competitors. Therefore, we conclude that foreign direct investment does not provide sufficient job opportunities for the host country, contrary to what has been declared by multinational companies. Researcher (Selma, 2013) on **Macedonia** reports that in addition to the increase in the problem of which greatly and indirectly affected economic growth in the short term due to the 'unemployment volume of the process of structural reforms of companies has exacerbated the 'lack of areas of work'. **this negatively affected economic growth** and 'unemployment

In **Algeria**, through the curve below n° (01) we note that the rate of **foreign direct investment (FDI)** has witnessed a noticeable fluctuation. During this specific period (**1990 to 2023**), and with regard to the relationship between foreign direct investment and economic growth in Algeria, we distinguish that the Algerian government did not adopt a strategy of supporting the national economy outside of hydrocarbons by relying on (**FDI**) flows. Rather, the goal was to strengthen the hydrocarbons sector, which was considered the sole source of funding for any strategy adopted in **Algeria**. In addition to the above, foreign direct investment during the same period under study did not bridge the gap between savings and investment to increase the country's manufacturing capacity, which would help diversify the national economy and support economic growth. (Abdelhakem, 2019, p. 08).

Fig n°(01) : The historical development of foreign direct investment in Algeria in exchange for the development of the economic growth rate during the 1990s to 2023.



Source: prepared by the researchers based on the outputs of the statistical program (Excel).

2.2. Previous studies have demonstrated the impact of migrant remittances on economic growth

2.2.1. In the view of (Al Mosharraf, Sahabuddin, & Saha, 2024, p. 2323) migrant labor and the resulting financial flows have received significant attention in the economic literature, with remittance flows from migrant labor considered a key factor in supporting economic growth in many emerging countries. To study (Al Mosharraf, Sahabuddin, & Saha, 2024, p. 2323) using time-frequency based waves - the dynamic causal relationship between migration (**M**), foreign remittances (**MR**) and economic growth (**EGR**) in **Bangladesh**. The results of the standard study of the dynamic causal relationship between the variables under study indicate a time-varying movement within the time frequency spaces, thus revealing a long-run relationship between the

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variables. A strong correlation was also found between migration and foreign remittances, between migration and economic growth, and between remittances and economic growth in **Bangladesh**. According to the (Fattalah, 2005) study on migration, remittances, and development, which emphasizes the direct impact of migrant remittances on income distribution, poverty alleviation, and individual well-being. It also has indirect effects on the economy as a whole through its impact on productive employment and economic growth.

This (Fattalah, 2005) study indicates that migrant remittances (**MR**) have social impacts. They are an important source of income for low- and middle-income families in developing countries, by providing the hard currency needed to import scarce inputs that are not available locally. Here, it must be assumed that the developmental impact of migrant remittances on the receiving countries depends on how these funds are spent, whether on consumption, housing, land purchases, financial savings, or productive investment. There is no doubt that spending on entrepreneurial investment has a direct positive impact on employment and growth. Recent economic research shows that remittances, even when not invested, have a significant multiplier effect. Every dollar spent on basic needs stimulates retail sales, which in turn stimulates demand for goods and services, which in turn stimulates production and employment. Results show a multiplier effect of 1.5. In the same study, remittances compensate for the decline in output experienced by developing countries due to the loss of trade opportunities resulting from skilled migration. The results also show that in the case of low-skilled migration, the welfare of the receiving country increases if the remittances exceed the loss of domestic incomes. However, remittances enhance the economic welfare of the receiving country only when the capital-labor ratio remains constant or high. If the ratio declines, remittances do not enhance economic welfare or have a negative impact.

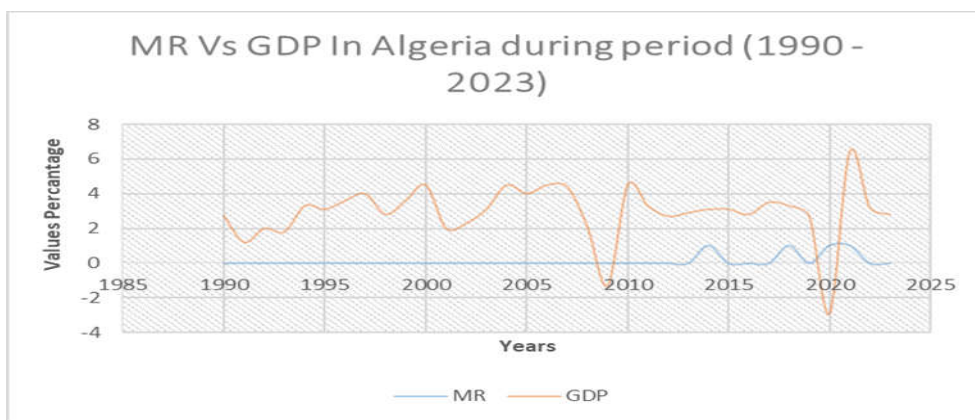
2.2.2. A study by (Noah, 2023, p. 113) shows that remittances from migrants to their home countries can increase the level of voluntary unemployment among recipients, this will cause severe shocks at the macroeconomic level to the labor supply and will increase income inequality, creating barriers for households that cannot access capital.

the researcher (Noah, 2023) also states that the existence of political and economic crises sees that the exchange rate channels mitigate the impact of immigrant remittances on economic growth. Therefore, as previously mentioned, remittances have no impact on economic growth in the absence of effective fiscal policies, which is a basic characteristic of high-income economies. Here we distinguish that migrant remittances negatively impact economic growth, and this negative impact is compounded when foreign goods and services dominate domestic consumption, which is a basic characteristic of low-income economies.

In **Algeria**, during the study period (**1990-2023**), we note fluctuations in the flow of remittances from migrants, as the years studied witnessed a decrease in remittances from migrants flowing in. In **2021**, the flows amounted to **\$2 billion**, which is the highest percentage achieved. The weak volume of remittances from migrants abroad reflects the fact that Algeria's economic policies do not rely on remittances to finance its trade deficit. Rather, it relies primarily on oil revenues to cover the deficit and correct any shortfalls in economic performance. According to the researcher's sources

(Benzeghioua, 2024, pp. 77-78), the number of Algerian expatriates abroad has reached about **6 million** expatriates, of whom **5 million** Algerians are in **France** and the rest are distributed across various countries of the world. The total volume of remittances from **Algerian** expatriates in France amounted to **€1.447 billion**, compared to **€3.448 billion** in **Morocco**, which has a **Moroccan** diaspora of **2 million**. The significant difference between the two countries reflects the **Moroccan** authorities' focus on remittance flows to support its national economy, in contrast to the **Algerian** economy, which relies on hydrocarbon revenues and completely ignores the significant role of remittances in supporting economic growth.

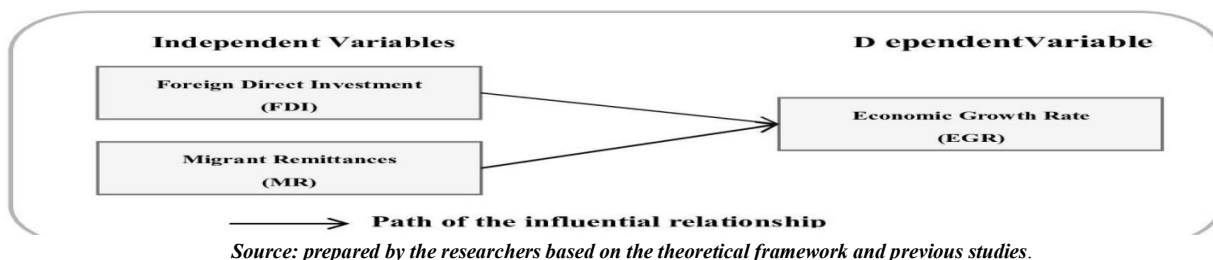
Fig n°(02) : Historical development of migrant remittances in Algeria versus the development of the economic growth rate during the period 1990s to 2023.



Source: prepared by the researchers based on the outputs of the statistical program (Excel).

By addressing the theoretical framework of international financing sources represented by foreign and ‘as well as economic growth in our research paper ‘direct investment and migrant remittances we formulated the ‘the relationship between the variables studied through previous studies :represented in the following form ‘theoretical model for the study

Fig n°(03) : The theoretical model of the study



II. Standard study

In the second part of our research paper, we will translate the theoretical relationship between the variables under study into a standard model.

1. Data description

Through this econometric study, we will attempt to study the impact of international financing sources, represented by foreign direct investment and migrant remittances, on economic growth

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from a practical perspective. The applied analysis is based on an annual data series for the Algerian economy (1990-2023), i.e. on 34 observations. Our standard study variables are shown as follows:

- _ **FDI**: Foreign Direct Investment;
- _ **MR**: Migrant Remittances;
- _ **EGR**: Economic Growth Rate;

The results were obtained using *Eviews* The mathematical model for our study .software 13 :should be taken as follows

$$X_t = A(L)X_{t-1} + B(L)Z_{t-1} + et \dots \dots (1)$$

:Where it represents

- _ **Xt**: the vector of dependent variables in the model;
- _ **Zt**: the vector of independent variables in the model;
- _ **et**: Random error term in the model (satisfies the following properties: median = 0 and variance is constant);
- _ **A(L)** and **B(L)**: they represent the model parameter matrix According to the above, the theoretical model of our study extracted from the statistical program **Eviews** takes the following form:

Estimation Proc:

LS 1 1 FDI MR EGR

VAR Model:

$$FDI = C(1,1)*FDI(-1) + C(1,2)*MR(-1) + C(1,3)*EGR(-1) + C(1,4)$$

$$MR = C(2,1)*FDI(-1) + C(2,2)*MR(-1) + C(2,3)*EGR(-1) + C(2,4)$$

$$EGR = C(3,1)*FDI(-1) + C(3,2)*MR(-1) + C(3,3)*EGR(-1) + C(3,4) \dots \dots (2).$$

✓ **What concerns us from the previous equations, (2) .is equation No**

2. Stationarity test of time series & cointegration test between the variables under study

2.1. Stationarity test of time series: the time series used must be stationary according to the regression theory, especially in the analysis of macroeconomic situations (studying macroeconomic variables of a particular country, for example). We will begin by testing the stationarity of the time series of economic analysis variables, by using both the extended **Dickey-Fuller** test and the **Schwarz** criterion. The number of delays is calculated based on the smallest value taken from the Akaike-Schwarz coefficient. The unit root integral of the time series of the variables under study is tested to see if the variables are stationary or not. **Extended** we will rely on the **ADF** Fuller-Dickey **-non (e.i) the presence of a unit root :the null hypothesis** test and test (ADF) Fuller-Dickey stationarity and avoid spurious results due to its non **(stationarity of the time series**, this is done through statistical comparison (the **calculated t** is greater than the **tabulated t** at a significance level of **(1% - 5% - 10%)**, and here we reject the null hypothesis and therefore the series is

stable. Accepting the null hypothesis requires us to repeat the test for the first and second teams. The following table (01) shows us the **Stationarity test** of the time series under study:

Table n°(0 1) : Stationarity test of time series

Variables	FDI		MR		EGR	
Test	Stationarity at the level					
	Estimated Value	Critical Value	Estimated Value	Critical Value	Estimated Value	Critical Value
Individual intercept	/-2.028235/ (0.2739)	/-2.957110/ (0.0005)***	/-2.072827/ (0.2563)	/-2.957110/ (0.0005)***	/-4.841181/ (0.0005)***	/-2.957110/ (0.0005)***
Individual intercept & trend	/-1.736446/ (0.7113)	/-3.557759/ (0.0005)***	/-2.367451/ (0.3884)	/-3.557759/ (0.0005)***	/-4.736168/ (0.0032)*	/-3.557759/ (0.0005)***
None	/-0.680524/ (0.4143)	/-1.951687/ (0.0005)***	/-1.684014/ (0.0867)	/-1.651687/ (0.0005)***	/-0.809176/ (0.3575)	/-1.951687/ (0.0005)***
Test	Stationarity at 1st difference					
	Estimated Value	Critical Value	Estimated Value	Critical Value	Estimated Value	Critical Value
Individual intercept	/-5.356453/ (0.0001)***	/-2.960411/ (0.0005)***	/-5.590760/ (0.0001)***	/-2.960411/ (0.0005)***	/-6.981164/ (0.0000)***	/-2.960411/ (0.0005)***
Individual intercept & trend	/-5.793196/ (0.0002)***	/-3.562882/ (0.0005)***	/-5.545348/ (0.0004)***	/-3.562882/ (0.0005)***	/-6.846204/ (0.0000)***	/-3.562882/ (0.0005)***
None	/-5.425264/ (0.0000)	/-1.952066/ (0.0005)***	/-5.608561/ (0.0000)***	/-1.952066/ (0.00005)***	/-7.068562/ (0.0000)***	/-1.952066/ (0.0005)***

Source: prepared by the researchers based on the outputs of the statistical program (Eviews.V. 13).

✓ Note: Estimated and critical values are extracted from the statistical program Eviews 13 in absolute values.

series are stable in their first differences we notice that all the series are stationary at the 5% level. From the table above this is done (value at a significance level of 5% with the critical t-value by comparing the estimated t-value). The first differences for each variable represent a **stationary time series**, so the model is first-order integrated. This requires a **cointegration test** between the variables under study.

2.2. Cointegration test: after ensuring the stationarity of the time series, it is necessary to ensure the presence of cointegration between these series in the presence of the null hypothesis and no cointegration between the variables. Here we can say that **cointegration** refers to a method of obtaining a balance for the **long-run relationship** between **non-stationary variables** or that it means the existence of an adjustment method that prevents the increase in the error of the long-run relationship. There are several methodologies for testing whether or not time series are cointegrated, the most important of which are:

2.2.1. The first method Johansen and Juselius test: To determine several co-integration vectors, **Johansen (1988/1991)** and **Juselius (1990)** suggested conducting two tests, which are considered better than the **Engel-Granger test** because it is suitable for small-sized samples as well as for the presence of more than two variables, and allows for the mutual influence between the variables under study.

2.2.1.1. Trace test (λ_{trace}): the hypothesis that there are at most **q cointegrating vectors** is tested against the generalized unconstrained model ($r=q$);

2.2.1.2. maximum full value test (λ_{max}): which tests the null hypothesis that there is (**r**) a vector of non-cointegration, and the alternative hypothesis (**r + 1**) a vector of cointegration. The results of this test are shown in the following table

Table n°(0 2) : Cointegration test

		λ_{trace}	
With a trend		The alternative hypothesis	The null hypothesis
level %0.5	Value at Estimated Value		

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29.79707	35.5772	$r \geq 1$	$r=0$
15.49471	12.06991	$r \geq 2$	$r < 1$
3.841465	3.941568	$r \geq 3$	$r < 2$
λ_{max}			
21.13162	23.50741	$r=1^{**}$	$r=0$
14.26460	15.80834	$r=2$	$r \leq 1$
3.841465	3.901468	$r=3$	$r \leq 2$

Source: prepared by the researchers based on the outputs of the statistical program (Eviews.V. 13)

From the table above it is clear that the estimated values for each of ($\lambda_{trace} \lambda_{max}$) are greater than the critical values at a significance level of (5%), and this forces us not to accept the null hypothesis, i.e. the existence of a joint integration relationship, this confirms the existence of a long-term equilibrium relationship between the variables under study.

3. Error correction form (1,1)VECM : this test is applied after the success of the **Johansen cointegration test**. It measures the short-term and long-term relationship between the variables under study. The equations appear according to the (**Eviews. V. 13**) statistical model as follows:

EC 1 1 FDI MR EGR

VAR Model:

$$D(FDI) = A(1,1)*(B(1,1)*FDI(-1) + B(1,2)*MR(-1) + B(1,3)*EGR(-1) + B(1,4)) + C(1,1)*D(FDI(-1)) + C(1,2)*D(MR(-1)) + C(1,3)*D(FDI(-1)) + C(1,4)$$

$$D(MR) = A(2,1)*(B(1,1)*FDI(-1) + B(1,2)*MR(-1) + B(1,3)*EGR(-1) + B(1,4)) + C(2,1)*D(FDI(-1)) + C(2,2)*D(MR(-1)) + C(2,3)*D(EGR(-1)) + C(2,4)$$

$$D(EGR) = A(3,1)*(B(1,1)*FDI(-1) + B(1,2)*MR(-1) + B(1,3)*EGR(-1) + B(1,4)) + C(3,1)*D(FDI(-1)) + C(3,2)*D(MR(-1)) + C(3,3)*D(EGR(-1)) + C(3,4).....(3).$$

Before starting to estimate the (1,1)VECM) we must test the validity of the model ‘model and we will limit ourselves to ‘There are many and varied tests in this regard .statistically :three of them

Model stability testing: for a model to be generally stable, it is necessary that its variables form a stable dynamic system. Therefore, the unit roots and all coefficients must be less than one, which means that the model does not suffer from the problem of correlation errors or non-stationarity of variance. The results for this test are extracted from (**Eviews. V. 13**) and are shown in the following table and figure.

Table n°(0 3): Model stability testing

Roots of Characteristic Polynomial	
Endogenous variables: FDI MR EGR	
Exogenous variables:	
Lag specification: 1 1	
Date: 04/22/25 Time: 22:18	
Root	Modulus
1.000000	1.000000
-0.578456	0.578456
-0.569280	0.569280

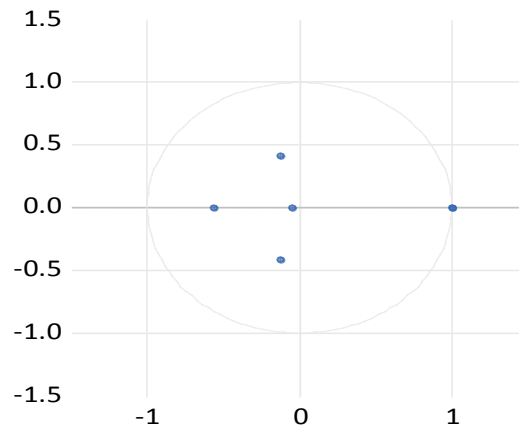
-0.127657 - 0.414303i	0.433524
-0.127657 + 0.414303i	0.433524
-0.051085	0.051085
VEC specification imposes 1 unit root(s).	

Source: prepared by the researchers based on the outputs of the statistical program (Eviews.V. 13)

From the data in the table above, we notice that most of the unit roots and coefficients are less than one. This means that the model does not suffer from the problem of error correlation. This is clearly evident from the following figure.

Fig n°(03) : Model stability test

Inverse Roots of AR Characteristic Polynomial



Source: prepared by the researchers based on the outputs of the statistical program (Eviews.V. 13).

Since most of the polynomials lie inside the circle, this confirms the stability of the model.

Normality Test: it is related to the tests of the normal distribution of the model's residuals, and aims to verify whether the series of residuals exhibits the characteristics of the normal distribution. The most important of these tests are the following:

✓ **Skewness & Kurtosis Testing:** in this test, we say that the residuals of the model follow a normal distribution if and only if: there is symmetry and normal flatness (we accept the null hypothesis), where we compare the calculated value with its corresponding tabulated value $X^2(1-\alpha)(df)$. Where the α coefficient indicates a (95%) confidence interval in this study, and (df) refers to the degree of freedom. If the table value is greater than the calculated value, we accept your hypothesis of symmetry and natural flatness, and vice versa, knowing that:

- $X^2(1 - 0.95)(3) = 7.81$;
- $X^2(1 - 0.95)(2) = 5.99$;
- $X^2(1 - 0.95)(1) = 3.84$.

✓ **Jaque-Berra Testing:** through this test, we also compare the calculated value (X^2) with its corresponding table at a 5% confidence interval. The results obtained are summarized in the following table:

Table n°(0 3): A residue screening test

	J.Berra	Kurtoses	Skewness
1	0.005419	3.024089	-0.029511
2	4.87815	5.456781	-1.800596
3	6.674690	5.024752	-2.444839

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Source: prepared by the researchers based on the outputs of the statistical program (Eviews.V. 13).

From the table above we notice that most of the calculated values (X^2) are smaller than the tabulated values (X^2) for the model residuals. This leads us to accept **the null hypothesis** in all three tests, and therefore the residuals of **the model follow a normal distribution**.

- ✓ **White Testing (Test of homogeneity of variance for the residuals of the model):** through this test, we ensure the homogeneity or lack of difference in the variance of the model's residuals, This is done through **the White test**. Accepting the null hypothesis through this test means the presence of homogeneity, and this is when the tabulated (X^2) values are greater than the calculated (X^2) values and vice versa.

Table n°(0 4):test of homogeneity of variance for the residuals

$X^2(6)$	
res1*res1	6.674814
res2*res2	4.228903
res3*res3	3.272125
res2*res1	10.56853
res3*res1	1.368748
res3*res2	4.144419

Source: prepared by the researchers based on the outputs of the statistical program (Eviews.V. 13).

It is clearly shown through the table (X^2) that the calculated values (X^2) are less than the scheduled value and estimated by: $X^2_{(1 - 0.95)(06)} = 12.59$, this means accepting the nihilistic hypothesis, with the presence of the remaining model.

4. Form estimate results: all the results extracted and obtained from the (Eviews. V. 13) program appear through the following equations:

VAR Model - Substituted Coefficients:

$$D(\text{FDI}) = -0.0220763587468 * (\text{FDI}(-1) + 0.547773962663 * \text{MR}(-1) - 4.56051421615 * \text{EGR}(-1) + 11.8962774336) - 0.532460912356 * D(\text{FDI}(-1)) - 0.140868175049 * D(\text{MR}(-1)) - 0.0729666621498 * D(\text{EGR}(-1)) + 0.0195123512435$$

$$D(\text{MR}) = 0.0216624212369 * (\text{FDI}(-1) + 0.547773962663 * \text{MR}(-1) - 4.56051421615 * \text{EGR}(-1) + 11.8962774336) - 0.0617554140119 * D(\text{FDI}(-1)) - 0.106949101293 * D(\text{MR}(-1)) + 0.0104161442158 * D(\text{EGR}(-1)) - 0.0614153633639$$

$$D(\text{EGR}) = 0.315842926707 * (\text{FDI}(-1) + 0.547773962663 * \text{MR}(-1) - 4.56051421615 * \text{EGR}(-1) + 11.8962774336) - 0.116404204078 * D(\text{FDI}(-1)) - 0.592406588008 * D(\text{MR}(-1)) + 0.214347529965 * D(\text{EGR}(-1)) + 0.0514446504326 \dots (4).$$

The results of the model appear as follows:

- ✓ **Foreign direct investment in Algeria** in the short term affects **positively** on economic growth rate at an amount of (0.315842926707). The **positive impact** relationship between foreign direct investment (FDI) on economic growth (EGR) in the short term is consistent with a set of previous studies. Based on the study (Abdelhakem, 2017) entitled «**Les politiques d'industrialisations en Algérie : approche historiques et perspectives d'avenir**», foreign direct investment is the true mechanism for supporting economic growth in any country, as it

contributes to providing what any country lacks in terms of professional, financial and technological expertise, as well as new management methods that can create a fundamental difference, within a short period. Accordingly, and based on this, foreign direct investment (FDI) plays a major role in enhancing economic growth in the host country in the short term through its direct and indirect impact on various channels that transmit the effect, most notably: technology transfer - capital flow - introduction of new operations and management methods - realizing gains, profits and production returns and opening up new market opportunities. In the long term, it **negatively** affects (- **0.116404204078**). If we follow some previous studies on the same topic (Sandrine, 2002) that finds that although foreign direct investment contributes to supporting economic growth in the short term due to its presence of various channels, in the long term it does not contribute to the same effect. The presence of foreign companies in the host country leads to the creation of an inverse relationship between foreign direct investment and establishment costs (Selma, 2013) believes that the total net benefits achieved from foreign investment flows into the host country do not generate any benefits but are all transferred to the original source. This type of foreign investment is likely to be negative because the host country to lose national sovereignty which results in dire negative consequences. The major concern with foreign direct investment flowing into a host country is especially traditional industries that it will destroy local industries and true advantage of each country;

- ✓ **The remittances of migrants in Algeria** in hard currency in the short term affect **positively** on economic growth at the amount of (**0.547773962663**). This is consistent with previous studies discussed in our research paper, most notably the study (Al Mosharraf, Sahabuddin, & Saha, 2024), which suggests that the flows resulting from remittances from migrants working abroad can support economic growth in the short term by creating micro-enterprises that create new job opportunities and reduce poverty. Here too, the (Fattalah, 2005) sees that remittances from migrants abroad have positive social effects in the short term in the receiving country, they are an important source for low-income families, especially in developing countries, as they provide the necessary hard currency, which is considered a scarce input and not available locally. This type of international financing source also depends on the nature of spending in the host country. If spending is solely on consumption, the impact of this type of remittance is only short-term. In contrast, spending this type of foreign inflow on land purchases and productive investment would impact economic growth not only in the short term, but also in the short, medium, and long term. While in the long term it **negatively** affects (**-0.592406588008**), this is in complete agreement with previous studies already discussed in this research paper. We have a study (Noah, 2023) that finds that remittances from migrants to their countries of origin can cause severe economic impacts, most notably unemployment, this would also cause unexpected shocks to the labor market, it increases inequality in income distribution, creating barriers for families who cannot achieve acceptable levels of capital. In addition to the above, the previous study demonstrated that in the absence of an effective fiscal policy, it is impossible for migrant remittances to positively impact economic growth. Rather, they will negatively impact it, given the dominance of foreign goods in the local market.

Conclusion

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At the end of our research study, we answer the problem and accept the hypothesis presented in our research paper through the following points:

- **FDI** has a positive impact on **EGR** in the short term by a factor of **(0.315842926707)** and a negative impact on the long term by a factor of **(- 0.116404204078)**. This is in complete agreement with most previous studies and the specificity of the Algerian economy;
- **MR** has a positive impact on **EGR** in the short term by a factor of **(0.547773962663)** and a negative impact on the long term by a factor of **(- 0.592406588008)**. This is also in agreement with most previous studies and the specificity of the Algerian economy;
- Algeria can benefit from foreign direct investment in projects outside the hydrocarbon sector, in order to support emerging small businesses by attracting high technologies, skilled foreign workers, and new management methods;
- Algeria's reliance on fiscal policy to address macroeconomic and microeconomic imbalances enables it to leverage migrant remittances to support small-scale investment projects and create new job opportunities, instead of hydrocarbon revenues.

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Appendices

Annual data for the variables under stud :01 .Appendix Noy in Algeria

FDI: Net flows ,% GDP Algeria											
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0	0	0.1	0	0	0	0.6	0.5	0.5	1.3	0.5	1.9
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1.7	0.9	1	1.1	1.5	1.2	1.5	1.8	1.3	1.2	0.7	0.7
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	-	-
0.6	-0.3	0.9	0.6	0.8	0.7	0.7	0.5	0.4	0.5	-	-
MR: personal remittances, received % of GDP – Algeria											
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0.6	2.8	2.9	2.3	3.3	2.7	1.9	2.2	2.2	1.6	1.4	1.1
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1.7	2.4	2.7	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	-	-
1	1.1	1.1	0.9	1	0.9	1	1	0.8	0.8	-	-
EGR: Economic Growth annual Rate % _ Algeria											
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
2.7	1.2	2	1.8	3.3	3.1	3.6	4	2.8	3.6	4.5	2
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2.3	3.1	4.5	4	4.5	4.4	2.1	-1.3	4.5	3.3	2.7	2.9
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	-	-
3.1	3.1	2.8	3.5	3.3	2.7	-2.9	6.4	3.2	2.8	-	-

Source: prepared by the researchers based on World Bank data via the following links:

1. FDI Database in Algeria: <https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS?end=2024&locations=DZ&start=2000&view=chart>
2. MR Database in Algeria: <https://data.worldbank.org/indicator/BX.TRF.PWKR.DT.GD.ZS?end=2023&locations=DZ&start=1970&view=chart>
3. EGR Database in Algeria: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=DZ>

.Appendix No02:Statistical program outputs (Eviews. V. 13)

Null Hypothesis: D(FDI) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

**Constant
only**

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.356453	0.0001
Test critical values:		
1% level	-3.661661	
5% level	-2.960411	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(FDI) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Fixed)

**Fixed and
directional**

t-Statistic Prob.*

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Augmented Dickey-Fuller test statistic		-5.793196	0.0002
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(FDI) has a unit root

Exogenous: None

Lag Length: 1 (Fixed)

None

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.435264	0.0000
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MR) has a unit root

Exogenous: Constant

Lag Length: 1 (Fixed)

**Constant
only**

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.590760	0.0001
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MR) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Fixed)

**Fixed and
directional**

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.545348	0.0004
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(MR) has a unit root

Exogenous: None

Lag Length: 1 (Fixed)

None

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.608551	0.0000
Test critical values:		
1% level	-2.641672	
5% level	-1.952066	
10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(EGR) has a unit root
 Exogenous: Constant
 Lag Length: 1 (Fixed)

**Constant
only**

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.981164	0.0000
Test critical values:		
1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(EGR) has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 1 (Fixed)

**Fixed and
directional**

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.846204	0.0000
Test critical values:		
1% level	-4.284580	
5% level	-3.562882	
10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(EGR) has a unit root
 Exogenous: None
 Lag Length: 1 (Fixed)

None

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.068562	0.0000
Test critical values:		
1% level	-2.641672	
5% level	-1.952066	
10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Date: 04/22/25 Time: 21:56
 Sample: 1990 2023
 Included observations: 34
 Lags interval (in first differences): 1 to 1
 Endogenous variables: FDI MR EGR
 Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating

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relationship includes a constant. Short-run dynamics include a constant.

Unrestricted
Cointegration Rank
Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.520306	35.57732	29.79707	0.0096
At most 1	0.240626	12.06991	15.49471	0.1536
At most 2	0.096902	3.941568	3.841465	0.0709

Trace test indicates 2 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted
Cointegration Rank
Test (Max-
eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.520306	23.50741	21.13162	0.0227
At most 1	0.240626	15.808346	14.26460	0.0025
At most 2	0.096902	3.901568	3.841465	0.0009

Max-eigenvalue test indicates 3 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 04/22/25 Time: 22:37
Sample: 1990 2023
Included observations: 32

Component	Skewness	Chi-sq	df	Prob.*
1	-0.029511	0.004645	1	0.9457
2	-1.800596	17.29145	1	0.0000
3	-2.444839	31.87861	1	0.0000
Joint		49.17471	3	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	3.024089	0.000774	1	0.9778
2	5.456781	55.58669	1	0.0000
3	5.024752	65.79608	1	0.0000

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Joint	121.3835	3	0.0000
Component	Jarque-Bera	Df	Prob.
1	0.005419	2	0.9973
2	4.878150	2	0.0000
3	6.674690	2	0.0000
Joint	170.5583	6	0.0000

*Approximate p-values do not account for coefficient Estimation

VEC Residual Heteroskedasticity Tests (Levels and Squares)

Date: 04/22/25 Time: 22:39

Sample: 1990 2023

Included observations: 32

Joint test:

Chi-sq	df	Prob.
39.95193	48	0.7891

Individual components:

Dependent	R-squared	F(8,23)	Prob.	Chi-sq(8)	Prob.
res1*res1	0.208588	0.757747	0.6421	6.674814	0.5721
res2*res2	0.132153	0.437797	0.8859	4.228903	0.8359
res3*res3	0.102254	0.327465	0.9468	3.272125	0.9161
res2*res1	0.330266	1.417752	0.2417	10.56853	0.2274
res3*res1	0.042773	0.128468	0.9973	1.368748	0.9947
res3*res2	0.129513	0.427749	0.8922	4.144419	0.8439