

The Attractiveness factors of Foreign Direct Investment in Algeria: the ARDL bounds testing approach (1990-2016)

عوامل جذب الاستثمار الأجنبي المباشر في الجزائر: دراسة باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة (ARDL) خلال الفترة 1990 قياسية 2016

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Received:30/10/2019

Accepted :08/01/2020

Published :15/01/2020

ملخص: تهدف هذه الورقة البحثية إلى دراسة أهم المحددات والعوامل المؤثرة في استقطاب و تدفق الاستثمارات الأجنبية المباشرة في ظل الإصلاحات الاقتصادية و السياسية التي قامت بها الحكومة الجزائرية منذ سنة 1990 . و لتحقيق أهداف هذه الدراسة تم اعتماد دراسة قياسية باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة *ARDL* خلال الفترة 1990-2016. وقد خلصت الدراسة إلى مجموعة من النتائج أهمها : أن هناك علاقة طردية في الأجل الطويل بين تراكم رأس المال الثابت ، سعر الصرف الحقيقي ، الانفتاح الاقتصادي ، الإنفاق العام ، معدل النمو الاقتصادي و بين الاستثمار الأجنبي ، بينما هناك علاقة عكسية بين المتغيرات المفسرة الأخرى و المتمثلة في : حجم الضرائب ، معدل التضخم ، معدل الفائدة و حجم المعروض النقدي. **الكلمات المفتاحية:** الاستثمارات الأجنبية المباشرة ، نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة *ARDL*، اختبار الحدود ، حد تصحيح الخطأ *ECT* .

تصنيف JEL: F21

Abstract:

This paper aims to study the most important attractiveness determinants and factors of foreign direct investment in light of the economic and political reforms adopted by the Algeria government since 1990. To achieve the objectives of this paper , an econometric study is adopted using the autoregressive distributed lag (ARDL) approach over the period 1990-2016. The results of this study showed that There is a positive long-term relationship between the gross fixed of capital formation, the real exchange rate, trade openness, government spending, economic growth rate and the foreign direct investment, while there is a negative relationship between other explanatory variables as: taxation, inflation rate, interest rate , and monetary aggregate .

Key words: Foreign direct investment, the autoregressive distributed lag (ARDL) approach, Bound testing, ECT (error correction term).

Jel Classification Codes : F21

1-Introduction:

The emergence of globalization as predominant configuration of the global economy has contributed to a reevaluation of the place and role of foreign direct investment in national economies. For long time, the behavior of governments whether of both developing and developed countries toward foreign direct investment has been changed. In this sense, there has been competition between governments to attract investments.

Algeria, as one of many developing countries, has increasingly come to see foreign direct investment not only as a source of economic development, but also a tool for modernization and growth, etc. This is reflected by the current economic reforms and policies to improve the business climate in order to attract more investment and maximize its benefits in the domestic economy.

In fact, according to the UNCTAD report, foreign direct investment into Algeria, which depends heavily on investment in oil and gas, fell 26 per cent to \$1.2 billion realized in 2017 despite the bundle of incentives offered by the country's new investment law (**UNCTAD, 2018**). However, the achievements of Algeria in attracting FDI are still low compared to its potentiality and its performance among other countries in the region

Therefore, this article aims to determine the important attractiveness factors of foreign direct investment in Algeria such as gross fixed of capital formation, trade openness, exchange rate, inflation etc, using a Bounds testing (ARDL) approach on the period 1990-2016.

The paper is organized as follows: Section 2 presents theoretical and empirical research of foreign direct investment determinants. Section 3 defines data and methodology of the study. Section 4 contains methods and materials. Section 5 provides results and discussions, and the paper concludes with Section 6.

2- Literature review:

The complexity of economic phenomenon has led to the multiplication of theoretical and empirical research efforts, justifying the wide range of hypothesis and explanatory models. The determinants of foreign direct investments attractiveness are elements with significant effects on which countries act when setting attractiveness policies, giving more consideration to the most significant variables.

There are various researches studies on the theoretical foundations of the attractiveness factors of FDI. Among this researches, there is the eclectic theory that was developed by Dunning (2000) and which is also called OLI paradigm that is based on three types of benefits to multinationalisation namely : Ownership, Location and Internalization (OLI) advantages. The extent of presence or absence of OLI either encourages or discourages firms from undertaking foreign activities.

Parallel to the theoretical researches, there are a considerable number of analytical and empirical studies of foreign direct investment FDI determinants whether in both developing and developed countries. In this paper we have tried to summarize only the most significant empirical studies:

Morisset, J studied the determinants of FDI in Africa using certain variables as the GDP growth rate, literacy rate, trade openness, an indicator of infrastructure and communication development (measured by the number of telephone lines per 1,000 people), and the share of urban population (as a percentage of total population). The estimated results of his study

indicate that GDP growth rate and trade openness are the most important factors of investment in Africa (**Morisset, 1999**).

Bevan A. A. and Estrin used a panel dataset containing information on FDI flows from market to transition economies to establish certain determinants of FDI inflows as : country risk, unit labor costs, host market size and gravity factor to Central and Eastern Europe over the period 1994-1998 . The results showed that the Market size of Central and Eastern European countries positively influence FDI. On the other hand, the labor costs factor and the geographical distance have a negative impact on FDI inflows of this region (**Estrin, 2000**).

Mohammad Hanif Akhtar examined the determinants of foreign direct investment in Pakistan through multivariate regression analysis using the time-series data for 1972 to 1996 .The results of the multivariate regression analyses reveal that market size, relative interest rates and exchange rates are the major determinants of FDI in Pakistan. The variables such as market growth and political instability were consistently insignificant in the analyses (**Akhtar, 2001**).

Bouoiyour analyzed the determinants of FDI inflows in Morocco. He found that the Market size, the cost of labor, the level of public investment, inflation, human capital and exports positively influence FDI flows in Morocco (**Bouoiyour, 2003**).

Anjum Aqeel, Mohammed Nishat and Faiz Bilquees empirically identified the determinants of growth in foreign direct investment (FDI) in Pakistan over the period 1961-2003. They studied how different variables or indicators reflecting the trade, fiscal, and financial sector liberalization attract FDI in Pakistan using the cointegration and error-correction techniques. The study considers the tariff rate, exchange rate, tax rate, credit to private sector, wage rate and index of general share price variables to see if they may explain the inflow of foreign direct investment. The results confirmed that all variables indicate correct signs and are statistically significant except for wage rate and share price index (**Anjum Aqeel, 2005**).

Xose Rodriguez and Julio Pallas examined the determinants of foreign direct investment (FDI) in Spain using the panel data over the period 1993-2002. The analysis investigated the sectoral, regional and macroeconomic variables that have successfully attracted FDI inflows. Empirical results suggest that the differential between labor productivity and the cost of labor has been an important determinant of FDI in Spain during the period 1993-2002. Factors related to demand, the evolution of human capital, the export potential of the sectors and certain macroeconomic determinants that measure the differential between Spain and the European Union average, also play a very important role in attracting flows of FDI (**Pallas, 2008**).

Muhammad Zahid Awan, Bakhtiar Khan and Khair Uz Zaman examined the major economic determinants of FDI inflows in commodity-producing sector of Pakistan, by using time series data (quarterly) covering the period of 1996Q 1 -2008Q 4 . Augmented Dickey Fuller (ADF) test has been used to check the stationarity of the data. In this study, Co-integration and Error Correction Model (ECM) are used for estimation. Results reveal that Gross Domestic Product (GDP), Real growth Rate of GDP in Commodity-Producing Sector (GRP), Gross Fixed Capital Formation (GFCF), Foreign Exchange Reserves (FOREX), Degree of Trade Openness (RTO) and Per Capita income (PC) are key determinants of FDI inflows in commodity-producing sector of Pakistan. This study explored that all these variables are found statistically significant with positive signs and had significant impact on FDI inflows into Pakistan in commodity-producing sector-(**Muhammad Zahid Awan, 2011**).

Imen Mohamed Sghaier and Zouheir Abida examined the causal linkage between foreign direct investment (FDI), financial development, and economic growth of 4 countries of North Africa (Tunisia, Morocco, Algeria and Egypt) over the period 1980-2011. Using Generalized Method of Moment (GMM) panel data analysis, they found strong evidence of a positive relationship between FDI and economic growth. They also found evidence that the development of the domestic financial system is an important prerequisite for FDI to have a positive effect on economic growth (**ZouheirAbida, 2013**).

Belloumi (2014) examined the relationship between foreign direct investment (FDI), trade openness and economic growth by applying the bounds testing (ARDL) Model for the period from 1970 to 2008. His results suggested that there is no significant Granger bidirectional causality between FDI and economic growth particularly in the short run (**Belloumi, 2014**).

Moreover, Hang Bich Phung examined the determinants that make developing countries more attractive as a destination for FDI using panel data analysis over the period 1980-2014. The result confirmed that human capital, macroeconomic stability, and market size, natural resources and labor force have all had a statistically significant impact on FDI inflows into developing countries. Unfortunately, financial development is not found to be an important determinant despite a sound theoretical argument (**Hang Bich Phung, 2016**).

3- Data source:

The study use an annual time series data covering the period from 1990 to 2016 .The data was retrieved from the World Bank database and is given in constant prices. The considered variables are: FDI –foreign direct investment, EXCH –real exchange rate, G-government spending, GFCF-gross fixed of capital formation, GY-economic growth rate, INF-inflation rate, IR-interest rate, M2-monetary aggregate, OPEN-trade openness, and TAX –taxation.

4 –Methods and Materials:

The ARDL model is used to analyze cointegration series for short and long-run dynamics, even when the time-series are stationary I(0) or integrated of order I(1). The variables may include a mixture of stationary and non-stationary time-series for ARDL Bounds testing approach proposed by Pesaran (1997), Pesaran, Smith and Shin (2001) and Pesaran et al. (2001).

The Model which specifies the long-run relationship for foreign direct investment (FDI) equation may be expressed as:

$$FDI = f(EXCH, G, GFCF, GY, INF, IR, M2, OPEN, TAX) \quad (1)$$

In order to test the co integration relationship for the FDI equation, a model was proposed by Pesaran (2001) using the bounds testing approach , represented in an autoregressive distributed lag form ARDL, known as unrestricted error correction (UECM) , which is expressed as:

$$\begin{aligned} \Delta FDI_t = & \alpha + \beta_1 FDI_{t-1} + \beta_2 EXCH_{t-1} + \beta_3 G_{t-1} + \beta_4 GFCF_{t-1} + \beta_5 GY_{t-1} + \beta_6 INF_{t-1} + \\ & \beta_7 IR_{t-1} + \beta_8 M2_{t-1} + \beta_9 OPEN_{t-1} + \beta_{10} TAX_{t-1} + \sum_{i=1}^q \gamma_1 \Delta EXCH_{t-i} + \sum_{i=1}^q \gamma_2 \Delta G_{t-i} + \\ & \sum_{i=1}^q \gamma_3 \Delta GFCF_{t-i} + \sum_{i=1}^q \gamma_4 \Delta GY_{t-i} + \sum_{i=1}^q \gamma_5 \Delta INF_{t-i} + \sum_{i=1}^q \gamma_6 \Delta IR_{t-i} + \\ & \sum_{i=1}^q \gamma_7 \Delta M2_{t-i} + \sum_{i=1}^q \gamma_8 \Delta OPEN_{t-i} + \sum_{i=1}^q \gamma_9 \Delta TAX_{t-i} + \sum_{i=1}^q \gamma_{10} \Delta FDI_{t-i} + \\ & \varepsilon_t \dots \dots \dots (2) \end{aligned}$$

Where Δ is the first difference operator; β_i are the long run coefficients; γ_i are the short run coefficients; α is the intercept and ε_t is the white noise error term and other variables are defined.

To investigate the presence of long-run relationship between examined variables, a bound test based on the F-statistics is used to estimate equation (2) in order to test for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables. In this way the null and alternative hypothesis are given as :

$$H_0 : \beta_1 = \beta_2 = \dots \beta_{10} = 0 \quad (\text{No cointegration})$$

$$H_1 : \beta_1 \neq \beta_2 \neq \dots \beta_{10} \neq 0 \quad (\text{There is cointegration})$$

Two asymptotic critical values bounds provide a test for co integration when the independent variables are I (d) (where $0=d=1$): a lower value assuming the regressors are I (0), and an upper value assuming purely I (1) regressors. If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the orders of integration for the time series. Conversely, if the test statistic falls below the lower critical value the null hypothesis cannot be rejected.

Finally, if the statistic falls between the lower and upper critical values, the result is inconclusive (**Norouzi, 2015**).

In the second step, once cointegration is confirmed ;the ARDL long run model for FDI_t is estimated as :

$$FDI_t = \sum_{i=1}^q \beta_1 EXCH_{t-i} + \sum_{i=1}^q \beta_2 G_{t-i} + \sum_{i=1}^q \beta_3 GFCF_{t-i} + \sum_{i=1}^q \beta_4 GY_{t-i} + \sum_{i=1}^q \beta_5 INF_{t-i} + \sum_{i=1}^q \beta_6 IR_{t-i} + \sum_{i=1}^q \beta_7 M2_{t-i} + \sum_{i=1}^q \beta_8 OPEN_{t-i} + \sum_{i=1}^q \beta_9 TAX_{t-i} + \sum_{i=1}^q \beta_{10} FDI_{t-i} + \varepsilon_t \quad \dots(3)$$

The last step of bounds testing approach involves estimating the error correction model (ECT) to determine a short run dynamic coefficient of the model .When there is co integration , it means that there is long run equilibrium relationship between the variables.

The ECM representation takes the following form:

$$\Delta FDI_t = \sum_{i=1}^q \gamma_1 \Delta EXCH_{t-i} + \sum_{i=1}^q \gamma_2 \Delta G_{t-i} + \sum_{i=1}^q \gamma_3 \Delta GFCF_{t-i} + \sum_{i=1}^q \gamma_4 \Delta GY_{t-i} + \sum_{i=1}^q \gamma_5 \Delta INF_{t-i} + \sum_{i=1}^q \gamma_6 \Delta IR_{t-i} + \sum_{i=1}^q \gamma_7 \Delta M2_{t-i} + \sum_{i=1}^q \gamma_8 \Delta OPEN_{t-i} + \sum_{i=1}^q \gamma_9 \Delta TAX_{t-i} + \sum_{i=1}^q \gamma_{10} \Delta FDI_{t-i} + \varnothing \text{ect}_{t-1} + \varepsilon_t \dots\dots(4)$$

Where γ_i are the short run coefficients; $\varnothing$ is the speed of adjustment and other variables are defined as previously.

5 - Results and discussion:

5-1-The sationarity of variables:

Table (1) gives the Augmented Dickey-Fuller (ADF) unit root test results for the attractiveness factors of FDI that obtain from Eviews10. The ADF test results for the variables indicate that only tow variables which G and M2 are stationary at the level, but we assume

that the other variables become after the first differences so all variables are integrated at the same order, long-run equilibrium relationship will be now investigated by using the bounds test for co-integration with ARDL modeling approach (ARDL).

Table n°1: ADF Unit Roots Tests

Variables	At Level			At First Difference			Order of Integration
	Tau,with Const	Tau,with Const and Trend	Tau,with out Const and Trend	Tau,with Const	Tau,with Const and Trend	Tau,without Const and Trend	
FDI	-2.5310	-2.582	-1.196	-5.320***	-5.588***	-5.411***	I(1)
EXCH	-1.3834	-1.771	2.500	-3.433**	-3.294*	-2.785***	I(1)
G	-1.6700	-3.035	-1.613*	-1.617	-6.068***	-1.185	I(0)
GFCF	-0.0640	-1.272	1.022	-3.947***	-4.653***	-3.855***	I(1)
GY	-3.2073**	-3.418*	-0.676	-8.446***	-8.400***	-8.544***	I(1)
INF	-1.4683	-1.751	-1.332	-5.164***	-5.191***	-5.166***	I(1)
IR	-3.2974**	-4.044**	-3.382***	-6.847***	-6.683***	-6.926***	I(1)
M2	2.7563	--1.470	-2.533**	-2.753*	-2.274	-0.297	I(0)
OPEN	-1.5474	-0.909	0.120	-4.660***	-4.734***	-4.769***	I(1)
TAX	0.3705	-2.329	2.584	-4.459***	-4.497***	-3.459***	I(1)

Note : (***), (**), (*) denotes significance at 1;5 and 10 percent significance level respectively

Source: Computed by Authors using Eviews10

5-2-The co-integration test :

The results presented in the table (2) indicate that the calculated F-statistics surpassed the upper critical bound at all significance levels and the null hypothesis of no co integration is rejected .This means that there is a long-run relationships between the examined variables.

Table n°2: Critical Values for ARDL Modeling Approach

Test Statistic	Value	Signif	I(0)	I(1)
F-statistic	7,82	10%	1,8	2,8
		5%	2,04	2,08
		2.5%	2,24	3,35
		1%	2,5	3,68

Source: Computed by Authors using Eviews10

5-3-Long-Run Estimates:

The estimated long run coefficients presented in the table (3) show that gross fixed of capital formation GFCF in Algeria have a very high significant positive effect on FDI. A 1% increase in GFCF leads to approximately 0, 08% increase in FDI, all things being equal. The real exchange rate EXCH, the government spending G , economic growth rate GY and the openness OPEN have a significant positive impact on FDI too. A 1% increase in real exchange rate EXCH, the government expenditure G , economic growth rate GY and the openness OPEN lead to approximately 0,02 ,0004 ; 0,001 and 0,002% increase in FDI.

Table n°3: Estimated Long Run Coefficients using the ARDL Approach

ARDL (2,1,1, 0,0,1,1,1,1,0) selected based on Akaike Info Criterion . Dependent variable is FDI _{It} .				
Variables	Coefficient	Std.Error	t-Statistic	Prob
EXCH	0.020280	0.007730	2.623657	0.0342
G	0.000476	0.000185	2.574279	0.0368
GFCF	0.079009	0.030085	2.626159	0.0341
GY	0.001732	0.032774	0.052836	0.9593
INF	-0.034196	0.014435	-2.368989	0.0497
IR	-0.022650	0.015632	-1.448967	0.1906
M2	-0.000394	0.000133	-2.952655	0.0213
OPEN	0.026140	0.013031	2.006038	0.0849
TAX	-9.34E-05	0.000145	-0.644945	0.5395
C	-3.072011	0.716722	-4.286199	0.0036

Source: Computed by Authors using Eviews10

5-4-Short-Run Estimates:

The results of the error correction term *CointEq(-1)* are reported in table (4) below indicate that most variables affect FDI in short run. The estimate results represented by the following ECT equation:

$$\text{Coint Eq} = \text{FDI} - (0,02.\text{EXCH} + 0,0005.\text{G} + 0,07.\text{GFCF} + 0,0017*\text{GY} - 0,003.\text{INF} - 0,002.\text{IR} - 0,0004.\text{M2} + 0,02.\text{OPEN} - 0,0001.\text{TAX} - 3,07.X) \dots\dots\dots(3)$$

Table n°4: Error Correction Representation for the Selected ARDL Model

ARDL ((2,1,1, 0,0,1,1,1,1,0) selected based on Akaike Info Criterion. . Dependent variable is DFDI _{It}				
Variables	Coefficient	Std.Error	t-Statistic	Prob
D(FDI(-1))	0.643307	0.089773	7.165891	0.0002
D(EXCH)	-0.044639	0.005523	-8.082950	0.0001
D(G)	0.000177	9.08E-05	1.954935	0.0915
D(INF)	-0.005639	0.006744	-0.836090	0.4307
D(IR)	-0.013918	0.003945	-3.527748	0.0096
D(M2)	-4.75E-05	6.44E-05	-0.738558	0.4842
D(OPEN)	0.005784	0.008627	0.670406	0.5241
CointEq(-1)	-1.525747	0.105531	-14.45784	0.0000
Diagnostic tests (Prob-value)				
Breusch-Godfrey Serial Correlation LM Test			0,43	
Heteroskedasticity Test :ARCH			0,23	
Jarque -Bera			0,84	
Ramsey RESET Test			0,59	
Adjusted R-Square			0,94	

Source: Computed by Authors using Eviews10

The significance of the error correction term ECT(-1) at 1 percent level indicates evidence of causality running from the explanatory variables to FDI . The coefficient of ECT(-1) reported is - 1,52 , indicating that about 152 % of disequilibrium in the system will be corrected in 1 year . This coefficient is out of the range of what is theoretically accepted (that is between 0 to -1).

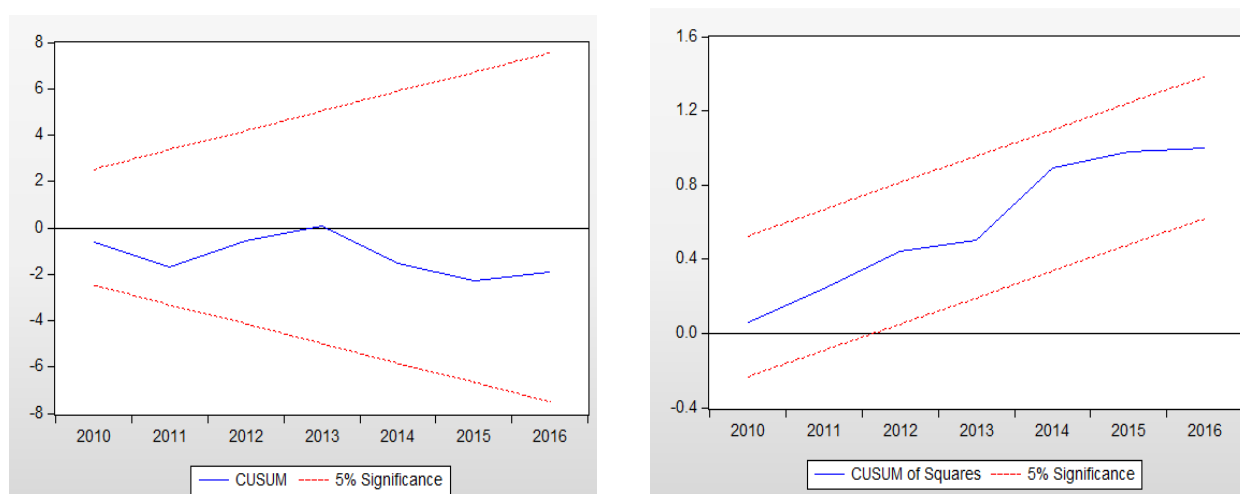
Diagnostic tests for serial correlation, specification, parameter stability, normality and, heteroskedasticity were conducted and the results are shown in table (4) . The results indicate that

no evidence of serial correlation, heteroskedasticity was found. Jarque-Bera test suggests a normal distribution; Ramsey RESET test for model specification has also passed the test.

5-5-CUSUM and CUSUMQ stability tests:

Finally, to establish the stability of the model the CUSUM test was applied to test for parameter stability. The decision rule based on the blue line, that is, when the blue line is within the two red lines the model is stable, otherwise it is not. Based on the results reported in figure below, the model estimated is stable at 5 percent level, implying no issue of parameter instability during the period.

Figure n°1: CUSUM test for parameter stability



Source: Authors , using Eviews10

6- Conclusion:

After having made a theoretical and empirical literature review on determinants of foreign direct investment, this article is a contribution to the literature that addresses the factors of attractiveness of FDI inflows into a given country. It empirically examines the attractiveness factors of foreign investment in the case of Algeria using the ARDL bound testing approach over the period of 1990-2016 .

The results of the study indicate that the main variables which have influence on dependent variable FDI in long-term are: GFCF-gross fixed of capital formation, EXCH-real exchange rate, OPEN-openness, G-government spending and GY-economic growth rate, while the others variables proved to be statistically insignificant.

Based on the above findings, we can conclude that, government must be taken in consideration all factors to improve business climate in order to attract more investments in Algeria.

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