
| RESEARCH ARTICLE

Monetary Policy and its Role in Attracting Foreign Direct Investment: A Study in the Iraqi Economy for the Period (2004-2018)

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| ABSTRACT

The aim of the research is to identify the performance of some variables related to monetary policy and foreign direct investment, as well as to identify the impact of monetary policy variables on foreign direct investment through the use of the descriptive analytical method as well as the quantitative approach. Foreign direct investment (FDI) is the most important variable to improve capital formation within the host country, which makes most countries exert their utmost efforts to attract foreign direct investment, as this study attempts to know the impact of some monetary policy variables and their role in attracting foreign direct investment (FDI) in Iraq. To achieve this goal, a time series extending from 2004-2018 was used through the use of the standard model on the statistical program E-views10 and by conducting tests for both induction (Extended Dickey Fuller (ADF) as well as Phillips-Peron test (PP)) and clarification of the integration relationship; the joint and using the boundary test methodology between the monetary policy variables (the exchange rate, the inflation rate, and the interest rate) and foreign direct investment and estimating the relationship within the short term using the Autoregressive Distributed Deceleration Model (ARDL), as well as knowing the causal relationship between the independent research variables and the dependent variable (FDI). It was concluded through the results presented by the tests that there is a negative and positive impact of some of the monetary policy indicators that were used, and the positive impact is on the two indicators of interest rate and inflation rate, as their impact on foreign direct investment in the Iraqi economy (1.485) and (0.18414) respectively, and the negative impact is for the exchange rate index, as its impact on foreign direct investment (FDI) in Iraq was (-0.00024). During the Kranger causal test, the results confirm the absence of a causal relationship between the research variables in Iraq's foreign direct.

| KEYWORDS

Foreign direct investment, monetary policy, economy

| ARTICLE INFORMATION

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1. Introduction

Foreign direct investment is one of the most important topics in economics, and it is a means of low-cost development compared to foreign loans. The direct has an important role in developing the production capabilities of its host countries through its use of an advanced technological level in production methods while creating employment opportunities, as well as increasing exports...etc. That is why most countries seek to attract the largest amount of foreign direct investment because of its positive effects, and this is through legislation by reducing or eliminating customs barriers and facilitating administrative obstacles, as most countries follow procedures and policies that work to attract the largest possible flows of foreign direct investment, and that monetary policy is one of the pillars of economic policies, through which the state works to attract this investment through the various mechanisms and tools of monetary policy. The countries also seek to make the tools of monetary policy work efficiently and effectively, as they are compatible with the state's economic policies in order to achieve the goals. The desired expansion in domestic credit is one of the components of the monetary base, which leads to an increase in the money supply, which leads to a reduction in the interest rate, which is positively reflected in investment and aggregate demand, and this leads to an increase in gross domestic product and national income, and that there is a link between the effectiveness of policy cash and the increase in

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national income and gross domestic product, which works to attract foreign direct investment. The research has been divided into three main topics, where the first topic included the research methodology and previous studies, the second topic included the theoretical framework of the research, and to complement the research, the third topic was employed in presenting the applied side as well as conclusions and recommendations.

2- Previous studies:

Mohamed Zaki Salama (2018) conducted a study on 'The impact of monetary policy and its role in attracting foreign direct investment in Iraq for the period 2000-2016'. The study used the descriptive method in framing the theoretical side and the analytical method in presenting the practical side, as the study found the negative impact and the positive impact of some monetary policy variables on foreign direct investment in Iraq and the positive impact of the money offer was (2.26), while the negative impact is for the two price indicators The exchange rate and the inflation rate, as the percentage of their impact on foreign direct investment (FDI) in Iraq was (-3.77) and (-14.22), respectively, and the study recommended the need to work on facilitating the procedures for granting licenses for investment projects, as well as achieving greater independence of monetary policy, and following a monetary policy Contribute to achieving the appropriate investment climate for foreign direct investment.

Mohammed Al-Hassan Allawi and Karim Borusha (2015) conducted a study on 'The impact of monetary and fiscal policy on foreign direct investment flows in Algeria, a standard study for the period 1990-2012'. The study aimed to know the impact of the monetary and fiscal policy followed, which in turn leads to attracting foreign direct investment (FDI), and through the vector autoregressive model (VAR), and the variables used for the monetary policy represented by (monetary mass M2, discount rate and exchange rate), as well as public expenditures as a variable representing Financial policy, as well as foreign investment coming to Algeria as a variable for foreign direct investment (FDI), as the study reached a set of recommendations, the most important of which is the existence of a one-way causal relationship between the discount rate, the mass of money and public spending on the one hand and foreign direct investment on the other side, in addition to the existence of a positive impact of monetary policy and finance in foreign direct investment

Matthias Busse et al. (2010) conducted a study on 'Foreign direct investment and exchange rate regimes, using a data set of direct investment flows and determining the effect of the effective exchange rate regime for FDI flows'. The study concluded that there is a strong impact of fixed exchange rates on foreign direct investment flows in advanced economies, and the absence of a significant impact in developing countries, and therefore the lack of a systemic and unified effect of stable exchange rates on foreign direct investment, and there are many possible explanations for the difference from country to country, and the most important recommendations made by the study are the conclusion of bilateral investment treaties or accession to regional trade agreements, rather than focusing on the exchange rate regime.

Magdalena Rădulescu et al. (2012) conducted a study on 'The Impact of Monetary Policy Factors on Foreign Direct Investments: Empirical Evidence from Romania 1995-2008'. The monetary policy of the National Bank of Romania (NBR) was based, in particular, on some restricted monetary tools and maintained for a long time and at high rates, and this shows that the discount rate is high as well as the high rate of the minimum reserves of the local currency and that this rise helps to attract foreign direct investment (FDI). The empirical results showed that monetary factors such as (high interest rates and high inflation) attracted foreign direct investment in the past decade and that the most important recommendation of the study, Romania should focus on improving the non-financial factors that significantly affect the investment environment (infrastructure, legal and political stability) in the long term.

3-Research Methodology

3.1 The research problem:

The research problem is the following question: What is the impact of monetary policy on attracting foreign direct investment in Iraq? Isn't this question branching out from several sub-questions, which are the following: How efficient is monetary policy in increasing income and monetary stability in Iraq? What are the mechanisms and tools that were used by the monetary policy to attract foreign direct investment? Did Iraq succeed in attracting foreign direct investment during the research period?

3.2 The aim of the research:

The aim of the research is the following:

Reality study of some variables related to monetary policy and foreign direct investment during the research period.

Knowing the role of monetary policy in attracting foreign direct investment in Iraq.

Measuring and analyzing the relationship between monetary policy variables and foreign direct investment.

3.3 Research Hypothesis:

The research was based on the basic hypothesis, which states that there is no relationship between the independent variables represented by (inflation, exchange rate, and interest rate) and the dependent variable (foreign direct investment), and this indicates the weak influence of monetary policy variables on foreign direct investment.

3.4 The importance of research:

The importance of the research is based on highlighting the need to follow the monetary policy that attracts foreign direct investment, as well as creating the investment climate necessary to attract foreign direct investment because it helps economic progress and works to advance the development wheel of countries, as it is one of the manifestations of integration within the global economic system, which works To increase economic relations between developed and developing countries, and monetary policy has a prominent role in monetary stability as well as increasing income through its tools, and coordination between monetary policy and other policies works to increase production and productivity, which leads to an increase in foreign direct investment, and therefore the role of economic policies In maximizing the benefit of foreign direct investment.

3.5 The limits of the research:

The spatial limits of the research are represented in the State of Iraq, and the temporal limits of the research are the period (2004-2018).

4. Theoretical framework for monetary policy

4.1 The concept of monetary policy:

Monetary policy expresses a set of measures and procedures applied by the monetary authorities, through which they control credit and monetary affairs, through a set of effects on the amount of money in line with the economic conditions of the country, as the monetary authorities seek, through these measures, to inject the state's economy With a stream of additional money or by absorbing excess liquidity (Al-Mandalawi, 2004, 1).

Thus, it is possible to arrive at a definition of monetary policy as a set of procedures and laws that the monetary authorities use in order to manage the money supply quantitatively and qualitatively, i.e., controlling the money supply in order to achieve general balance in the money market as a primary goal, as monetary authorities need information about different sectors such as: (The government sector, the business sector, the public and private financial family sector, the public and private non-financial business sector, and the external sector) when developing a monetary policy, so monetary policy is the policy that is linked to cash and that controls the money supply, and consequently the size of the purchasing power of a particular country. Therefore, "monetary policy" is a set of laws set by the monetary authorities to ensure speed and ease in the circulation of the unit of money in order to be able to perform its economic functions in a way that helps to reach the objectives of monetary policy, as monetary policy is the procedures and rules taken by the state and that Through the Central Bank in order to achieve economic stability, in order to avoid the various crises that the national economy may be exposed to (Shalghoum, 2012, 44). Thus, monetary policy has two concepts, the first is called in the narrow sense and is expressed in the actions taken by the monetary authorities in order to control the money supply to achieve certain goals, and the other is called in the broad sense, as it includes all monetary and banking regulations taken by the government and the central bank to influence the amount of cash and credit and government borrowing or the size and composition of public debt (Radwan, Nawal, 2017, 9).

Second - monetary policy tools:

Monetary policy is mainly based on managing money within the economy, and the central bank is considered committed to achieving the objectives of monetary and credit policy because of its control role on credit, as it can influence the volume of deposits in commercial banks, as it represents the money supply. The central bank has direct or indirect control tools on it, where the quantitative monetary policy tools of the central bank are represented by (discount rate, open market operations, bank rate, and legal reserve ratio) and these tools are used for indirect influence on the volume of deposits with commercial banks The internal credit policy, and the direct control of the Central Bank is through influencing the credit policy of commercial banks through controlling the volume of credit as well as how it is used and its terms, and thus the effect is on the volume and type of credit (Khalaf and others, 2019, 38). We will explain the monetary policy tools in the following:

4.2 Quantitative tools (indirect):

The quantitative tools of monetary policy are the means that affect the amount of credit through the rediscount rate, which is between the central bank and commercial banks, to influence bank credit and its cost, and thus affect the amount of money offered in the market, to treat the inflation situation within the national economy, and that Through credit, and in the event of a recession, the central bank works to reduce the rediscount rate, and this leads to a decrease in interest rates at commercial banks, which leads to an increase in credit and works to increase investment and consumption, but the commercial banks are working hard to

reconcile the price to restore Discount and interest rates imposed on loans through traditional means, and quantitative tools are often used in developed countries, and the most important of these tools are the following: (Al Qatabri, 2012, 26)

a) Re-discount price:

This tool explains the interest charged by the Central Bank in return for providing loans to commercial banks. The discount rate policy is one of the old methods of monetary policy that central banks have used as a means of controlling credit and is considered a means of controlling financing and the volume of cash balances. When inflation occurs, the Central Bank works on Raising the rediscount rate, which leads to a rise in interest rates in the money markets, and this leads to a contraction in credit, and in the event of depression, the central bank works to reduce the rediscount rate, which in turn leads to a decrease in interest rates, and thus increases credit (borrowing).) and increases investment and consumption (Al-Zahra, 2018, 39). The discount rate is determined by the central bank and thus affects the loans of commercial banks (Nouriah and Al-Zahraa, 2018, 22).

b) open market operations:

Open market operations express the buying and selling of government financial instruments of stocks and bonds in the market through the Central Bank to influence the volume of cash circulating in the market. Therefore, the Central Bank maintains a portfolio of government bonds of varying durations in order to intervene in the monetary market by buying or selling, and the objective of this is the effect on the volume of liquid funds in the open market in order to treat cases of disruption of the national economy, that is, the central bank is working to absorb quantities of money in order to influence the monetary liquidity in the markets, in order to treat cases of inflation, and the central bank may intervene as a purchaser of these assets, i.e., It provides the market with liquidity for the value of these assets to treat cases of depression, so commercial banks are the most important elements of the money market, and therefore enter into buying and selling relations with the Central Bank.

4.3 The importance of foreign direct investment

The importance of foreign direct investment is represented in (Manati, Naji, 2017, 9):-

It increases the GDP in the host country as well as improving the quality of products, especially in the case of joint economic projects such as subsidiaries of multinational companies with companies affiliated with the developing country.

It works on the development of infrastructure, such as (bridges, roads, means of transportation and communication, buildings, health, and education), which is one of the pillars of economic growth.

Providing hard foreign currencies through products for projects of this type of investment, which are intended for export and are characterized by their competitiveness within global markets, and this is reflected positively on the trade balance of the host country.

Providing job opportunities while reducing unemployment, as well as developing human capital.

It works to increase scientific and technological progress in the host country.

Foreign direct investment leads to obtaining technical and administrative skills and expertise, as well as organizational capabilities in developing countries.

Transfer of expertise from developed banks in the countries that are linked to this type of investment to the banks of the host countries.

4.4 Determinants of foreign direct investment:

The investment decision depends on many determinants in terms of achieving the goals and ambitions of the foreign investing companies and setting appropriate policies and determinants are necessary to provide the appropriate atmosphere for the investment climate, and among these policies are financial policy and monetary policy, and there are other policies, including commercial policy and industrial policy, and that these Policies have many direct effects on investment, whether foreign or domestic, in terms of wages, interest rate, prices, exchange rate, expenditures, taxes and other commercial policies (Al-Ghaliby, 2006,103).

Foreign direct investment should have a growth rate higher than the rate of export growth as well as higher than the rate of GDP growth (Ali, 2011, 79), and countries use different economic policies in order to attract foreign direct investment, and vice versa, some countries use attractive policies It encourages foreign direct investment, and that there are those who use policies that

restrict the work of foreign companies and invest in them, and the prohibition may be completely for such investment (Aziz, 2018, 26).

There are many economic factors that work to attract foreign direct investment, the most important of which are:

4.5. Inflation rate:

Inflation is a monetary phenomenon that leads to imbalances in the national economy (Al-Zubaidi, 2010, 4). High and inflation rates negatively affect production through the increase in production costs; Which is reflected in the volume of profits, and negatively affects foreign companies wishing to invest, and therefore whenever inflation rates are low, this leads to a decrease in production costs, which is one of the important factors that attract foreign direct investment (Ismail and Hassan, 2017, 20).

4.5.1 Exchange rate:

There is an inverse relationship between the relative profitability of investment returns in the countries hosting foreign direct investment (FDI) and the exchange rates. Lowering the rates of exchange rates leads to an increase in profitability for investors, and thus the devaluation of the local currency is an important factor in attracting foreign direct investment. Fluctuations in exchange rates affect the volume of investment flows, as the unusually high volatility of the exchange rate in the host country does not encourage investors to invest in this country because the instability in the exchange rate reduces the certainty of the economic prospects of the host country (Diop, 2018, 19).

4.5.2 Interest Rate:

Positive interest rates have a role in increasing investment and saving and vice versa because negative interest rates lead to an increase in the exchange rate by converting the largest percentage of savings into deposits and in foreign currency, and the negative interest rate leads to the flight of local capital (Mohammadi, 2013, 16-17).

5. Application side

5.1 The concept of silence:

Silence is the first step for most models that work on using time series in order to prove whether or not the time series is in motion, and the absence of the time series' inactivity means a false deviation or what is known as spurious regression) and the absence of stillness or stability of the time series occurs as a result of the circumstances that the country is going through, such as the presence of depression or stagnation or otherwise, as it must be ensured that the stability of the time series is still for all model variables, and the stillness is achieved within the time series if the following conditions are met (Al-Samarrai, 2018, 71):

The first condition: the fluctuation around the arithmetic mean is constant over time:

$$E(Y_t) = \mu \dots \dots \dots (1)$$

The second condition: the stability of the variance of values over time:

$$\text{Var}(Y_t) = E(Y_t - \mu)^2 = \sigma^2 \dots \dots \dots (2)$$

The covariance should be between any two values of the variable and depending on the time gap, (k) between the two values, (yt) and (yt + k), not on the actual time value at which the covariance is calculated

$$\text{Cov } Y_k = E[(Y_t - \mu)(y_{t-k} - \mu)] = Y_k \dots \dots \dots (3)$$

Where " μ ") is the arithmetic mean, while " σ " represents the variance, and (Yk) represents the covariance coefficient, and all this information is considered constants.

There are many methods used to test the stillness, and they are (Mohamed, 2014, 106)

Autocorrelation.

Dickey and Fuller Unit Root Test.

Augmented Dickey and Fuller Composite Unit Root Test.

The Philips-Peron test.

And that the unit root test is one of the most important and most important tests

5.2 Autoregressive Distributed Deceleration (ARDL):

The previous methods of cointegration analysis, such as the two-step Engel-Granger test, as well as the Johansen and Juselius test, focus on cases in which the variables of the time series are integral and of the same degree, which sets a condition for the use of these two The two methods for analyzing long-term relationships between variables (Al-Mamouri et al., 2011, 198). While the ARDL model is used to test for the existence of a long-term co-integration relationship between the model variables, regardless of the

degree of integration of these variables if they are integrated of degree I(1) or I(0) or a combination of them and according to the Bound Test, The lower bounds, upper bounds, and Wald Test are also determined, where the null hypothesis (H0) is tested, which states that there is no co-integration between the model variables, and on the other hand, the alternative hypothesis (Ha) is tested, which states On the existence of a long-term co-integration relationship between the model variables, and the calculated value (F-Statistic) and the statistical value of (Wald-Statistic) are compared with the tabular values (Nouredine, 2019).

And that the F test has a non-standard distribution, as its value depends on the degree of integration of the studied variables if they are integrated from zero degree or first degree or a combination between them, on the number of explanatory and studied variables and whether the model contains a fixed term or direction In general, if the statistic for (F and W) calculated and greater than the upper limit, then we reject the null hypothesis (there is no joint integration relationship), which means the existence of joint integration, and if it is less than the minimum limit, we accept the null hypothesis that is, the absence of joint integration, and if the values occur Calculated between the minimum and the maximum and that the result is not settled (Aziz, 2016, 86), and thus the error correction model and testing for limits can be done after determining the degree of integration of the studied model variables and by adopting the following equation:

$$\Delta y_t = \beta_0 + \sum_{i=0}^r \beta_{1i} \Delta y_{(t-i)} + \sum_{i=0}^r \beta_{2i} \Delta p_{(t-i)} + \sum_{i=0}^r \beta_{3i} \Delta m_{(t-i)} + \alpha_1 y_{(t-i)} + \alpha_2 p_{(t-i)} + \alpha_3 m_{(t-i)} + \epsilon_t \dots\dots\dots (5)$$

Since:

Δ : represents the first difference of the variable values

β_0 : constant limit

r: the number of optimum deceleration times

$\beta_{3i}, \beta_{2i}, \beta_{1i}$) : the short-term coefficients of the dynamic relationship

$(\alpha_1, \alpha_2, \alpha_3)$: the coefficients of the long-run relationship that reflect the presence or absence of co-integration

t: search time

ϵ_t : the model's random error term

And that the parameters ($\beta_1, \beta_2, \beta_3$) represent co-integration, and this indicates that the (F and W) test for co-integration, which tests the null hypothesis (H0), which states that there is no co-integration between the variables The study ($\beta_1 = \beta_2 = \beta_3$) (H0, in contrast to the alternative hypothesis (H1) which states that there is a co-integration between the study variables H1: ($\beta_1 \neq \beta_2 \neq \beta_3$)) is done by During the bounds test and by comparing the calculated statistic values (F, W) with their tabular values and under a specific level of significance (Aziz, 2016, 88), but in the case of a co-integration relationship between the studied variables according to the boundary test and the model estimates the short-term relationship According to the error correction model as follows:

$$[\Delta y]_t = \beta_0 + \sum_{i=0}^r \beta_{1i} [\Delta y]_{(t-i)} + \sum_{i=0}^r \beta_{2i} [\Delta p]_{(t-i)} + \sum_{i=0}^r \beta_{3i} [\Delta m]_{(t-i)} + YECT_{(t-i)} + \epsilon_t \dots\dots\dots (6)$$

And that is, by adding the error correction limit to the model (ECT) and (Y) expresses the percentage of the imbalance that can be corrected in the period t-1 to the period t, i.e., the speed in correcting the error for the dependent variable yt and in the short term and towards its long-term equilibrium value and its value is less than one Negative and significant indicates the existence of a long-term co-integration relationship between each of the variables, despite the short-term imbalance.

5.3 The concept of causality:

Granger's concept of causation (Granger, 1969) includes the statistical detection of the trend of the causal relationship between changes, and it can be expressed by the cause-and-effect relationship. It is possible that (Y) affects (X), and Granger's causal test gives the idea of the nature of the short-term causal relationship between the variables of the economic study, and the variable (X) affects the variable (Y) when (the calculated value is statistically significant), and the variable (Y) affects) with the variable (X) when all the calculated values are statistically significant, and thus when there is a reciprocal effect between each of the variables (X, Y) and at the same time the two parameters are statistically significant, and that in the absence of the reciprocal relationship between each of the variables (X, Y) That is, there is no effect of one of them on the other, and this is the case when the two parameters are not significant. In order to test the causality between two variables, Granger developed the causation test in order to test the following statistical hypothesis:

H0: There is no causal relationship between the two variables

H1: There is a causal relationship between the two variables

The causality is tested between the variables $[y]_t$ and x_t using the following equations:

(https://en.wikipedia.org/wiki/Granger_causality)

$$Y_t = \beta_1 + \sum_{i=1}^n \alpha_i X_{t-i} + \sum_{j=1}^m \gamma_j Y_{t-j} + u_{1t} \dots \dots \dots (7)$$

$$X_t = \beta_2 + \sum_{i=1}^n \theta_i X_{t-i} + \sum_{j=1}^m \delta_j Y_{t-j} + u_{2t} \dots \dots \dots (8)$$

From the two equations, one of the following cases can be reached:

The independent variable X influences the dependent variable Y (Y←X) when the sum of the calculated value (p_i) is statistically significant, that is, it is not equal to zero (∑ [p_i≠0]), and the calculated value of the parameter (δ) is not statistically significant when (∑ [δ_i=0]).

The dependent variable Y affects the independent variable X (X←Y) when the sum of the calculated value of the parameter (δ) is statistically significant, meaning that it is not equal to zero (∑ δ_j ≠0), and the calculated value of the parameter (p_i) is not statistically significant (∑ δ_j = 0).

The existence of the reciprocal relationship between each of the variables X and Y (Y↔X), i.e., when the parameters (δ, p_i) were statistically significant, meaning that (∑ δ_j ≠0) and (∑ [p_i≠0])

The absence of the reciprocal relationship between the variables X and Y, meaning the absence of the effect of one of them on the other, when the two parameters (δ, p_i) are not statistically significant, meaning that (∑ δ_j = 0) and (∑ p_i = 0), note that the use of The different deceleration periods are based on our reliance on the quarterly data, bearing in mind that the causality test will be very sensitive to the number of deceleration periods. (Abd, and Ali, 2016, 26-27)

Estimating the relationship between some monetary policy variables and foreign direct investment
 In this topic, the results of the standard models used in measuring the impact of the study variables (monetary policy on foreign investment flows in Iraq) and using the statistical program Eviews10 will be presented, and the data for the current study also covers the time period (2004-2018), and because of the shortness in the time series of the variables used for measurement. Diz Approach equations were used to convert annual data into quarterly data as follows:

$$X1 = Z_t - 1 + 7.5/12 (Z_t - Z_{t-1}) \dots \dots \dots (9)$$

$$X2 = Z_t - 1 + 10.5/12 (Z_t - Z_{t-1}) \dots \dots \dots (10)$$

$$X3 = Z_t - 1 + 1.5/12 (Z_{t+1} - Z_{t-1}) \dots \dots \dots (11)$$

$$X4 = Z_t - 1 + 4.5/12 (Z_{t+1} - Z_{t-1}) \dots \dots \dots (12)$$

Since:
 Z_t: indicates the value of the variable in a year (t)
 : Z_{t-1} indicates the value of the variable in the year prior to year (t)
 Z_{t+1}: indicates the value of the variable in the year following year (t)
 X_i: indicates the value of the quarter ((4,3,2,1

Here, the independent variables are defined, as well as the dependent variables that are included in the standard model. The variables included in the model are described below:

- Dependent Variables: These express the flows resulting from foreign direct investment and are measured in billions of US dollars.
- Independent Variables: which represent monetary policy tools, as follows:
 - Inflation rate: It represents the continuous rise in prices and is expressed as a percentage.
 - Exchange rate: It represents the number of national units corresponding to each foreign unit.
 - Interest rate (Interest rate): It expresses the amount of interest against loans and is expressed as a percentage.

First - the silence test:
 The stability of all the model variables is first ascertained by conducting the following stability tests:
 Augmented Dickey Fuller Test (ADF): The stability of the time series of the tested variables are verified according to the Dickey-Fuller test. , and this means that the series contains a unit root, but if the series is stable (static), this means accepting the alternative hypothesis H1: β<1), which assumes the absence of a unit root.

Table (1)

Extended Dickey-Fuller Test (ADF) for Model Variables in Iraq

Variable

The first level difference

variable

Without a fixed limit and no general direction A fixed limit and general direction A fixed limit only Without a fixed limit and no general direction A fixed limit and general direction A fixed limit only

variable	level one			The first difference			Variable
	fixed limit only	Fixed boundary and general trend	No fixed limit and no general direction	fixed limit only	Fixed boundary and general trend	No fixed limit and no general direction	
	Prob	Prob	Prob	Prob	Prob	Prob	
Investment	0.6733	0.6462	0.3056	0.0001	0.0004	0.0000	F.D.I
Inflation	0.2121	0.2417	0.0334	0.0001	0.0004	0.0000	INF
exchange rate	0.1781	0.8516	0.0997	0.0000	0.0000	0.0000	EX
interest rate	0.5880	0.4142	0.3598	0.0001	0.0004	0.0000	I

Source: The researcher's work based on the outputs of the E-Views10 program

Phillips Perron (PP) test:

It is one of the tests that is used in order to find out the stillness of the time series, and the extent of the silence of the series is tested by accepting the alternative hypothesis or the null hypothesis, where the significance of the series is based on the value of prob, as the series is static when the probability value (prob) is lower than 5 %.

Table (2)

Phillips-Peron (pp) test for model variables in Iraq

Variable

The first level difference

variable

Without a fixed limit and no general direction A fixed limit and the direction of a fixed limit only Without a fixed limit and no general direction A fixed limit and the direction of a fixed limit only.

variable	level one			The first difference			Variable
	fixed limit only	Fixed boundary and general trend	No fixed limit and no general direction	fixed limit only	Fixed boundary and general trend	No fixed limit and no general direction	
	Prob	Prob	Prob	Prob	Prob	Prob	
investment	0.6664	0.6247	0.2994	investment	0.0000	0.0000	F.DI
Inflation	0.2060	0.2185	0.0351	inflation	0.0000	0.0000	INF
exchange rate	0.2258	0.8576	0.0859	exchange rate	0.0000	0.0000	EX
interest rate	0.5668	0.4524	0.3563	0.0000	0.0000	0.0000	I

Source: The researcher's work based on the outputs of the E-Views10 program

It is clear from Table (1) and Table (2), according to the static test of the model variables, that some variables are static and at the first level, and others are static and at the first difference and in both tests, depending on the value of the prob that was less than (5%) and thus we may have met Conditions for applying an autoregressive model for ARDLs.

Secondly, the estimation of the model by ARDL method

It is not required to apply the Autoregressive Distributed Deceleration Periods (ARDL) model and to be preceded by the inactivity tests for the time series.

Table (3)
ARDL model estimation results Table (3)
ARDL model estimation results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
FDI(-1)	0.785169	0.163697	4.796485	0.0002
FDI(-2)	-3.71E-13	0.162965	-2.28E-12	1.0000
FDI(-3)	1.39E-12	0.162965	8.51E-12	1.0000
FDI(-4)	0.157823	0.235924	0.668955	0.5131
FDI(-5)	-0.267251	0.232898	-1.147505	0.2680
FDI(-6)	4.05E-12	0.176273	2.29E-11	1.0000
FDI(-7)	-1.48E-11	0.176273	-8.38E-11	1.0000
FDI(-8)	-1.334810	0.240886	-5.541248	0.0000
FDI(-9)	1.114910	0.272574	4.090303	0.0009
INF	148.5527	34.48158	4.308174	0.0005
INF(-1)	-103.0330	38.98343	-2.642995	0.0177
INF(-2)	-2.79E-10	5.287350	-5.27E-11	1.0000
INF(-3)	9.52E-10	5.287350	1.80E-10	1.0000
INF(-4)	107.4920	19.85095	5.414955	0.0001
INF(-5)	-73.47183	20.70483	-3.548536	0.0027
EX	-0.240136	0.104483	-2.298313	0.0354
EX(-1)	0.141445	0.112628	1.255856	0.2272
EX(-2)	1.77E-12	0.029191	6.06E-11	1.0000
EX(-3)	-6.35E-12	0.029191	-2.18E-10	1.0000
EX(-4)	-0.288871	0.065507	-4.409777	0.0004
EX(-5)	0.206951	0.064455	3.210787	0.0055
EX(-6)	-1.42E-12	0.025593	-5.57E-11	1.0000
EX(-7)	5.60E-12	0.025593	2.19E-10	1.0000
EX(-8)	0.066908	0.040057	1.670331	0.1143
I	18.41480	83.84061	0.219641	0.8289
I(-1)	-103.7708	68.97963	-1.504368	0.1520
I(-2)	2.39E-09	42.31885	5.65E-11	1.0000
I(-3)	-8.96E-09	42.31885	-2.12E-10	1.0000
I(-4)	-160.5340	46.52207	-3.450706	0.0033
I(-5)	96.02232	38.55608	2.490458	0.0241
I(-6)	-9.28E-10	23.81877	-3.89E-11	1.0000
I(-7)	3.36E-09	23.81877	1.41E-10	1.0000
I(-8)	154.3011	36.33690	4.246402	0.0006
I(-9)	-99.71604	37.46640	-2.661479	0.0171
C	33.74682	23.51654	1.435025	0.1705
R-squared	0.976278	Mean dependent var	-0.487353	
Adjusted R-squared	0.925869	S.D. dependent var	1.073684	
S.E. of regression	0.292331	Akaike info criterion	0.591454	
Sum squared resid	1.367321	Schwarz criterion	1.917217	
Log likelihood	19.91793	Hannan-Quinn criter.	1.098067	
F-statistic	19.36723	Durbin-Watson stat	2.196081	
Prob(F-statistic)	0.000000			

Source: The researcher's work based on the outputs of the E-Views10 program

It is clear from Table (3) that the test results of the ARDL model and the autoregressive model, as the results of the model indicate that the model is acceptable, as the coefficient of the determination reached (0.92), and this indicates that the independent variables can explain 92% of the changes in the dependent variable. And that Fisher's statistic has reached (19.367) with a high significance, as it must be noted that the arrival of the statistical value of (Durbin-Watson) from the number (2.196), which does not mean that the model is free from the problem of autocorrelation and that there are other tests that work to determine this. Which we will discuss later and in the same topic, and we note that the distribution of slowing down periods was (9, 5, 8 and 9) but the maximum degree of slowing down is (9), and the significant results of the independent variable, which ranges between the level of (5% - 10%) as well as the weak significance of the vector are at the 15% level.

Third - Co-integration test according to the ARDL methodology:

The ARDL model's co-integration test is called the Bound Test, which depends on Fisher's statistical value, compared with the lower and upper limits (Critical Value Bounds) established by Basran, which are distributed in levels. The different meanings, as shown in Table (21):

Table (4)
ARDL boundary test for cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	1.512894	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: The researcher's work based on the outputs of the E-Views10 program

We note from Table (4) that according to the limits test, there is no co-integration between the independent variables (inflation, exchange rate, interest rate) and the dependent variable (foreign direct investment flows) on the lack of co-integration and this is confirmed by the calculated value of F, whose value amounted to (1.512), and thus it is less than the tabular value of the upper bound of the same parameter Bound (I1), which amounted to (3.2), as well as less than the value of the lower bound Bound I0) which is (2.37 at the level of morale (5%), and that the economic explanation for the lack of joint integration in line with the economic theory, as the investment environment in Iraq is weak in addition to the lack of economic, political and security stability, all of this led to the absence of a relationship to joint integration and that the independent variables (inflation), exchange rate, interest rate) has a weak impact on foreign direct investment in Iraq, as this result leads to the application of the model to correct the error without long-term analysis.

Fourth - Error Correction Model According to ARDL Methodology:

The model for error correction mostly consists of two parts, the first contains the "short-term" elasticities shown in Table (5), and the second section contains the "long-term" elasticities, which we will not address because there is no co-integration between the independent variables and the dependent variable, according to the boundary test (Bound), as the results were as follows:

Table (5)
Error Correction Model (Short Term) ARDL Methodology

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI(-1))	0.329329	0.148638	2.215647	0.0416
D(FDI(-2))	0.329329	0.148638	2.215647	0.0416
D(FDI(-3))	0.329329	0.148638	2.215647	0.0416
D(FDI(-4))	0.487152	0.168971	2.883046	0.0108
D(FDI(-5))	0.219901	0.132450	1.660258	0.1163
D(FDI(-6))	0.219901	0.132450	1.660258	0.1163
D(FDI(-7))	0.219901	0.132450	1.660258	0.1163
D(FDI(-8))	-1.114910	0.187838	-5.935486	0.0000
D(INF)	148.5527	28.50601	5.211277	0.0001
D(INF(-1))	-34.02015	11.55781	-2.943476	0.0095
D(INF(-2))	-34.02015	11.55781	-2.943476	0.0095
D(INF(-3))	-34.02015	11.55781	-2.943476	0.0095
D(INF(-4))	73.47183	14.77713	4.971995	0.0001
D(EX)	-0.240136	0.086078	-2.789734	0.0131
D(EX(-1))	0.015012	0.019097	0.786090	0.4433
D(EX(-2))	0.015012	0.019097	0.786090	0.4433
D(EX(-3))	0.015012	0.019097	0.786090	0.4433
D(EX(-4))	-0.273859	0.045485	-6.020828	0.0000
D(EX(-5))	-0.066908	0.027119	-2.467187	0.0253
D(EX(-6))	-0.066908	0.027119	-2.467187	0.0253
D(EX(-7))	-0.066908	0.027119	-2.467187	0.0253
D(I)	18.41480	60.02548	0.306783	0.7630
D(I(-1))	9.926619	26.95877	0.368215	0.7175
D(I(-2))	9.926619	26.95877	0.368215	0.7175
D(I(-3))	9.926619	26.95877	0.368215	0.7175
D(I(-4))	-150.6074	26.92008	-5.594611	0.0000
D(I(-5))	-54.58505	23.28178	-2.344540	0.0323
D(I(-6))	-54.58505	23.28178	-2.344540	0.0323
D(I(-7))	-54.58505	23.28178	-2.344540	0.0323
D(I(-8))	99.71604	27.32991	3.648604	0.0022
CointEq(-1)*	-0.544160	0.176963	-3.074994	0.0072
R-squared	0.796827	Mean dependent var	-0.025833	
Adjusted R-squared	0.492066	S.D. dependent var	0.366874	
S.E. of regression	0.261469	Akaike info criterion	0.434591	
Sum squared resid	1.367321	Schwarz criterion	1.608838	
Log likelihood	19.91793	Hannan-Quinn criter.	0.883306	
Durbin-Watson stat	2.196081			

Source: The researcher's work based on the outputs of the E-Views10 program

Table (5) shows the short-term transactions and flexibility of the study model, as we note through the table the presence of the positive impact of inflation, as its increase by (1%) will lead to an increase in foreign direct investment by (148.5%), which is approximately (1.485) This is considered a good percentage, and that this effect is significant at the level (5%), as its probabilistic value was (0.0001), and we note the negative impact of the exchange rate, as its increase by (1%) will lead to a decrease in foreign direct investment by (0.240%).) which is approximately (-0.0024), and thus it is a very small percentage, as this effect is significant and at the level of (5%), as its probabilistic value was (0.0131), and we note the positive impact of the independent variable (interest rate), as its increase by (1%) will lead to an increase in foreign direct investment by (18.414%), which is approximately (0.18414), and thus it is a very small percentage, and that this effect is significant at the level of (10%), as its probabilistic value is (0.7630), and we note the high morale And at the 5% level of the vector, if its probability value is (0.007), and we note the lack of significance of the error correction coefficient (CointEq(-1)), as its value The negative, which was confined between (zero and the correct one), and this indicates that it conforms to the condition of correcting the error in terms of value and indication, since its value is (-0.54) and that it does not conform to the moral terms and this works to reinforce the results of joint integration, as the limit of The error cannot correct the imbalances, as a result of the lack of a long-term relationship between the independent variables and the dependent variable.

Fifthly - Granger causality tests:

Granger's causality test is not considered as a complementary step to the autoregressive model and ARDL ("distributed lag times"), but rather as a reinforcement step for the previous tests, where the Granger test confirms that the existence of the correlation of co-integration between each of the two variables is an indication of the existence of a causal relationship in at least one direction.

(Al-Samarrai, 2018, 75); from this point of view, because the previous results, which did not contain a co-integration relationship, mean the absence of a causal relationship between the two variables, the results were as follows:

Table (6)
Granger causality tests

Null Hypothesis:	Obs	F-Statistic	Prob.
EX does not Granger Cause FDI	51	0.16189	0.9965
FDI does not Granger Cause EX		0.05213	1.0000
I does not Granger Cause FDI	51	0.29874	0.9698
FDI does not Granger Cause I		0.53045	0.8414
INF does not Granger Cause FDI	51	0.07075	0.9999
FDI does not Granger Cause INF		0.01644	1.0000

Source: The researcher's work based on the outputs of the E-Views10 program

The results shown in Table (6) of the study model indicate that there is no causal relationship in both directions between foreign direct investment and the exchange rate, and thus the exchange rate does not cause FDI in FDI, as the probability of them (0.9965) is greater than (5) %), and also the FDI does not cause the exchange rate, because the probability of them is (1.0000) which is greater than 5%, as well as the lack of relationship between FDI and the interest rate, because the probability of them (0.9698) is greater than (5%), i.e., The interest rate in FDI does not cause foreign direct investment, and FDI does not cause interest rate, because the probability of them is (0.8414) which is greater than (5%), and as for inflation, it does not cause foreign direct investment, because the probability of them is (0.999).), which is greater than (5%), and foreign direct investment (FDI) does not cause inflation because the probability of them is (1,000), which is greater than (5%).

Sixth- ARDL Model Quality Tests:

ARDL model quality checks include:

Normal distribution of residuals: The test for the normal distribution of residuals depends on the statistical probability value (Jarque-Bera), as we accept the null hypothesis, which states that the residuals in the model are distributed normally if their probabilistic value is more than (5%), and we also accept the alternative hypothesis Which states that the residuals of the model are not distributed normally when the probability value is less than (5%). The following figure shows us that:

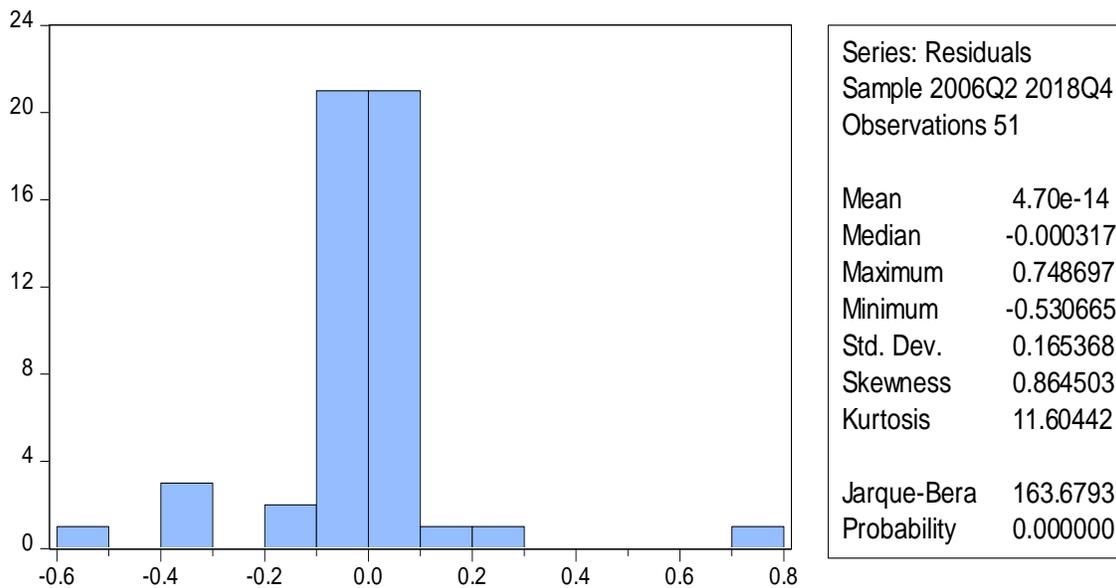


Figure (1) Normal distribution of residuals of a model

Source: The researcher's work based on the outputs of the E-Views10 program

It can be seen from Figure (1) that the shown result indicates that the residuals of the study model are not distributed normally because the probability value for them is (0.000), which is less than (5%), and the reason is due to the presence of outliers in the series of flows resulting from foreign direct investment.

Invariance stability test for errors: There are many tests that show the homogeneity and variance of errors or not, and among these tests is the Breusch-Pagan-Godfrey test, which depends on the probabilistic value of the chi-square χ^2 as the results are as in Table (7) for following:

Table (7)
Variance stability test for ARDL model errors.

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.705052	Prob. F(34,16)	0.1280
Obs*R-squared	39.96876	Prob. Chi-Square(34)	0.2221
Scaled explained SS	20.85822	Prob. Chi-Square(34)	0.9624

Source: The researcher's work based on the outputs of the E-Views10 program

It is clear from Table (7) that the probabilistic value of the chi-square of the study model amounted to (1.705), and thus we accept the null hypothesis, which states that the errors in the model are fixed in variance, and we reject the alternative hypothesis, which states that the errors in the model are not fixed in variance because it has reached greater than (5%).

ARDL model residual autocorrelation test:

Table (8)
ARDL model residual autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.666589	Prob. F(2,14)	0.5290
Obs*R-squared	4.434310	Prob. Chi-Square(2)	0.1089

Source: The researcher's work based on the outputs of the E-Views10 program

It is evident from Table (8) that the probabilistic value of the chi-square of the study model amounted to (0.1089), which means acceptance of the null hypothesis, which states that the model does not suffer from sequential autocorrelation of errors and rejecting the alternative hypothesis which states that the model suffers from sequential autocorrelation of errors, as it reached a value greater than (5%).

Seventh - Model stability tests:

After estimating the model for the autoregressive and distributed lag periods (ARDL), the procedure for testing the limits (cointegration), making the model correct the error and conducting a quality test, then the procedure for stability tests for the model and that these tests may not be performed except after re-estimating the model according to the (least squares) method.), (OLS only), where then many tests appear within the item (Stability Diagnostics), and among these recursive estimates, which include many tests, the most common and used are my tests (the cumulative sum of the residuals Cusum) and (the cumulative sum of squares). Residuals (Cusum of Square), which were made, and the results were as shown in the following figures (2) and (3):

Where the figure (2) shows the test for the cumulative sum of the residuals in the model, where the red and separate lines show the critical limits at a significant level (5%), as well as the zigzag and continuous blue series, shows the cumulative total of the residuals of the model, and the stability within the series is within the red critical limits, and it is clear For us in the study model, the series was stable throughout the research period because the blue series is within the red borders and throughout the research period.

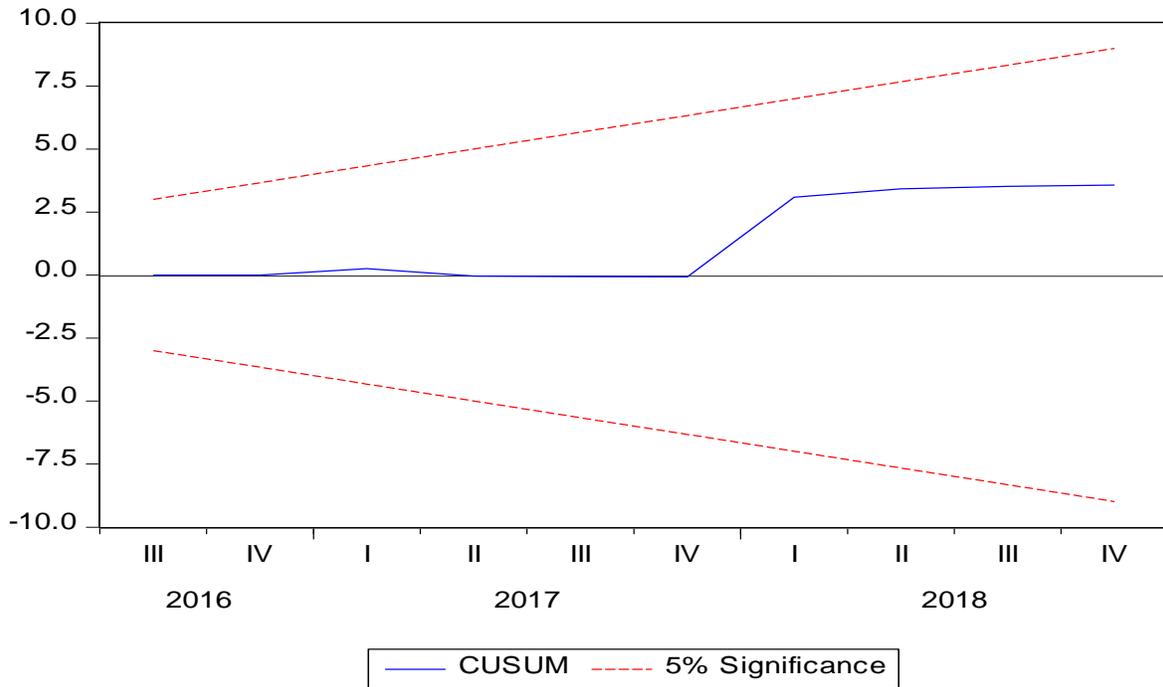


Figure (2)

Cumulative Residual Test Cusum

Source: The researcher's work based on the outputs of the E-Views10 program

As for Figure (3), the test of the cumulative sum of the residual squares of the study model shows where the red and dashed lines show the limits of the model and at the level of significance (5%), as the zigzag and continuous blue series shows the cumulative sum of the residual squares of the model, and the stability of the series is within the critical and red limits, and it becomes clear to us in the research model that the series was unstable, due to the presence of the blue series inside and outside the red limits, and it becomes clear to us in the research model that the series was unstable, due to the presence of the blue series inside and outside the red limits during the research period, as the series of residual squares outside the critical limits for the period from (the second quarter of 2017 - the fourth quarter of 2017).

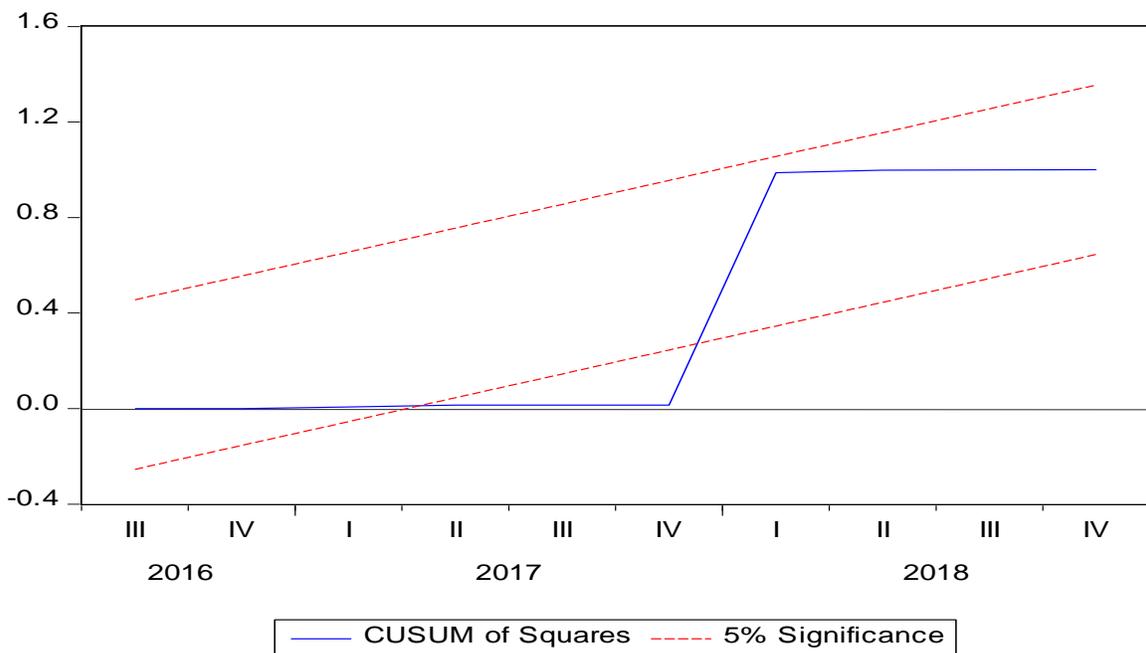


Figure (3)

Cusum of Squares Test

Source: The researcher's work based on the outputs of the E-Views10 program

6. Conclusion

Monetary policy in Iraq, which used the exchange rate policy in order to reduce imported inflation, and the interest rate policy was used in order to reduce domestic inflation, and through the use of these two mechanisms, inflation rates in Iraq were controlled.

The flows of foreign direct investment were very small during the research period and were negative during the last years of research. During the period (2013-2018), the flows of foreign direct investment were negative at an amount of 36.27 billion dollars.

Among the most important countries investing in Iraq are: - The United Arab Emirates, the United Kingdom, and the United States, as foreign direct and incoming investments to Iraq were concentrated in: - The oil and gas sectors, and therefore it is an investment looking for natural resources.

The impact of foreign direct investment in foreign trade is negative, and it did not bridge the gap of internal financial resources, as well as did not affect the manufacturing sector positively, and the Iraqi gross domestic product is mainly concentrated in the extractive industries.

The security and political instability that Iraq experienced during the research period was the weakness of the investment environment in Iraq.

The results of the standard analysis indicate that the time series of the economic study variables, some of them were stable at the level, and others were static and at the first difference, according to the developed Dickey-Fuller test, as well as the Phillips-Beron test.

The results indicate the absence of a short-term equilibrium relationship, as well as the lack of co-integration between the independent variables and the dependent variable, due to the lack of significance of the error correction coefficient.

The results also indicate that there is no long-term relationship between the independent variables and the dependent variable.

6.1 Recommendations

Working on diversification in the economic sectors within the Iraqi national economy, as well as diversification in the sources of national income, especially since Iraq has fertile land as well as fresh water in addition to labor, and through the comparative advantage that characterizes the country, it is possible that there are leading economic sectors and other than the sector Oil, which has a positive effect on national income, should rely on the real economy and not only on the rentier economy.

Working on coordination between monetary policy and other economic policies, such as (fiscal policy and trade policy) in order to attract the largest amount of foreign direct investment.

Working to achieve greater independence of monetary policy, which would face economic shocks, whether inflationary or otherwise, in order to provide an attractive environment for investment in the country.

The low rates of inflation contributed to the explanation of the flows of foreign direct investment in Iraq and that maintaining these inflation rates plays a key role in attracting foreign investment flows into Iraq.

Creating the appropriate investment environment by providing incentives to investors, as well as working on more institutional and legislative reforms, as well as encouraging investors to invest outside the oil sectors, especially with the recent decline in oil prices.

Working on Iraq's joining the economic blocs, which facilitates the flows of foreign direct investment in Iraq.

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