Determinants of Investment Allocations in the Agricultural Sector in Iraq : A Comparison Between the Method of least Squares Approach and the errror Correction Model

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Received 2023/6/15

Accepted 23/7/2023

Published 30/9/2023

Abstract

The research aimed to test the relationship between the size of investment allocations in the agricultural sector in Iraq and their determinants using the Ordinary Least Squares (OLS) method compared to the Error Correction Model (ECM) approach. The time series data for the period from 1990 to 2021 was utilized. The analysis showed that the estimates obtained using the ECM were more accurate and significant than those obtained using the OLS method. Johansen's test indicated the presence of a long-term equilibrium relationship between the size of investment allocations and their determinants. The results of the Error Correction Model indicated a positive relationship between the size of investment allocations and the inflation rate, agricultural gross domestic product (GDP) and government revenues. On the other hand, there was a negative and significant relationship between the size of investment allocations and public debt, operational expenses, and investment expenditures in other economic sectors. The research recommends the necessity of balancing the distribution of investment allocations among different economic sectors based on scientific studies and the importance of each sector's impact on economic growth. This includes creating a suitable environment for domestic and foreign private investment, providing infrastructure to stimulate investment, reducing reliance on borrowing to finance public investments, diversifying sources of income.

Keywords: Public expenditure, Inflation, Public debt.

* The research is based on a master's thesis for the second researcher

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Introduction

Investment plays a significant role in the economies of both developing and developed countries, as it is crucial for expanding productive capacities and achieving economic and social growth (**Ali & Kazem ,2017**). Agricultural investment refers to any expenditure aimed at acquiring fixed assets or increasing the availability of resources for agriculture. It involves the utilization of capital in agricultural projects, whether plant-based or animal-based, that contribute to increasing production and utilization by providing employment opportunities and achieving self-sufficiency **(Al-Mawla, 2011)**. In general, agricultural investment contributes to increasing economic growth rates and profits for investors **(Husain & Alkhafaji, 2022)**. It also increases employment rates, job opportunities, ensures food security, and provides raw materials for the industry. Investment is an important indicator of the performance of the agricultural sector and the achievement of economic development. Public expenditure is one of the fiscal policy tools aimed at influencing the size of agricultural activity and raising production levels **(Awwad & Jassim , 2022)**. An increase in investment expenditure leads to increased production capacity and agricultural productivity by improving the agricultural environment, land reclamation, providing infrastructure, and enhancing labour productivity through training and developing agricultural personnel **(Al-Ghanai, 2015).** Many factors affect the size of this expenditure and the decision-making process regarding its allocation to the agricultural sector. These factors include government revenues and external variables that may influence the expenditure, such as domestic and external debt and high inflation rates. The importance of this research lies in the significance of the agricultural sector and its contribution to the GDP, as well as the role of public allocations for the agricultural sector in promoting agricultural growth to achieve sustainable agricultural development. The research assumes that the allocation of investment to the agricultural sector is positively influenced by government revenues, with oil revenues representing the largest portion. On the other hand, an increase in external debt negatively affects the allocation to the agricultural sector, as debt servicing diverts expenditure away from investment allocations for agriculture and other economic sectors. Moreover, reliance on external or domestic borrowing to finance budget deficits, including investment expenditures, negatively impacts economic growth indicators. Therefore, understanding the impact of each factor influencing public investment allocations provides the basis for developing comprehensive agricultural policies that aim to achieve sustainable agricultural development.

Research methodology

1: Research Problem: Several internal and external variables negatively affect the government's decision-making regarding allocating funds to the agricultural sector. As a result, the spending for this sector are insufficient and do not align with its economic and social significance. This has led to declining agricultural production growth rates, which have not exceeded 1% in most studies. The problem encompasses various dimensions, including the decrease in private agricultural investment and the emergence of macroeconomic variables such as inflation, deficit, and indebtedness, which have affected the effectiveness of the fiscal policy, particularly public expenditure on the agricultural sector.

2: Importance of the Research:

a. The significance of the research is linked to the importance of the agricultural sector and its contribution to the GDP, which is directly related to government financing. Public allocations to the agricultural sector contribute to increasing agricultural growth rates to achieve sustainable agricultural development.

b. This research will help bridge gaps in understanding how economic policy decisions, particularly budgeting for the agricultural sector, are made and the key influencing factors. Moreover, this type of expenditure contributes to the development of scientific research in Iraq's agricultural field, which is essential for scientific progress. It also works towards increasing agricultural productivity by improving the agricultural environment, land reclamation, and providing infrastructure. On the other hand, it enhances labor productivity through training and developing agricultural professionals and providing agricultural guidance.

C . This research will also demonstrate the allocation size for the agricultural sector compared to other economic sectors and its development over the research period, reflecting the national output. This provides us with sufficient insight into structural policies aimed at transforming the economy away from its rentier character by focusing on productive sectors with added value, such as the industrial and agricultural sectors.

3: Research Objectives :The importance of the research is reflected in the following objectives:

a. Identifying the impact of variables such as government revenues, government debt, inflation, public spending on operational and investment activities in other economic sectors, and agricultural GDP on the allocation size for the agricultural sector.

b. Determining the long-term relationship between the studied variables.

4: Research Hypothesis:

a. The research assumes that the general allocation size for the agricultural sector is positively influenced by government revenues .

b . an increase in external debt negatively affects the allocation size for the agricultural sector since debt service directs spending away from investment allocations for the agricultural sector and other economic sectors.

c. The research assumes an inverse relationship between investment spending in other economic and agricultural sectors.

5: Research Methodology: The research adopted a descriptive and quantitative approach using the statistical software Eviews 12, OLS regression, Johansen's cointegration test, and the ECM method.

6: Data Sources: Secondary data sources were relied upon, including variables included in the model, covering the period from 1990 to 2021. These data were obtained from governmental institutions such as the Ministry of Planning, the Central Statistical Organization, and the Ministry of Finance, as well as relevant master's theses and doctoral dissertations.

7:Time Constraints of the Research: The research utilized data for the period from 1990 to 2021.

The theoretical framework

The multiple regression analysis model is one of the most widely used statistical methods for analyzing the relationship between the dependent and independent variables. This relationship results in a statistical equation that includes the variables used to assess their compatibility **(Fadil,2021)**. The OLS method is the most common approach due to its ease of calculation and accuracy of estimates. However, it could be more efficient when one of the conditions specific to the regression model is met, namely the homoscedasticity condition. Misleading and inaccurate conclusions are obtained **(Ghufran &Shaimaa , 2021).** Therefore, the error correction model is adopted to ensure the variables' stability and determine the appropriate model for data analysis and research goals. To assess the stability of the variables, the augmented Dickey-Fuller test and the perspective examination of the time series plot are used. In contrast, the Johansen cointegration model is used to identify long-term equilibrium relationships among the variables included in the model **(Aleumr, 2007)**. This test confirms the existence of cointegration, i.e., the convergence of time series, and is based on the economic concept of the statistical properties of time series. The model assumes that the economic variables, which the economic theory assumes to have a long-term equilibrium relationship, do not diverge significantly from each other, and this divergence is corrected by economic forces that work to restore these economic variables towards long-term equilibrium. Thus, the concept of cointegration simulates the existence of long-term equilibrium to which the economic system tends **(Ahmad & Salim, 2019).** The error correction model differs from other models in that it separates the relationship between variables in the long and short term. It also exhibits better properties in the case of small samples, and the estimated parameter in the model is more consistent. However, this model is only applied after the successful Johansen test for cointegration to derive and estimate the error correction model using the equal integration developed by Johansen **(Edgeman,1999).** On the other hand, the OLS method is the most common and widely used approach for estimating the linear regression model due to its ease of parameter calculation. Still, it is characterized by lower variance estimates **(Alhialli & Muhammad, 2018).** However, in the case of unstable variables, it may result in spurious regression.

The use of this model requires the following steps:

1. **Testing the stability of the time series**: This is done through the perspective examination of the time series plot, which involves visualizing the variables at their original levels.
2. **Unit root testing:** The Augmented Dickey-Fuller (ADF) test measures the stability of the time series.
3. **Determining the lag order:** Before conducting the cointegration test, the lag order is determined based on five criteria: HQ, SC, FPE, LR, and AIC **(Ahmad & Salim, 2019).**
4. **Conducting the Johansen cointegration test:** To test the existence of a long-term equilibrium relationship, the Johansen cointegration test is used, which has two types: the trace test and the maximum eigenvalue test **(Ahmad & Salim, 2019).**
5. **ECM:** After confirming the integration of the variables, the ECM model is used to estimate and test long-term equilibrium and report the short-term dynamics. The ECM model is widely used to study the dynamic relationship between economic variables, as it estimates the long-term relationship or cointegration between the dependent and independent variables **(AL Badri &Alattabi, 2019).**
6. **Error Correction model tests include:**

6-1 Lagrange Multiplier (LM) test: One of the most important tests in this context is the LM test for serial correlation of errors in the model. Suppose the p-value is greater than 5%. In that case, we can accept the hypothesis that the model does not suffer from serial correlation and is good, meaning there is no serial correlation in the errors **(AL Badri & Alattabi, 2019).**

6-2 Heteroskedasticity test: The Breusch-Pagan-Godfrey test is used, and the computed F-value is obtained. If the significance is greater than 5%, it indicates the acceptance of the null hypothesis, meaning there is no problem of heteroskedasticity in the model **(AL Badri &Alattabi, 2019).**

6-3 CUSUM and CUSUMSQ tests: These tests assess the structural stability of the model in the short and long term. Suppose the graphical representation of these tests exceeds the boundaries at a certain level. In that case, it indicates the lack of stability in the model, whereas if the estimated line falls within the confidence limits, it indicates structural stability between the study variables**(AL Badri & Alattabi, 2019).**

6-4 Partial autocorrelation function and autocorrelation function of residuals: When all variables fall within the boundaries, indicating no partial correlation **(Alhiyali & Jubair, 2018)**. Also, when all significance levels are greater than 5%, the residuals are stable for the model **(Alhiyali &Jubair, 2018).**

6-5Normality test of residuals: The Jarque-Bera test is used, and when the p-value is greater than 5%, it indicates that the null hypothesis is accepted, meaning that the residuals follow a normal distribution. This is an indicator of the quality of the estimated model **(Ahmad & Salim, 2019).**

The following model was adopted:

- ***LY = F (LIN, LPd, LPe, LGr, LPit, LGdpg)***

- **LY:** Natural logarithm of government allocations for the agricultural sector.
- **LIN:** Natural logarithm of the inflation rate.

- **LPd:** Natural logarithm of public debt.
- **LPe:** Natural logarithm of operational expenditures.
- **LGr:** Natural logarithm of government revenues.
- **LPit:** Natural logarithm of investment expenditures for other economic sectors.
- **LGdpg:** Natural logarithm of agricultural GDP.
- The model was described based on theoretical concepts, previous studies, and the nature of the Iraqi economy, as several factors affect the size of investment allocations for the agricultural sector, including:

1. **Inflation:** is defined as a continuous upward trend in the general level of prices **(Saqr, 1983).** The agricultural sector in Iraq suffers from inflation, which manifests in the poor distribution of resources, high agricultural production costs, and a lack of investment in the agricultural sector. This leads to a decline in domestic agricultural production and an increase in the value of food imports **(Al Badri & ALL lessa, 2022).**
2. **Public debt:** Public debt is one of the financial policy tools used to finance budget deficits. It represents a sum of money the state obtains from domestic or foreign markets. The state repays these debts according to specified conditions, including loan repayments and interest payments. Public debt can be classified into external and internal debt **(Aleumr, 2007).**
3. **Operating spending**: It refers to current expenditures, such as employee salaries, material and service supplies, grants, allowances, social benefits, transfer payments, and interest payments on government loans **(Saud, 2018).** It is an important component of fiscal policy in achieving economic balance. However, this spending contributes to the deterioration of the external balance and reliance on the international community to meet current expenditures (**Saleh& Eaday, 2019).**
4. **Government revenues:** Government revenues include two components: oil revenues, which are the most important pillar of the Iraqi economy, contributing to the development of various sectors and accounting for more than 80% of revenues, and tax revenues, which vary among countries and represent about 20% of revenues **(Saleh & Nayef, 2021).** Other revenues include revenues from the sale of non-financial assets, social contribution revenues, grant revenues, and treasury transfers **(Awwad & Jassim, 2022).**
5. **Investment expenditures for other economic sectors**: This refers to allocating remaining funds to other economic sectors for investment spending. The importance of these sectors may vary according to economic needs and societal needs. For example, the electricity sector may require increased spending to address electricity sector problems and provide infrastructure for agriculture and industry. The remaining funds are allocated to other sectors to a lesser extent, as there is a disparity between these sectors **(Saleh& Eaday, 2019).**
6. **Agricultural, domestic product:** The agricultural sector is an important economic sector in Iraq and most economies worldwide, as it provides food for the population. In Iraq, the agricultural sector faces various challenges that require direct and indirect state intervention, financial support, and increased investment to promote its development. The sector has experienced a decline due to economic, political, social, security, financial, and administrative factors **(Alhialli & Muhammad, 2018).**

The time series data for the period (1990-2021) was adopted, including variables such as government revenues, public debt, inflation, investment expenditures for other economic sectors, operating spending, and agricultural, domestic product. The data sources were obtained from the Ministry of Planning - Central Statistical Organization and the Ministry of Finance. The descriptive and quantitative analysis methods will be used using the statistical software EViews 12

The practical side

1. Stability testing:

The stability of the time series was tested using the Augmented Dickey-Fuller test, as shown in Table (1). The variables were found to be stable when considering the first difference.

Table (1) Results of the unit root test for the studied variables using the ADF test

Gdpg LX6	Pit LX5	Gr LX4	Pe LX3	Pd LX2	IN LX1	IAA L y	Sig.	Variables test
At Level								
-5.057486	-2.087679	-2.180606	-1.611340	-3.501893	-1.461789	-2.088248	t-statistic	With Constant
0.0003	0.2507	0.2170	0.4650	0.0149	0.5383	0.2505	Prob.	
***	NO	NO	NO	**	NO	No		
-3.087794	-4.933758	-0.934365	0.693347	-3.294541	-2.753670	-0.726379	t-statistic	With Constant &Trend
0.1267	0.0031	0.9384	0.9994	0.0865	0.2243	0.9609	Prob.	
NO	***	NO	NO	*	NO	No		
2.197455	-5.560384	1.821055	-3.620964	0.192334	-1.242142	0.837112	t-statistic	None
0.9918	0.0001	0.9810	0.0113	0.7351	0.1917	0.8865	Prob.	
NO	***	NO	**	NO	NO	No		
At first difference								
-2.940115	-5.776624	-8.589684	-4.313424	-3.189037	-6.809684	-6.669403	t-statistic	With Constant
0.0526	0.0003	0.0000	0.0096	0.0307	0.0000	0.0000	Prob.	
**	***	***	***	**	***	***		
-3.801412	-5.576337	-9.197918	-3.741870	-3.303493	-6.715500	-9.456590	t-statistic	With Constant &Trend
0.0305	0.0000	0.0000	0.0005	0.0850	0.0000	0.0000	Prob.	
**	***	***	***	**	***	***		
-2.649299	-5.560384	-7.607306	-4.313424	-3.355216	-6.533009	-6.048615	t-statistic	None
0.0099	0.0001	0.0000	0.0113	0.0015	0.0000	0.0000	Prob.	
***	***	***	**	**	***	***		

Refernce: the output of the statistical program (Eviews 12).

* Not significant at the 10% level, ** Not significant at the 5% level, *** Not significant at the 1% level.
No: Not significant.

Since all variables stabilized after taking their first differences, the model can be estimated using the cointegration test.

2. Estimating the model using OLS method:

Table (2) shows the Ordinary Least Squares regression analysis. The high value of the determination coefficient (R^2) indicates a good fit of the model. Additionally, the significance of the estimated parameters decreased, indicating the presence of heteroskedasticity issues in the model, which was detected using the Harvey test. The Harvey test showed no problem of heteroskedasticity in the model

Table(2) Estimation results using OLS

Dependent Variable: LY
Method: Least Squares
Date: 04/07/23 Time: 04:28
Sample: 1990 2021
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LX6	0.681259	0.385266	1.768280	0.0892
LX5	- 0.411758	0.203822	-2.020187	0.0542
LX4	0.106336	0.164295	0.647228	0.5234
LX3	- 0.142173	0.145353	-0.978126	0.3374
LX2	-0.275637	0.277999	-0.991502	0.3309
LX1	0.083943	0.096630	0.868708	0.3933
C	0.029813	1.885527	0.015811	0.9875

R-squared	0.924340	Mean dependent var	11.88909
Adjusted R-squared	0.906181	S.D. dependent var	2.432065
S.E. of regression	0.744938	Akaike info criterion	2.439609
Sum squared resid	13.87332	Schwarz criterion	2.760238
Log-likelihood	-32.03374	Hannan-Quinn criter.	2.545888
F-statistic	50.90400	Durbin-Watson stat	1.109405
Prob(F-statistic)	0.000000		

Refernce: the output of the statistical program (Eviews 12).

The detection of problems with the method of small squares reveals several issues, including:

a. Harvey Test for detecting the problem of heteroskedasticity, which refers to the lack of variance stability.

Table (3) Displays the Heteroskedasticity test.

Heteroskedasticity Test: Harvey
Null hypothesis: Homoskedasticity

F-statistic	0.685429	Prob. F(6,25)	0.6631
Obs*R-squared	4.520465	Prob. Chi-Square(6)	0.6066
Scaled explained SS	3.320136	Prob. Chi-Square(6)	0.7677

Refernce: the output of the statistical program (Eviews 12).

The absence of heteroskedasticity issue is tested through the Harvey test, as indicated in Table (3). The computed F-value obtained is 0.68, with a significance level of 0.66, greater than 0.05. Therefore, the null hypothesis of no heteroskedasticity is accepted, and the alternative hypothesis is rejected. This implies no heteroskedasticity issue in the model's variance homogeneity.

b. Detection of Autocorrelation problem:

Table (4) Lagrangian multiple test LM

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	**3.421649**	**Prob. F(2,23)**	**0.0500**
Obs*R-squared	**7.337847**	**Prob. Chi-Square(2)**	**0.0255**

Refernce: the output of the statistical program (Eviews 12).

The absence of the problem of self-correlation is tested through the Breusch-Godfrey Serial Correlation LM Test: as shown in Table (4), and also the results of the test conducted on the model confirmed that the Chi-Square statistic reached (7.33) and its significance is (0.02), which is the lowest. From (0.05), there is an autocorrelation problem**.**

c. The problem of linear correlation (Multicollinearity):

Table (5) illustrates the correlation matrix between the independent variables.

	LX6	LX5	LX4	LX3	LX2	LX1
LX6	1.000000	0.884270	0.896088	0.866939	0.899897	-0.647374
LX5	0.884270	1.000000	0.971400	0.955341	0.645748	-0.756765
LX4	0.896088	0.971400	1.000000	0.947028	0.672418	-0.737227
LX3	0.866939	0.955341	0.947028	1.000000	0.617652	-0.701904
LX2	0.899897	0.645748	0.672418	0.617652	1.000000	-0.440897
LX1	-0.647374	-0.756765	-0.737227	-0.701904	-0.440897	1.000000

Refernce: the output of the statistical program (Eviews 12).

Table (5) shows that the correlation coefficients indicate a strong positive relationship between variables LX5, LX4, LX3, and LX2 with agricultural GDP LX6. However, variable LX1 has a moderate negative relationship with LX6. The correlation coefficients for variables LX6, LX4, LX3, and LX2 indicate a strong relationship with LX5, while variable LX1 has a moderate positive relationship. The correlation coefficients for variables LX6, LX5, LX3, and LX2 show a strong relationship with LX4, while variable LX1 has a good negative relationship. The correlation coefficients for variables LX6, LX5, LX4, and LX2 indicate a strong relationship with LX3, while variable LX1 has a good negative relationship. The correlation coefficients for variables LX3, LX5, LX4, and LX2 show a moderate relationship with LX6, while variable LX1 has a weak negative relationship. Finally, the diagonal elements of the correlation matrix are all equal to one.

3. Determining the lag order:

Before conducting the joint integration test, it is necessary to determine the lag order based on the most accurate criteria, as shown in Table (6). The lag order was determined based on five criteria: LR, FPE, AIC, SC, and HQ. According to the mentioned criteria, the best lag order was (3), with the lowest values

Table(6) Var test determine the duration of hysteresis

VAR Lag Order Selection Criteria
Endogenous variables: LY LX6 LX5 LX4 LX3 LX2 LX1
Exogenous variables: C
Date: 02/24/23 Time: 04:41
Sample: 1990 2021
Included observations: 29

Lag	LogL	LR	FPE	AIC	SC	HQ

0	-265.4708	NA	0.341688	18.79109	19.12113	18.89445
1	-128.5386	198.3156	0.000880	12.72680	15.36710	13.55371
2	-77.06023	49.70327	0.001452	12.55588	17.50643	14.10633
3	128.2270	99.10420*	3.71e-07*	1.777445*	9.038257*	4.051441*

SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Refernce: the output of the statistical program (Eviews 12).

4. Johansen's Cointegration Test: To test for the presence of long-term equilibrium relationships, Johansen's test was used. There are two types of tests: the Trace test and the Max test. Table (7) indicates the presence of a long-term equilibrium relationship between the model variables using both the Trace test and the Max test.

a. Trace Test:

Since the computed value of the maximum eigenvalue is 159.4810, greater than the critical value of 125.6154 at a 5% significance level, we reject the null hypothesis of no cointegration vector. This indicates the presence of a cointegration equation. The same conclusion holds for at most 1*, at most 2*, at most 3*, at most 4*, at most 5*, and at most 6*. Therefore, it is evident that there are other cointegration equations.

b. Max Test:

Since the computed value of the maximum eigenvalue is 55.38193, greater than the critical value of 46.23142 at a 5% significance level, we reject the null hypothesis of no cointegration vector. This indicates the presence of a cointegration equation.

Therefore, the computed value of the maximum eigenvalue is smaller than the critical value at a 5% significance level, indicating the impossibility of the existence of cointegration.

Table (7) Johansen cointegration test

Date: 04/07/23 time: 04:04
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments
Trend assumption: linear deterministic trend
Series: ly lx1 lx2 lx3 lx4 lx5 lx6
Lags interval (in first differences): 1 to 1

Unrestricted cointegration rank test (trace)

Hypothesized No. Of ce(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob.**
None *	0.842143	159.4810	125.6154	0.0001
At most, 1 *	0.658219	104.0990	95.75366	0.0118
At most, 2 *	0.491116	71.89145	69.81889	0.0338
At most, 3 *	0.470151	51.62540	47.85613	0.0212
At most, 4 *	0.348254	32.57052	29.79707	0.0234
At most, 5 *	0.316118	19.72750	15.49471	0.0108
At most, 6 *	0.242410	8.328405	3.841465	0.0039

trace test indicates 7 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level
**mackinnon-haug-michelis (1999) p-values

Unrestricted cointegration rank test (maximum eigenvalue)

Hypothesized No. Of ce(s)	Eigenvalue	Max-eigen Statistic	0.05 Critical value	Prob.**
None *	0.842143	55.38193	46.23142	0.0041
At most 1	0.658219	32.20759	40.07757	0.2918
At most 2	0.491116	20.26605	33.87687	0.7380
At most 3	0.470151	19.05488	27.58434	0.4103
At most 4	0.348254	12.84303	21.13162	0.4668
At most 5	0.316118	11.39909	14.26460	0.1353
At most, 6 *	0.242410	8.328405	3.841465	0.0039

max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**mackinnon-haug-michelis (1999) p-values

Refernce: the output of the statistical program (Eviews12).

5. Estimating the error correction model :

a.The relationship is short term**Table (8)** displays the relationship between investment allocations and explanatory variables in the short run.

Dependent Variable: D(LY)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 04/08/23 Time: 21:52
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.073501	0.013901	-5.287461	0.0000
C(2)	-0.191494	0.146444	-1.307627	0.2051
C(3)	0.714222	0.181790	3.928840	0.0020
C(4)	-0.007675	0.096679	-0.079389	0.9380
C(5)	0.198419	0.095113	2.086144	0.0590
C(6)	-0.315962	0.123502	-2.558355	0.0251
C(7)	-0.542331	0.247900	-2.187700	0.0138
C(8)	0.166906	0.089705	1.860618	0.0875
C(9)	0.502032	0.110884	4.527529	0.0002

R-squared	0.822909	Mean dependent var	0.243719
Adjusted R-squared	0.665819	S.D. dependent var	0.499586
S.E. of regression	0.288803	Akaike info criterion	0.659884
Sum squared resid	1.000883	Schwarz criterion	1.975740
Log likelihood	4.751450	Hannan-Quinn criter.	0.839857
F-statistic	4.984778	Durbin-Watson stat	1.988335
Prob(F-statistic)	0.000432		

Refernce: the output of the statistical program (Eviews 12).

The results from Table (8) indicate that the error correction coefficient c(1) was found to be negative and statistically significant at the 1% level, being less than one. This suggests the presence of a long-run equilibrium relationship between the study variables. Its value of (-0.073501) implies that 7% of the imbalance will be corrected in the long run. Furthermore, the coefficient C(3) demonstrates a positive and significant relationship between agricultural GDP and the level of investment allocations. With a 100% increase in agricultural GDP, investment allocations increase by 71%. On the other hand, the variable C(4), representing investment expenditure in other economic sectors, exhibits a negative and insignificant relationship with the level of investment allocations in the agricultural sector. Its value is (-0.007). The operating expenditure coefficient C(6) indicates a negative and significant relationship, suggesting that an increase in operating expenditure comes at the expense of investment expenditure. A 0.01% increase in operating expenditure leads to a 31% decrease in investment allocations.

In relation to the government revenue variable C(5), there is a positive and significant relationship with investment allocations. A 100% increase in government revenue results in a 19% increase in investment allocations in the agricultural sector. As for variable C(7), representing public debt, a 0.01% increase in public debt leads to a 54% decrease in investment allocations. This indicates that most of the borrowing benefits other economic sectors and operating expenditures rather than investment.

The inflation coefficient suggests a positive and significant relationship between the inflation rate and investment allocations in the agricultural sector. With a 100% increase in the inflation rate, investment allocations increase by 16%.

Lastly, C9 represents the constant term, and its positive and significant sign indicates a constant upward effect on investment allocations.

b. The long-term relationship can be expressed by the equation:

$$(ly) = 1.558147X6 - 0.657212X5 + 0.848347X4 - 0.064271X3 - 0.538651X2 + 0.848347X1$$

When substituting the given values:

$$8.98 - 6.78 + 5.02 - 0.79 - 3.15 + 5.02 = t$$

The equation indicates a negative relationship between agricultural GDP and investment allocations in the long term, with a coefficient value of 1.558147. The investment expenditure in other sectors negatively and significantly impacts agricultural investment allocations, with a coefficient value of -0.657212. On the other hand, government revenue (LX4) has a positive and significant effect on agricultural investment allocations, with a coefficient value of 0.848347. The impact of operating expenditure is negative and significant on investment allocations, with a coefficient value of -0.064271. The coefficient of public debt (LX2) indicates a negative and significant impact on investment allocations, with a value of -0.538651. The inflation rate (LX1) has a positive and significant effect, with a coefficient value of 0.848347. It is worth noting that the signs of all coefficients in the long term are consistent with the short-term relationship.

6. Estimation Model Testing:

To ensure the accuracy and validity of the obtained results, it is necessary to conduct some important tests, including:

a. Lagrange Multiplier (LM) Multiplication Test

The purpose of this test is to verify the absence of linear correlation issues, as indicated in Table (9)

Table (9) Lagrangian multiple test LM

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.285624	Prob. F(2,11)	0.7570
Obs*R-squared	1.481037	Prob. Chi-Square(2)	0.4769

Refernce: Statistical Program Eviews 12 Outputs

If the LM test results show a probability value of (0.4769), we can accept the hypothesis that the model does not suffer autocorrelation issues. This indicates that the model is good and the errors have no serial correlation.

b. Heteroskedasticity Test

Table (10) shows the Heteroskedasticity Test.

Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity			
F-statistic	2.445666	Prob. F(5,26)	0.0606
Obs*R-squared	10.23604	Prob. Chi-Square(5)	0.0688
Scaled explained SS	5.603803	Prob. Chi-Square(5)	0.3467

Refernce: Statistical Program Eviews 12 Outputs

Based on the Breusch-Pagan-Godfrey test, the computed F-value was (2.44) with a significance level of (0.06). Additionally, the test results confirm that the Chi-Square statistic was (0.06), which is greater than (0.05). Therefore, the null hypothesis is accepted, indicating no heteroskedasticity issue in the model, and the variance is homoscedastic.

c. Stability Tests: CUSUM, CUSUMSQ

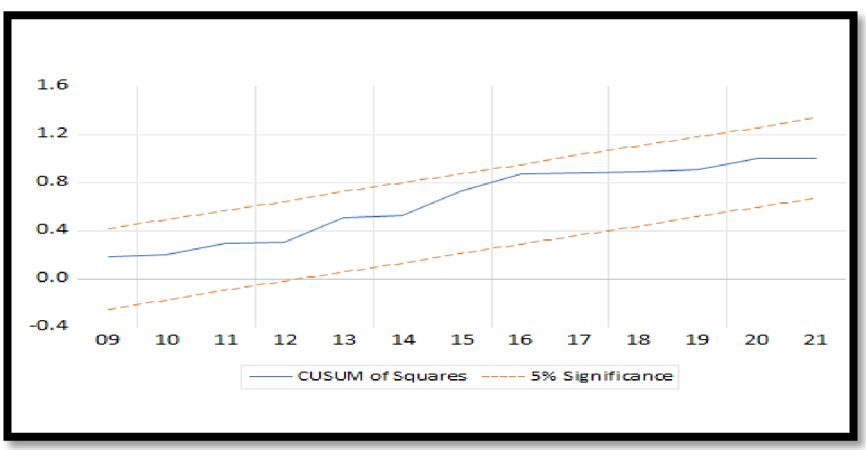

Figure (1): CUSUMSQ test

Refernce: the researcher's work based on the Eviews 12 statistical program.

The results indicate the presence of structural stability between the study variables and consistency in the model in both the short and long terms. The estimated line falls within the confidence bounds throughout the research period, which supports accepting the null hypothesis and confirms the stability of the estimated parameters in the model over time.

To test the adequacy of the regression model, the CUSUM test was used, as shown in Figure (1).

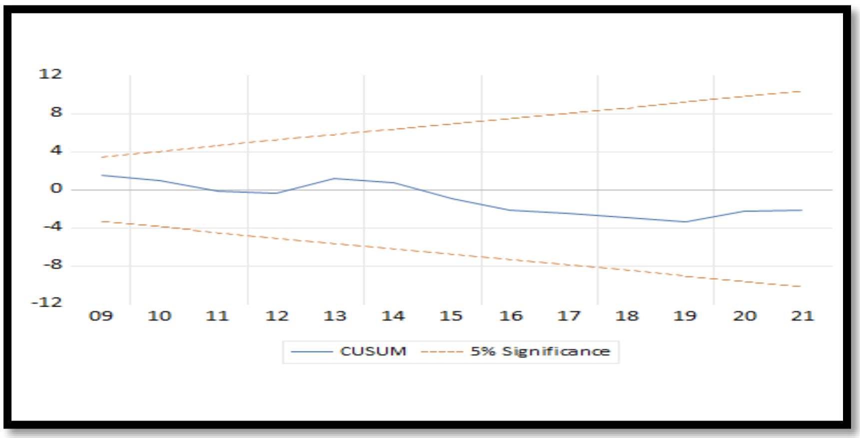

Figure (2): CUSUM Test

Refernce: Conducted by the researcher using the statistical program Eviews 12

The adequacy of the estimated model was tested as shown in Figure (2). It is observed that all the autocorrelation coefficients of the residuals fall within the confidence bounds, indicating that the used model is good and suitable.

d- Partial Autocorrelation Function (PACF) and Autocorrelation Function (ACF) of residuals will be tested separately

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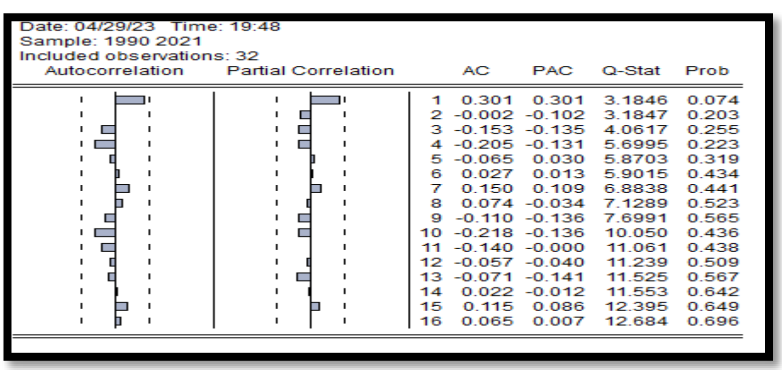


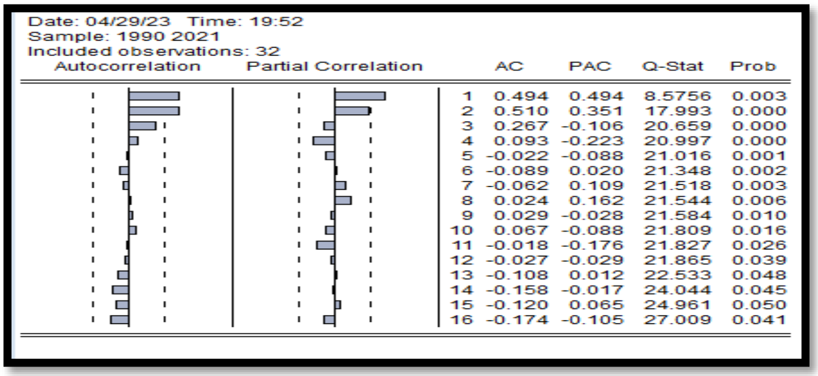
	AC	PAC	Q-Stat	Prob
1	0.301	0.301	3.1846	0.074
2	-0.002	-0.102	3.1847	0.203
3	-0.153	-0.135	4.0617	0.255
4	-0.205	-0.131	5.6995	0.223
5	-0.065	0.030	5.8703	0.319
6	0.027	0.013	5.9015	0.434
7	0.150	0.109	6.8838	0.441
8	0.074	-0.034	7.1289	0.523
9	-0.110	-0.136	7.6991	0.565
10	-0.218	-0.136	10.050	0.436
11	-0.140	-0.000	11.061	0.438
12	-0.057	-0.040	11.239	0.509
13	-0.071	-0.141	11.525	0.567
14	0.022	-0.012	11.553	0.642
15	0.115	0.086	12.395	0.649
16	0.065	0.007	12.684	0.696

Figure (3): Partial Autocorrelation Function (PACF)

Refernce: Statistical Program Eviews 12 Outputs

The figure illustrates that all variables are within the confidence bounds, indicating the absence of partial correlation.

Eviews 12 Source: Statistical Program Eviews 12 Outputs

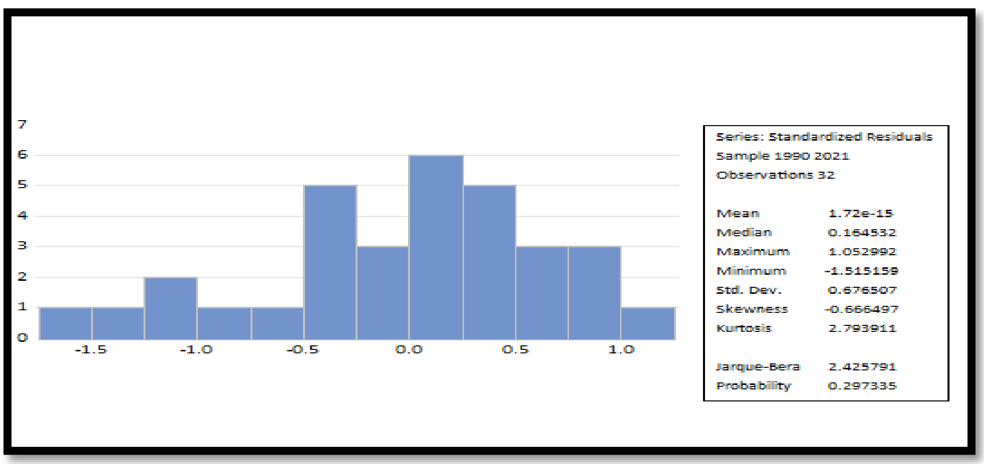

Date: 04/29/23 Time: 19:52
Sample: 1990 2021
Included observations: 32

	AC	PAC	Q-Stat	Prob
1	0.494	0.494	8.5756	0.003
2	0.510	0.351	17.993	0.000
3	0.267	-0.106	20.659	0.000
4	0.093	-0.223	20.997	0.000
5	-0.022	-0.088	21.016	0.001
6	-0.089	0.020	21.348	0.002
7	-0.062	0.109	21.518	0.003
8	0.024	0.162	21.544	0.006
9	0.029	-0.028	21.584	0.010
10	0.067	-0.088	21.809	0.016
11	-0.018	-0.176	21.827	0.026
12	-0.027	-0.029	21.865	0.039
13	-0.108	0.012	22.533	0.048
14	-0.158	-0.017	24.044	0.045
15	-0.120	0.065	24.961	0.050
16	-0.174	-0.105	27.009	0.041

Figure (4): Autocorrelation Function (ACF)
Refernce: Statistical Program Eviews 12 Outputs

The figure demonstrates that all variables fall within the confidence bounds, indicating no autocorrelation. Additionally, all significance levels are greater than 5%, implying that the residuals were stable for the model.

E .Normality Test of Residuals Distributi



Figure(5):Test for normal distribution of residuals
Refernce: Statistical Program Eviews 12 Outputs

Since the Jarque-Bera test value indicates that the null hypothesis should be accepted, as the probability value is greater than 5%, it can be concluded that the residuals follow a normal distribution.

7. conclusions and recommendations

a. Conclusions

The research concludes that an increase in operational expenditure negatively affects the allocation of investment resources to the agricultural sector. This is because operational expenditure cannot be

easily reduced in the case of declining government revenues. Therefore, increasing public sector employment is necessary to address the issue of unemployment, which, in turn, affects the government's ability to increase the volume of investment allocations. The continuous rise in operational expenditure indicates a lack of correction in the structure of public sector spending.
Due to limited tax revenues and fluctuations in oil revenues, the decision to allocate funds to investment expenditure in other economic sectors becomes challenging. The importance of these sectors varies according to economic needs and societal demands. For example, the electricity sector may require increased expenditure to address electricity-related issues and provide infrastructure for agriculture, industry, and housing services. When revenue decreases, a smaller portion is allocated to the remaining sectors. Increasing investment expenditure in a specific sector does not necessarily result in increased allocations to all sectors simultaneously. There is often variation in expenditure among different sectors based on the needs of one sector at the expense of another.
Based on these findings, the research recommends the need for balanced distribution of investment allocations among different economic sectors, guided by scientific studies and the importance of each sector's impact on economic growth. It is essential to create a conducive environment for domestic and foreign private investment, establish the necessary infrastructure to stimulate investment and reassess public investment expenditure in the agricultural sector. Diversifying sources of income and reducing reliance on oil revenues for financing investment projects is crucial. Moreover, public debt should be channelled towards investment expenditure to enhance agricultural growth rates.

b. Recommendations

Based on the previous findings, the following recommendations were made:

1- It is necessary to balance the distribution of investment allocations among different economic sectors based on scientific studies and the importance of each sector's contribution to economic growth.

2- Creating a favorable environment for local and foreign private investment and providing infrastructure to encourage and stimulate investment, particularly foreign investment, increases the private sector's contribution to investment and reduces dependence on the government.

3- Reducing reliance on borrowing to finance public investments and diversifying income sources while minimizing dependence on oil revenues, characterized by volatility.

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