

The Crowding Out of Government Investment Over Private Investment in Iraq: A Standard Study Using the Model (VECM) for the Period 2004-2021

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Received: May 11, 2023

Accepted: July 7, 2023

Available online: August 2, 2023

doi:10.11114/aef.v10i3.6286

URL: <https://doi.org/10.11114/aef.v10i3.6286>

Abstract

The purpose of this research is to investigate the impact of crowding out government investment upon private investment in Iraq during the period 2004-2021. We hypothesize that the investments made by the government crowd out the investments made by the private sector. Econometric methods were used to clarify the crowding-out effect through unit root tests by using the Augmented Dickie-Fuller test (ADF), the Phillips-Peyron (PP) test for time series, and the co-integration test according to Johansen. Vector Error Correction Mechanism (VECM) and model integrity tests were also applied. The independent and dependent variables undergo a long-term equilibrium relationship. It also turns out that there is a long-standing equilibrium causal correlation that goes from the independent variables, government investment (LX1), GDP (LX2), interest rate (X3) to the dependent variable private investment (LY), because the error correction limit parameter adopts the negative mark. It is also significant according to the (t) test ($p > 0.05$), where there is an inverse significant relationship for government investment (LX1) on private investment (LY) in the long term. This means that there is crowding in-out by the investments made by the government, and an inverse significant relationship to the GDP (LX2) on private investment (LY) in the long term, and an inverse significant relationship to the interest rate (X3) on private investment (LY) in the long term. the model's effectiveness in performing and its resistance to common issues has been confirmed.

Keywords: crowding in-out, government investment, private investment, VECM

JEL: E00, E02.

1. Introduction

The concept of crowding in-out dates back to Adam Smith (1776), John Maynard Keynes (1929), Martin Bailey (1971), William Pewter (1977), and Aristes (1979). Certain studies have illustrated that crowding in-out refers to an increase in government debt to finance increased spending to cover the volume of investments, which crowds out private investment, either directly or indirectly. Crowding in-out is made directly by reducing the material resources available to the private sector, whereas indirect crowding in-out occurs through an increase in interest rates. The concept of crowding in by and large denotes to the economic impacts of expansionary fiscal measures, especially when the rise in government spending, which is financed by taxes or debt issued to the public, does not improve overall economic activity (AlHusseini, 2022). Government investment is defined as investment made and carried out by the state for infrastructure, service, and production projects, whereas private investment is defined as investment made at the level of all production and service activities by the private sector. Three diverse viewpoints on crowding in-out are evident from economic perspectives. These views are neoclassical, Keynesian, and Ricardian. The neoclassical theory holds that when the government decides to raise its investment and expenditure, private investment is crowded out by it. Neoclassicists contend that since individuals anticipate future taxes being collected through the withholding of a percentage of their income, people's spending increases as a result of government budget deficits. Neoclassicists contend that because public expenditure is less productive than private investment, the rise in production brought on by debt-financed public spending does not entirely make up for the harm caused by the general public. Given that the neoclassical viewpoint holds that there is full employment in the economy, an increase in interest rates reduces the profitability of private investment, which leads to a fall in private investment. Therefore, private investment will be displaced by government spending (Hüseyin, 2014).

Keynesian analysis contrasts to the neoclassical view, in which the economy is rarely always at full employment. The economies are at a sub-par level of employment. Keynes emphasized that this relationship can take an integrated pattern, that is, public investment stimulates private investment and raises its growth rates, which is known as the effect of integration (Abdul, 2021).

The Ricardian equivalence theory serves as the foundation for the latter point of view. When private investment and government spending are observed to work independently of one another, it is indicated that private investment does not result in a crowding in-out effect. The premise of this view is that the rise in government expenditure is unlikely to be complemented by an increase in taxes in the future. Therefore, government spending is expected to be financed through the issuance of public bonds to be repaid from the revenue generated from future taxes. Therefore As economic agents anticipate future income taxes, they maintain their existing level of savings and consumption. As a result, private investment and interest rates do not change (Hüseyin, 2014).

Crowding out is an economic principle that claims that increased public sector investment leads to lower private sector spending. The government has two options for increasing expenditure to pay for its investment: either raising taxes or borrowing more money. As the majority of government borrowing involves selling bonds, higher taxes lead to expenditure reductions among individuals and corporations. If people and investors buy these bonds, there could be less money available for private sector investments. The government may also raise interest rates to make bonds more attractive, which leads to higher interest rates in general, which discourages borrowing and spending. Critics argue that the theory of crowding in-out is incorrect and that the opposite occurs in certain circumstances as more government spending leads to more private spending which boosts the economy. Crowding out happens once the private sector is forced out of the loanable funds market as a result of greater government expenditure to finance its investments. Crowding out reduces private sector investment in the short term because higher interest rates discourage borrowing. In the long run, crowding out could crowd out the private sector and thus slow the rate of capital accumulation, which could cause a loss in economic growth. This makes borrowing more expensive for the private sector.

Crowding out happens when the availability of loans is insufficient to meet the demands of people, enterprises, and the government. When capital is in short supply, this drives interest rates to increase in order to establish a new market equilibrium. Traditionally, fixed income investors are willing to lend more to the government than to private companies as the government has the tax power to pay its bills. As a result of this, borrowing from the government is less hazardous than from the private sector. In contrast, the government is typically able to secure finance first when both it and a private enterprise need a loan. When the government consumes more of the private lending capacity of the economy, it leaves less private lending in the market. Private corporations borrowing funds to extend their factories, build new stores, or hire more employees, considering the cost of funding, could have to drop such ambitions. is either high or the money is unavailable in the money market.

Crowding out in indicates that financing investments made by the government crowds out investments made by the private sector through its acquisition of funds available in the lending market, and fewer loans to the private sector, and for all investments in the sectors of the economy (residential and non-residential buildings, construction, machinery and equipment, furniture and constants, means of transportation, agricultural assets, mineral exploration, computer programs, artistic, literary and entertainment works, other intellectual property products, major improvements to non-productive assets, including lands). The government adoption of investment plans increases the volume of government spending, which prompts the direction of obtaining more borrowing loans to implement these programs and cover the high volume of spending. Furthermore, we adopt the error correction vector mechanism to assess the effects of government investment crowding out private sector investments on the Iraqi economy and quantify the magnitude of this impact. The research was divided into the following sections: a review of the literature that focuses on prior empirical investigations, a description of the data utilized, the development of the model, a discussion of the findings; and concluding remarks.

2. Experimental Literature Review

The study of Sunitha Raju, Jaydeep Mukherjee (2007): It investigates the long-term interactions among the Indian economy's net exports, private capital formation, and fiscal deficit from 1980 -2008, including how these factors affect one another. Use of co-integration models and unit root tests was made. The study's findings refuted the idea that government spending and private investment are being crowded out of the market. In contrast, the study results refer to the Ricardian equivalence theory regarding public debt, which means that It makes no difference whether the government borrows money to pay for its expenses or raises taxes. The impact on the economy's overall level of demand will be the same. The study recommended reconsidering the rules of targeting the deficit, and determining the level of financial deficit, which requires evaluating the savings rate, the current stock of debt, the interest rate, the position of foreign exchange reserves, the degree of capital discipline, and the identification of investments (Sunitha, 2007).

A study by Hüseyin Şen and Ayşe Kaya (2014). The key purpose of this study is to analyze the effect of government spending on private investment, and to assess whether crowding out effects exist or not in Turkey for the period 1975-2011. The co-integration models that allow us to notice the impacts of each item of government spending on private investment were used. The experimental results of the research showed that the current transfer spending of the government crowds out private investment, while the government capital spending is attractive to the investment of the private sector in Turkey (Hüseyin, 2014).

Rizkallah's study (2019). It studies the impact of public investment crowding out private investment in the Egyptian economy. The study adopted the standard method to clarify the association among public investment and private investment in Egypt for the period (1982-2016) at the level of all different sectors. The Auto-Regressive Distributed Lag Time (ARDL) model was used to estimate the co-integration relationship. The research revealed that government investments crowded out private investments during the study period (Rizkallah, 2019).

Abdel Halim's study (2021). It tests the scope of the effect of crowding in among government public investment and private investment in the Egyptian economy during (1970-2017). The relationship between them was measured through the vector error correction mechanism (VECM). The findings of the long-term assessment showed that there is an inverse link between real domestic private investment and real governmental investment. This indicates that the two different forms of investment compete with one another. Additionally, it was discovered that their relationship was initially positive but changed to a negative inverse relationship over time. The long-term findings also demonstrated the reciprocal link between domestic private investment and public investment by the government, each of which contributes to the fall of the other (Abdel, 2021).

Atallah Ben Massoud's study (2015). It measures the impact of crowding in-out in the Algerian economy during the time period (1980-2011). The effect of crowding out government spending, in both its current and capital aspects, was studied for private investment by examining the amount to which public spending is diverted to the private sector and the financial resources available for lending. The results reveal that the cause of crowding in-out is capital spending, and that the infrastructure that was accomplished by virtue of the capital spending had no significant effect, while the current government spending was complementary to it. It was also illustrated that GDP has a positive and strong correlation with private investment. Real interest rates have not been affected and therefore government expenditure does not crowd out private investment on financial resources (Atallah, 2015).

Al-Husseini's study (2022). It clarifies the role of fiscal and monetary policy in crowding in-out private investment in USA, Algeria and Iraq. The ARDL standard model was used to specify the nature of the relationships between the variables. The study concluded that the crowding in-out process results from an increase in government spending financed by debt. Due to the high interest rates brought on by the expansion of the public sector, private sector spending declines as a result. Moreover, the government becomes more dependent on borrowing to finance its spending, which substantially raises the real interest rate. This leads to absorbing the economy ability to lend and limiting the ability of projects to make capital investments (AlHusseini, 2022).

According to a research by Jang Ping Thia (2019). government spending in the USA is a significant source of aggregate demand. When private sector demand is weak, the government often uses deficit spending to boost demand. Using the OLS model, deficit spending in USA crowds out about half of it in loan markets and dumps some of it in other markets. It is also turned out that one percentage point of GDP increases government deficits and increases price margins by about nine basis points on average. This is in line with crowding in-out (Jang,2019).

Alexander Nilsson's study (2020). It tests the validity of the impact of public debt rates on private investment in 26 countries in the Eurozone for the period (1999-2018) by using the OLS regression model for panel data. It turns out that public debt is negatively correlated with private investment. This is identical to the theory of crowding in-out in that increased government spending financed by bonds will crowd out private investment. A correlation was found when an effective variable (military spending) was introduced (Alexander, 2020).

Girish B., Mehdi R's study (2015). This study aims at clarifying the crowding in-out or complementarity among public investment and private investment in India. Quarterly data were used for the period (1950-1980), in addition to employing yearly time series data for (1996-2015). The study was based on the use of the vector error correction model (VECM). The results concluded a crowding in-out effect between public and private investment during the period (1950-1980), while there is an effect of complementarity between public and private investment during (1996-2015). The reason for this shift in the relationship among these variables from crowding in-out to integration is due to the reform policies approved by the government in that period (Girish, 2015).

3. Data

The current research detected the impact of crowding out government investment in favor of private investment in the Iraqi economy. The timeframe covered was 2004–2021. To apply the model and econometric tests that provide greater analytical accuracy, we changed time series data from yearly to quarterly data. (AlLahibi, 2018).

The natural logarithm was taken for three variables (government investment LX1, GDP LX2, private investment LY) in order to homogenize the units, because their data are absolute numbers. The variable (interest rate X3) is a percentage. Government investment was represented by the real fixed capital of the government sector at constant prices, GDP at constant prices. As for private investment, it was represented by the real fixed capital of the private sector at fixed prices, the interest rate, which is the policy rate. Data was collected from various sources, such as the Ministry of Planning and the Central Bank of Iraq.

Table 1. Government investment, private investment, GDP at constant prices for a base year (2007 = 100), and the interest rate in the Iraq economy (2004-2021)

interest rate %	Gross Domestic Product (million dinars)	Government investment (thousands of dinars)	Private investment (thousands of dinars)	Years
6	101845000	3247625	434764	2004
7	103551403	11133972	654988	2005
16	109389941	16837603	993523	2006
20	111455813	6861039	669364	2007
16.75	120626517	20554542	709425	2008
8.83	124702847	11254116	1164868	2009
6.25	132687028	24400333	2157756	2010
6	142700217	24989344	2390242	2011
6	162587533	31652831	3381094	2012
6	174990175	41857085	8428008	2013
6	178951406	41150560	10961751	2014
6	183616252	30879439	14648946	2015
4.3	208932109	15652411	10460244	2016
4	205130066	15710925	16293114	2017
4	210532887	22375589	11063522	2018
4	222141229	40093673	11246459	2019
4	196985514	7234651	7717113	2020
4	202468281	9266792	7649318	2021

Source: Ministry of Planning (2004-2021), Central Statistical Organization, National Accounts Unit, Iraq. Central Bank of Iraq (2004-2021), Department of Statistics and Research, Iraq

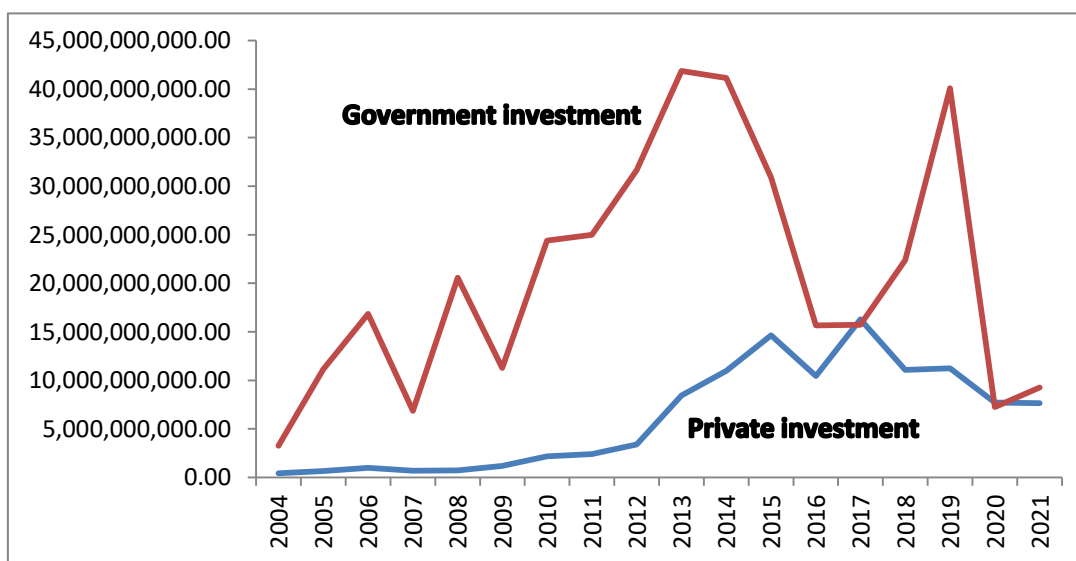


Figure 1. Government investment and private investment developments for the period 2004-2021

Source: The figure was made by the researcher

Table 2 shows the magnitude of public and private sector loans, which is important to note since, throughout the most of the research period, it was discovered that the public sector obtained the majority of loans from the money market. The private sector receives a lower percentage of loans than the government gets. Moreover, the effect of crowding in-out by the government becomes clear. Iraq has experienced administrative and financial corruption since 2003 in addition to political and economic upheaval. This led to weak economic planning, the decline of development plans, the amassing of public debt growth, and the collapse of the productive structure. This caused the weakness of the private sector and the dominance of the government sector over the economy (Niam, 2022).

Table 2. Government loans and private sector loans for the period (2004-2021) million dinars

Years	Private sector loans	Government loans
2004	810603	5732338
2005	1581696	6381243
2006	2640453	7535417
2007	3442425	8180989
2008	4553683	6807163
2009	5290727	7367466
2010	9413153	12278004
2011	12994125	15280982
2012	20770625	14750252
2013	23574328	11855657
2014	15896085	15896085
2015	28399472	28412902
2016	26616637	41490404
2017	27809664	44385068
2018	25179810	44352547
2019	26436464	43199621
2020	30937352	68112148
2021	36035284	72561851

Source: Central Bank of Iraq (2004-2021), Central Statistical Organization.

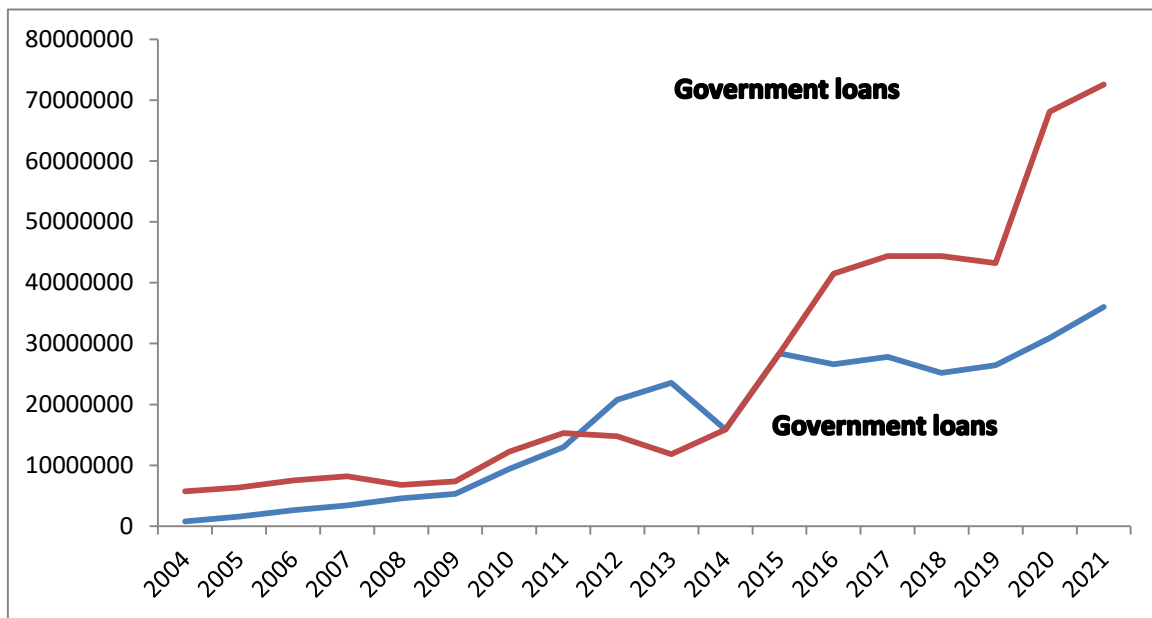


Figure 1. Developments in government loans and private sector loans for the period 2004-2021.

Source: The figure was made by the researcher

4. Experimental Model

To obtain the effect of crowding in-out government investment on private investment in the Iraqi economy, the standard vector error-corrected model (VECM) was used. This helps in access the impact of economic variables on each other. The standard model has been modified by adding other economic variables in order to know their impact on private investment, so that the economic model is expressed as follows:

$$Y_t = \beta_0 + \beta_1 X1_t + \beta_2 X2_t + \beta_3 X3_t + u_t \quad (1)$$

Where (Y) stands for private investment which is a dependent variable. (β_0) stands for the intersection, (X1) for government investment, (X2) stands for GDP, (X3) stands for interest rate, and (t) stands for time. They are independent variables random variable. To implement the Standard Model, we first used unit root tests, the Augmented Dickey-Fuller test (ADF) and the Phelps-Peyron test (PP), to find out the stability of the time series. The optimal deceleration period for the later time periods was determined, then the presence of co-integration was tested using the Johanson-Josselius test, and finally vector error-corrected mechanism (VECM) was prepared to analyze the short and long-term relationships among economic variables. The integrity of the model was tested via (ARCH) to see that the issue of variance heterogeneity does not affect the model. The LM series autocorrelation was also tested to find out that the model is devoid of the autocorrelation problem.

5. Results

5.1 Unit Root Tests

Table (3) and (4) illustrate the findings of unit root tests by adopting the Augmented Dickey-Fuller test (ADF) and the Phillips-Peyron test (PP) for time series of variables at the level and 1st difference with a fixed boundary, a fixed boundary with a general trend, and without a fixed boundary and a general trend.

Table 3. Augmented Dickey-Fuller Test (ADF)

UNIT ROOT TEST TABLE (ADF)					
At Level					
		LY	LX1	LX2	X3
With Constant	t-Statistic	-1.5803	-1.8722	-1.2477	-2.5619
	Prob.	0.4873	0.3433	0.6493	0.106
		n0	n0	n0	n0
With Constant & Trend	t-Statistic	-0.8243	-1.4269	-1.0363	-2.5472
	Prob.	0.9581	0.844	0.9318	0.3053
		n0	n0	n0	n0
Without Constant & Trend	t-Statistic	1.6289	-0.0077	2.5082	-2.2946
	Prob.	0.9739	0.6766	0.9968	0.022
		n0	n0	n0	**
At First Difference					
		d(LY)	d(LX1)	d(LX2)	d(X3)
With Constant	t-Statistic	-8.6091	-6.1701	-0.5036	-6.8142
	Prob.	0.000	0.000	0.8827	0.000
		***	***	n0	***
With Constant & Trend	t-Statistic	-8.8098	-6.3688	-1.3135	-6.7682
	Prob.	0.000	0.000	0.8749	0.000
		***	***	n0	***
Without Constant & Trend	t-Statistic	-8.3066	-6.2377	-0.7444	-6.869
	Prob.	0.000	0.000	0.3898	0.000
		***	***	n0	***

Source: The table was made by the researcher depending on the Eviews econometrics program, 9th edition.

It is clear from the table of the Augmented Dickie Fuller test (ADF) that all variables are not constant at the original level of the data. We also note from the table of the Phillips-Peron test (PP) that the variables are not constant at the original level of the data.

Table 4. Phillips-Peron (PP) test

UNIT ROOT TEST TABLE (PP)					
At Level					
		LY	LX1	LX2	X3
With Constant	t-Statistic	-1.5993	-2.8906	-1.3164	-3.5046
	Prob.	0.4777	0.0515	0.6177	0.1206
		n0	*	n0	n0
With Constant & Trend	t-Statistic	-0.7199	-2.5299	-0.8604	-3.502
	Prob.	0.9674	0.3133	0.9543	0.2468
		n0	n0	n0	n0
Without Constant & Trend	t-Statistic	1.7429	0.2715	2.8772	-3.3863
	Prob.	0.9796	0.762	0.9989	0.061
		n0	n0	n0	*
At First Difference					
		d(LY)	d(LX1)	d(LX2)	d(X3)
With Constant	t-Statistic	-8.6151	-8.261	-9.1258	-8.2462
	Prob.	0.000	0.000	0.000	0.000
		***	***	***	***
With Constant & Trend	t-Statistic	-8.8495	-8.4315	-9.4281	-8.1882
	Prob.	0.000	0.000	0.000	0.000
		***	***	***	***
Without Constant & Trend	t-Statistic	-8.3066	-8.3066	-8.3066	-8.3066
	Prob.	0.000	0.000	0.000	0.000
		***	***	***	***

Source: The table was made by the researcher depending on the Eviews econometrics program, ninth edition.

Since the variables in question contain the unit root, that is, they are not constant at the original level of the data, so the first difference was taken for them as shown in Tables (3) and (4). It becomes clear after taking the first difference of the variables that they have become constant at a significant level (1%), i.e. they are integrated of the order [(1)]. This denotes adopting the alternative hypothesis (H1), states “the time series is constant at the first difference, and rejecting the null hypothesis (H0), stating that the time series is not constant at the first difference.

5.2 Analyze the Results of the Optimal Deceleration Period

To determine the optimal deceleration period for the model, the tests (HQ, SC, AIC, FPE, LR) were adopted. The optimal deceleration period is chosen for the lowest value. The findings in Table (5) illustrate that the optimal deceleration period is the second deceleration period, because it gives the lowest values for most of the criteria used.

Table 5. Optimum deceleration period test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-476.421	NA	16.09527	14.13002	14.26058	14.18176
1	-206.622	499.9219	0.009232*	6.665345*	7.318141*	6.924002*
2	-202.367	7.383215	0.013109	7.010794	8.185827	7.476378
3	-194.698	12.4062	0.016964	7.255814	8.953085	7.928325
4	-174.192	30.75848*	0.015224	7.123295	9.342803	8.002732

Source: The table was made by the researcher depending on the Eviews econometrics program, ninth edition.

5.3 Co-Integration Test Results

Table (6) illustrates the value of the trace coefficient according to Johansen test, and table (7) shows the maximum value (Max). Through these tests, it is possible to know whether or not there is co-integration among the variables.

Table 6. Trace coefficient according to Johansen test

Unrestricted Co-integration Rank Test (Trace)				
Hypothesized	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None *	0.348352	53.96769	44.49359	0.0120
At most 1	0.200341	24.41838	27.06695	0.1833
At most 2	0.072506	8.992053	13.42878	0.3661
At most 3 *	0.053562	3.798468	2.705545	0.0513

Source: The table was made by the researcher depending on the Eviews econometrics program, 9th edition.

The above table shows that there are two complementary equations. This means rejecting the null hypothesis which states ‘there are no co-integration vectors ($r=0$), and accepting the alternative hypothesis (H1) stating “that there are more than zero co-integration vectors ($r=1$). This illustrates that there is a long-term equilibrium relationship among the variables. As for the maximum values (Max) test in Table (7), its results were identical to the results of the impact test, i.e. the two co-integration relationships among the variables, because the calculated value of the maximum values (Max) test exceeds the critical values. According to these results indicating that there is co-integration, the vector error correction model is estimated.

Table 7. The maximum value (Max) according to the Johansen test

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)				
Hypothesized	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.**
None *	0.348352	29.54931	25.12408	0.0276
At most 1	0.200341	15.42633	18.89282	0.2601
At most 2	0.072506	5.193585	12.29652	0.7172
At most 3 *	0.053562	3.798468	2.705545	0.0513

Source: The table was made by the researcher depending on the Eviews econometrics program, ninth edition.

5.4 Analysis of the results of the VECM

The parameters of the vector error correction model should be calculated as stated in Table (8) to determine whether there could be a co-integration connection among the variables as well as to assess the effect of the independent variables on the dependent variable.

Table 8. Test error correction vector model

Co-integrating Eq:	CointEq1			
LY(-1)	1			
LX1(-1)	-0.90713			
	-0.19099			
	[-4.74957]			
LX2(-1)	-3.23656			
	-0.45248			
	[-7.15286]			
X3(-1)	-0.00541			
	-0.00129			
	[-4.20322]			
C	60.65015			
Error Correction:	D(LY)	D(LX1)	D(LX2)	D(X3)
CointEq1	-0.09687	0.165996	0.005657	48.25429
	-0.04728	-0.08573	-0.00788	-15.5825
	[-2.04899]	[1.93634]	[0.71749]	[3.09670]

Source: The table was made by the researcher depending on the Eviews econometrics program, 9th edition.

5.5 The Tests of Standard Model Quality

The following tests can be used once the VECM has been evaluated to guarantee the model's performance quality and safety against common issues:

5.5.1 Test of Heterogeneity of Stability of Variance (ARCH)

Table (9) makes it evident that there is no issue with heterogeneity of variance in the model since the calculated (F) value was (0.065619) at the probability level (0.7986), which was negligible at the (5%) level. This indicates that there is no variance heterogeneity issue with the estimated model.

Table 9. heterogeneity of stability test for variance (variance of error limits)

Heteroscedasticity Test: ARCH			
F-statistic	0.065619	Prob. F(1,68)	0.7986
Obs*R-squared	0.067484	Prob. Chi-Square(1)	0.7950

Source: The table was made by the researcher depending on the econometrics program Eviews, 9th edition.

5.5.2 The Autocorrelation Test of the LM Series

The test results demonstrated the reliability and accuracy of the estimated model, as shown in Table 10, as the calculated (F) value was (0.38675) at the probability level (0.6809), which was negligible at the (5%) level. This indicates that there is no serial correlation issue among the others in the calculated model.

Table 10. Autocorrelation Test for Series (LM)

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.38675	Prob. F(2,61)	0.6809
Obs*R-squared	0.889029	Prob. Chi-Square(2)	0.6411

Source: The table was made by the researcher depending on the Eviews econometrics program, 9th edition.

6. Discussion

The results of the vector error correction of the relationship among the variables can be analyzed and interpreted as follows:

From the findings of the vector error correction model equations in the table, it is clear that there are several short-term responses to the relationship among the variables. As for the long-term correlations, there is a long-term equilibrium relationship among the independent variables and the dependent variable. This indicates a long-term equilibrium causal relationship which goes from the independent variables (LX1, LX2, X3) to the dependent variable (LY), because the error correction limit parameter adopts the negative mark and is significant according to the (t) test ($p > 0.05$). The error correction coefficient is equal to (0.09687), which means that about (9%) of the shocks can be explained in the long term. This supports the influence of the independent variables on the dependent variable in short and long-term dynamic models. The modified coefficient of determination (R2) was (99%), giving an explanatory force to the model, that is, the independent variables in this ratio explain what happens in the dependent variable (private investment).

Analyzing the results of the correlation among government investment (LX1) and private investment (LY), The findings point out that there is a significant inverse relationship for government investment (LX1) on private investment (LY) in the long term. The partial elasticity of government investment in relation to private investment amounted to (-0.90713) in the long run. This indicates an increase in government investment by (1%) will lead to decreasing private investment by (0.90713) in the long run. The inverse relationship among the two variables is similar to the economic theory that acknowledges the existence of an inverse response because government investment crowds out private investment in the Iraqi economy.

Analyzing the results of the relationship between gross domestic product (LX2) and private investment (LY), The findings indicate an inverse significant relationship of GDP (LX2) on private investment (LY) in the long term, as the partial elasticity of GDP in relation to private investment reached (-3.23656) in the long term. This indicates that increasing in GDP by (1%) will lead to a decrease in private investment by (3.23656) in the long run. The inverse relationship between the two variables is contrary to the economic theory that recognizes the existence of a direct response. This is due to the low role of this sector to the GDP, and the dependence of the GDP on crude oil revenues, which contribute 60% to its formation.

Analyzing the results of the correlation among interest rates (X3) and private investment (LY), The findings indicate an inverse significant correlation to the output of the interest rate (X3) on private investment (LY) in the long term, as the interest rate parameter for private investment was (-0.00541) in the long term. This indicates that increasing the interest rate by one unit will cause a decrease in private investment by (0.00541) in the long run. The existence of an inverse correlation between the two variables is similar to the economic theory that recognizes an inverse response among the

interest rates and private investment. That is, whenever interest rates rise, they are repelling investors in the private sector because of the high volume of costs on invested capital, and vice versa in the case of low interest rates.

There is no issue with heterogeneity of variance in the model since the calculated (F) value was (0.065619) at the probability level (0.7986), which was negligible at the (5%) level. This indicates that there is no variance heterogeneity issue with the estimated model. The test (LM) results demonstrated the reliability and accuracy of the estimated model, as the calculated (F) value was (0.38675) at the probability level (0.6809), which was negligible at the (5%) level. This indicates that there is no serial correlation issue among the others in the calculated model.

7. Conclusion

One of the topics that continues to draw interest in theoretical and empirical investigations is the crowding in-out among government investment and private investment. Due to their significance in the economic literature, the correlation among government and private investment and the emphasis on crowding in-out between them have drawn a great number of economists and scholars to develop theoretical and analogical studies. In our literary review of this relationship in a number of economies of the world that differ in their rates of growth and economic system. It reveals that the results of these studies vary from one economy to another, in terms of whether there is an effect of crowding in-out or not, and in terms of the strength of the effect, which used standard methods to clarify the effect, such as co-integration models, the autoregressive distributed delay time model (ARDL), the vector error correction model (VECM), and the model OLS. Although the link among government and private investment continues to be a topic of research and discussion for economists, our analysis of the findings of earlier studies revealed that there was no agreement among the points of view on the subject of crowding in-out between both. It was discovered that there is crowding in-out in the economy when we investigated the effect of crowding in-out government investment on private investment in Iraq over the years 2004–2021. The standard methods were used in the analysis through the use of vector error correction model (VECM), where it was found that government investment crowds out private investment in the economy, and there are several short-term responses to the relationship between variables.

A long-term equilibrium correlation among the independent variables and the dependent variable is noticed. This illustrates a long-term equilibrium causal relationship which goes from the independent variables, government investment (LX1, GDP (LX2), interest rate (X3) to the dependent variable private investment (LY), because the error correction limit parameter adopts the negative mark. It is also significant according to the (t) test ($p > 0.05$), and there is an inverse vital relationship for government investment (LX1) on private investment (LY) in the long term. This indicates that a rise in government investment by (1%) will lead to decreasing in private investment by (0.90713) in the long run. There is an inverse significant relationship to GDP (LX2) on private investment (LY) in the long term, and an inverse significant relationship to interest rate (X3) on private investment (LY) in the long term. Based on these results, this research urges that the Iraqi government should give greater priority to the ability of the private sector to obtain sufficient loans and not to crowd it out to invest.

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