Estimating the Impact of Selected Influencing Factors on the Rate of Agricultural Unemployment in Iraq for the Period (2001–2023)

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SUMMRY

"This study investigates the impact of selected macroeconomic variables on the agricultural unemployment rate using the Autoregressive Distributed Lag (ARDL) approach. Leveraging data processed via Eviews 12. The adjusted R^2 value is 0.90, indicating that the independent variables included in the estimated model explain approximately 90% of the variation in the dependent variable. This suggests that the explanatory factors have the greatest impact on the function, while the remaining 10% is unexplained, attributed to variables not included in the model and absorbed by the random error term. The F-test value is 137.84, with a probability level of 0.000, which is less than 0.05 and even below 0.01. This indicates that the estimated model is statistically significant as a whole and can be relied upon for planning and future forecasting. The study conculuded that the relationships among the study variables are balanced in the long term. Economic growth is the most influential and stable variable in explaining changes in the dependent variable, while investment shows a positive effect only in the short term, and inflation does not have a significant effect in either the short or long term during the study period.The relationships among the study variables are balanced in the long term. Economic growth is the most influential and stable variable in explaining changes in the dependent variable, while investment shows a positive effect only in the short term, and inflation does not have a significant effect in either the short or long term during the study period. Policymakers should focus on variables that have a significant long-term impact on unemployment, as addressing unemployment requires sustainable structural policies rather than temporary measures. Adopt short-term economic policies targeting the reduction of unemployment fluctuations, based on short-term relationship results, to absorb economic shocks and minimize their negative effects on the labor market.

Keywords: Agricultural Unemployment, Macroeconomic Variables, Iraq Economy ARDL Model, Long-run Equilibrium, Economic Growth

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First: General Framework of the Research

INTRODUCTION:

The concept of unemployment differs from one society to another according to the nature of that society, its values and traditions, and the type of work practiced. While unemployment has no clear meaning in traditional rural societies engaged in agriculture, the expansion of industry, with its diversity of specializations, training, and employment opportunities, brought unemployment to the forefront as a tangible economic phenomenon. The International Labour Organization defines an unemployed person as "anyone who is capable of work, willing to work, actively seeking work, and accepting it at the prevailing wage level, but without success." Therefore, defining unemployment in any society depends on the extent to which individuals are able to obtain employment opportunities, which is considered an indicator of welfare and social development. Unemployment is a serious economic and social problem that occupies a prominent place in most economic, political, and social literature. It is one of the most important economic issues addressed primarily by macroeconomic analysis, as it is among the most significant macroeconomic problems of concern to this type of analysis. Numerous concepts related to this phenomenon have been proposed in order to study it and develop appropriate treatments to reduce its risks and economic and social effects. However, measuring the unemployed population is not an easy task; rather, it remains a subject of debate and disagreement among specialists due to technical issues and objective and subjective factors involved in defining this group of the population. In order to present a clear picture of the dimensions of this concept, it is necessary to offer an appropriate analytical approach to this phenomenon in this research so as to ensure a comprehensive understanding of it.

With regard to the Iraqi economy, it is currently facing a serious problem of high unemployment rates, which represent one of the most prominent difficulties and challenges confronting this economy, due to their profound and dangerous repercussions on social and economic conditions. The severity of this problem is further exacerbated by its persistence over a long period, the rise in unemployment rates in recent years, and its emergence in various forms and types, alongside the continued weak capacity of economic sectors to absorb the increasing numbers of workers who are able and willing to work.

2. Research Problem:

The agricultural sectors in Iraq experience varying levels of unemployment compared with the non-agricultural sector. Agricultural employment data continue to be affected by major economic fluctuations (macroeconomic growth, inflation, agricultural product prices, government spending on agriculture, exchange rates, etc.). Given the limited number of studies that explicitly link macroeconomic variables to the agricultural unemployment rate in the Iraqi context, the research problem stems from the absence of a quantitative understanding of the relationship between macroeconomic variables and agricultural unemployment, as well as the impact of economic policies on rural employment.

3. Importance of the Research:

- Providing policymakers in the Ministry of Agriculture and the Ministry of Planning with clear indicators for addressing rural unemployment.
- Contributing to the local literature on the agricultural labor market in Iraq and

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translating findings into rural development strategies.
- Offering practical recommendations to reduce agricultural unemployment through targeted monetary, fiscal, and structural policy instruments.

4. Research Objectives:

The study aims to measure the impact of selected variables on the agricultural unemployment rate in the agricultural sector, which is considered one of the sectors most sensitive to economic fluctuations, thereby contributing to the development of more accurate analytical models and economic policies.

5. Research Hypothesis:

There is a statistically significant relationship between macroeconomic variables (GDP growth, inflation, government spending on agriculture, exchange rates, and agricultural output) and the agricultural unemployment rate in Iraq, such that:

- An increase in the number of workers in the agricultural sector reduces the agricultural unemployment rate.
- Higher inflation is associated with an increase in the agricultural unemployment rate (or vice versa, depending on the nature of inflation).
- Increased government spending and agricultural investments reduce the agricultural unemployment rate.
- Improvement in agricultural exports (greater trade openness) leads to a reduction in agricultural unemployment.

6. Research Methodology:

The descriptive–analytical approach was employed to examine the impact of selected macroeconomic variables on the agricultural unemployment rate, along with a quantitative approach using econometric analysis through the application of a multiple regression model to analyze the relationships among variables.

7. Research Limits:

In terms of spatial limits, Iraq was purposively selected as the study area. With respect to temporal limits, the period from 2001 to 2023 was chosen. The thematic scope of the study is the estimation of the impact of selected factors influencing the agricultural unemployment rate in Iraq for the period (2001–2023).

8. Previous Studies

Saud (2017) [1]

The Impact of Some Economic Variables on the Unemployment Rate in Iraq for the Period (2003–2014). This study examined the effect of certain economic variables on the unemployment rate in Iraq. The research aimed to explore the reasons for the weak capacity of economic sectors to absorb the workforce capable of and willing to work at the prevailing wage, which led to rising poverty rates and a disrupted labor market. Despite government efforts to employ as many workers as possible, unemployment remained a persistent issue. The study was based on the hypothesis that there is a relationship between the unemployment rate and some economic variables, including GDP, population growth rate, and inflation rate. The study concluded that there is a strong relationship between unemployment and the aforementioned variables and recommended establishing fundamental development projects to absorb more labor and activating the role of the private sector to achieve the same goal.

Saraireh (2020) [2]

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The Impact of Government Expenditures on Unemployment: A Case Study of Jordan. This study aimed to assess the impact of government expenditures on unemployment rates in Jordan during the period 1990–2019 using an ARDL model. The study found a negative effect of government spending on unemployment, showing that a 1% increase in government expenditure as a share of GDP led to a reduction in unemployment by 0.43% within the year.

Islamiah, Zamhuri, Rahmatia,&Paddu (2021) [3]. *The Impact of Investment and Government Spending on the Unemployment Rate*. This study monitored and analyzed the factors affecting unemployment through changes in investment levels and government spending. Hypotheses were tested using panel data regression analysis, examining the effect of one variable on another with IBM SPSS 22. The study concluded that government spending significantly affects unemployment and that higher investment levels create new job opportunities, indirectly reducing the unemployment rate.

Jawad (2024)[4]

The Impact of Agricultural Investment on the Unemployment Rate in Iraq for the Period (2004–2021). The study aimed to measure and analyze the relationship between domestic investment and unemployment in Iraq for the period 2004–2021 using econometric analysis via an ARDL model. The research found a long-term positive effect of domestic investment as a percentage of GDP at constant prices on employment levels, contributing to the reduction of unemployment. Any short-term imbalances in this long-term relationship would be corrected after ten quarters (two and a half years). The study recommended government implementation of public works programs that create employment opportunities, often in infrastructure projects, to encourage private sector investment and generate new jobs.

Saadallah (2024)[5]

The Impact of Some Macroeconomic Variables on Unemployment: An Econometric Study for the Period (2004–2021). This study aimed to examine the development of certain macroeconomic variables in Iraq and measure their impact on unemployment rates using descriptive and quantitative methods. The study covered the period 2004–2021, employing the ARDL model to estimate short-term relationships and test for cointegration among macroeconomic variables, including exchange rate, monetary base, GDP, and government expenditures, in relation to the unemployment rate. The study also estimated long-term relationships through long-term coefficients. It found that different macroeconomic variables have varying effects on unemployment: the exchange rate, monetary base, and GDP negatively impacted unemployment, while government expenditures had a positive effect. The key recommendation was to build a balanced economy that gradually reduces dependence on oil resources and diversifies the production base to meet domestic and external demand, achievable through transitioning to a market-oriented economy.

II. Theoretical Framework of the Study

1. The Concept of Unemployment

Unemployment is defined as the condition in which a large number of healthy individuals of working age desire to work but are unable to find employment at prevailing wage levels. Persons who are unable to work due to physical, psychological, or mental reasons, or who do not wish to work, are excluded from this definition[6]. Organisation for Economic Co-operation and Development (OECD) defines

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unemployment as all individuals over the age of 15 who are not engaged in paid or self-employment during a specific period [7]. A person is considered unemployed within the labor force if they do not have a job but have actively sought one during the preceding four weeks [8]. The unemployment rate is measured as follows [9]:

$$\text{Unemployment Rate} = \frac{\text{Number of Unemployed}}{\text{Labor Force}} \times 100$$

Employment and unemployment measures may be inflated in countries that provide unemployment benefits, as such benefits can incentivize individuals to register as unemployed, even if they are not actively seeking work. Some may receive benefits while working unreported jobs or earning income from other sources. Despite criticisms regarding the calculation of the unemployment rate, this formula is widely adopted internationally, including by the International Labour Organization.

The unemployment rate is often compared to the natural rate of unemployment, which is the rate that persists when wages are fully adjusted in the labor market over the long term. This rate is influenced by factors such as population growth, workforce composition, and productivity changes. In the United States, the natural unemployment rate ranged between 4–5% in the 1950s, about 6% in the 1980s and early 1990s, and slightly below 5% by the mid-2000s. Attempting to achieve a rate lower than the natural rate can accelerate inflation, negatively affecting the economy. Therefore, the natural unemployment rate is defined as the lowest achievable rate without triggering rising inflation. Economists generally agree that this rate is around 4%, and it is used in both monetary and fiscal policies to achieve full employment [10].

Unemployment is among the most serious problems that undermine national stability, varying in severity across countries and societies. It is a primary cause of many social issues and poses a clear threat to political and security stability. According to the International Labour Organization, "An unemployed person is an individual above a certain age who is without work, capable of working, willing to work, and actively seeking work at the prevailing wage but cannot find it" [11]. Individuals who do not fall under the category of unemployed include [12]:

1. Wealthy individuals capable of working but not seeking employment.
2. Part-time workers working involuntarily fewer hours than they desire, though able to work full-time.
3. Individuals employed at a wage but continuously seeking better jobs.
4. Workers in unstable, low-income, supplementary, or self-employment roles.
5. Individuals who have given up searching for work, despite wanting to work, often frustrated by repeated failures—especially during economic recessions.

This distinction highlights that not all non-working individuals are unemployed, and not all job seekers are considered part of the workforce. A person is classified as unemployed if they meet the following criteria [13]:

1. They have the desire, willingness, or capacity to work but cannot find employment.
2. They actively seek work using any means, such as newspaper

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advertisements, submitting applications to civil service offices, companies, employers, recruitment agencies, labor ministries, or online platforms.

3. They are of working age and capable of working, typically defined between 16 and 60 years, where 16 is the minimum working age and 60 is the retirement age.

In summary, unemployment is the condition in which individuals of working age, capable of working, do not engage in any paid economic activity, are earnest in their job search, and demonstrate both willingness and commitment to working.

2. Types of Unemployment

There are several types and forms of unemployment, with the most significant including:

A. Structural Unemployment:

This type of unemployment arises due to structural changes in the national economy, leading to a mismatch between available labor supply and the qualifications and skills of job seekers. These changes often result from technological advancements, shifts in demand for products, or geographic mismatches between locations of job opportunities and where job seekers reside, sometimes caused by the relocation of industries. This is the typical definition of structural unemployment in industrialized countries. In developing countries, economists usually attribute structural unemployment to the imbalance between the number of new job opportunities created by the economy and the number of new entrants into the labor market each year [14].

B. Seasonal Unemployment:

This type occurs in certain sectors of the economy due to seasonal economic or climatic variations, leading to temporary job inactivity in these sectors. It is most apparent in agriculture during off-harvest periods and in the hotel and restaurant sectors during the winter season [15].

C. Frictional Unemployment:

Frictional unemployment results from continuous movement of workers between professions and regions, often due to a lack of information for both job seekers and employers. The main cause of frictional unemployment is insufficient job advertisement through newspapers, direct contacts, or employment offices. Effective employment requires a national employment office or a system that exchanges information between job providers and seekers [16].

D. Cyclical Unemployment:

Economic activity does not progress at a constant pace over time. Economic cycles, consisting of expansions and recessions every three to ten years, create fluctuations in labor demand, which directly affect unemployment rates. During recessions, unemployment rises, while in periods of expansion and prosperity, unemployment decreases.

3. Effects of Unemployment

Unemployment has significant economic, social, and political effects that cannot be ignored. It is a major cause of social problems and a threat to political stability and social cohesion.

A. Economic Effects [17]:

- Reduced actual production compared to potential production due to idle labor.

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- Economic stagnation of goods in the community, as consumption depends on production, which is tied to employment.
- Costs of reintegrating unemployed individuals, varying by country and unemployment benefits provided.
- Loss of investment in education, as education spent on unemployed individuals becomes inefficient during periods of unemployment.
- Reduced government revenues due to lower income tax collection caused by unemployment.

B. Social Effects:

- Unemployment may drive some individuals to illegal activities to support themselves and their families, potentially leading to crime due to psychological frustration and stress.
- Social underdevelopment resulting from the inability of unemployed individuals to meet family needs, such as healthcare, education, food, and housing.
- Delayed marriage, often beyond the age of 30, due to lack of financial stability and housing, negatively affecting both men and women.

C. Political Effects:

- The consequences of unemployment can undermine political and security stability, including diminishing transparency and integrity.
- Unemployment may contribute to extremism and terrorism.
- It can drive emigration, legally or illegally, as people seek better employment and living opportunities abroad.

4. Unemployment in Iraq (2001–2013)

1. Unemployment Rate:

The average unemployment rate during this period was approximately 21.19%. The highest rate was recorded in 2003 at 27.28%, while the lowest was in 2018 at 10.53%.

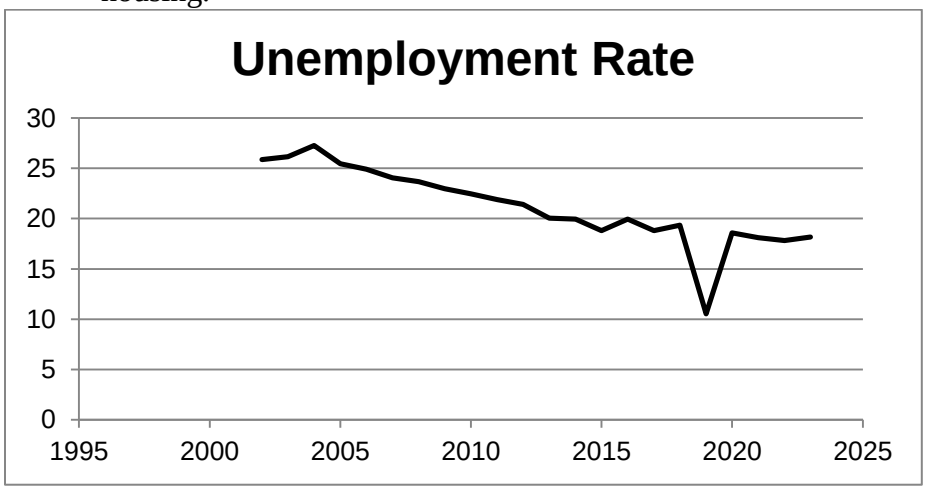

Figure 1: Unemployment Rate in Iraq

2. Gross Domestic Product (GDP):

The average GDP during the period was approximately 4,299.64, with the highest value

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recorded in 2013 at 5,418.91 and the lowest in 2018 at 2,886.61.

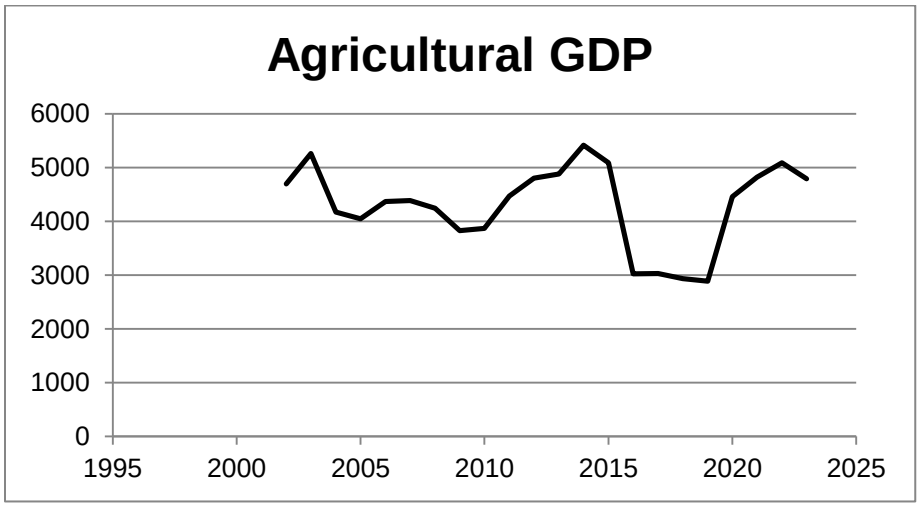

Figure 2: Gross Domestic Product in Iraq

3. Agricultural Investment:

The average agricultural investment during the period was approximately 775.45, with the highest value recorded in 2013 at 2,092.8 and the lowest in 2001 at 55.7.

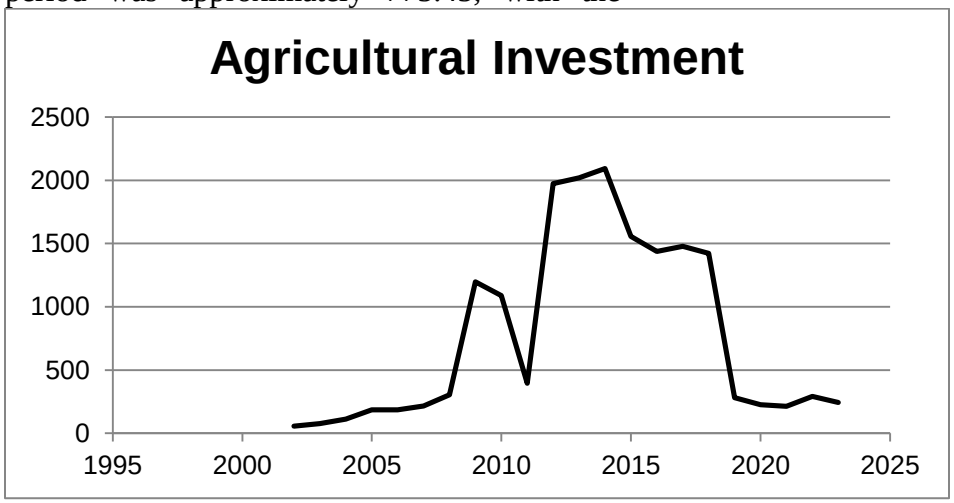

Figure 3: Agricultural Investment in Iraq

4. Inflation Rate:

The average inflation rate during the period was approximately 10.28, with the highest value recorded in 2006 at 53.23 and the lowest in 2007 at -10.07.

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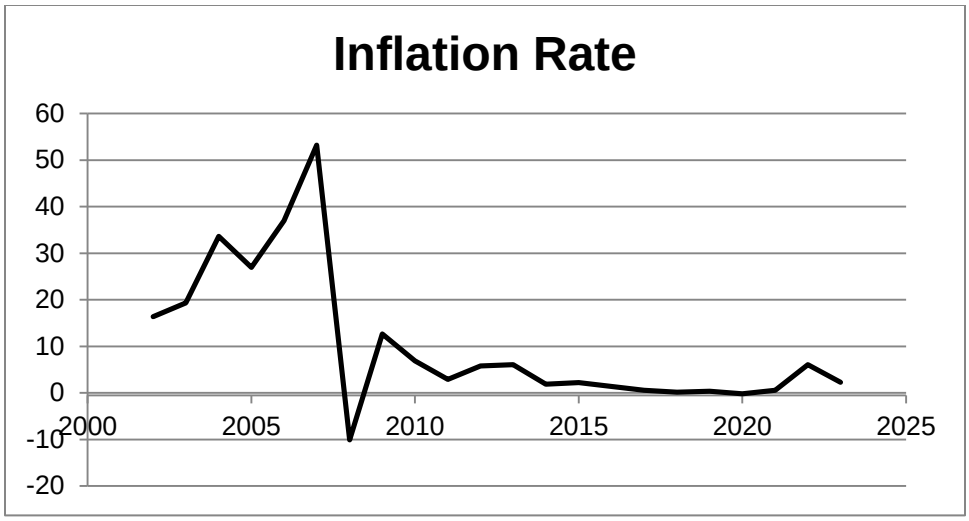

Figure 4: Inflation Rate in Iraq

Table 1: Status of Unemployment in Iraq (2001–2023)

Inflation Rate (INF)	Agricultural Investment (INV)	Agricultural GDP (GDP)	Unemployment Rate (Ut)	Year
16.37	55.7	4698.65	25.88	2001
19.32	77.4	5262.90	26.15	2002
33.62	111.3	4176.57	27.28	2003
26.96	186.2	4050.69	25.44	2004
36.96	185.4	4372.18	24.91	2005
53.23	216.6	4385.57	24.05	2006
-10.07	304.5	4243.74	23.67	2007
12.66	1197.4	3826.13	22.97	2008
6.87	1088.5	3868.94	22.45	2009
2.88	395.91	4468.92	21.89	2010
5.80	1974.9	4801.96	21.42	2011
6.09	2019.3	4881.40	20.05	2012

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1.88	2092.8	5418.91	19.94	2013
2.24	1556.0	5087.75	18.80	2014
1.39	1438.2	3023.28	19.94	2015
0.56	1479.1	3034.01	18.80	2016
0.18	1422.3	2934.28	19.36	2017
0.37	281.0	2886.61	10.53	2018
-0.20	226.4	4462.18	18.58	2019
0.60	214.2	4823.55	18.10	2020
6.10	292.4	5091.48	17.82	2021
2.30	244.3	4792.40	18.16	2022
3.00	250.3	4902.47	18.02	2023
10.27772727	**775.4459091**	**4299.640909**	**21.19045455**	**Average**
53.23	**2092.8**	**5418.91**	**27.28**	**Maximum**
-10.07	**55.7**	**2886.61**	**10.53**	**Minimum**

Source [18]: prepared by the Author based on data Iraqi Ministry of Agriculture. (2022). Annual report on the production and export of agricultural crops. Baghdad: Department of Agricultural Statistics.&United Nations Development Programme (UNDP). (2020). Iraq Sustainable Development Goals Report 2020. New York: United Nations.

4: Measuring the Effect of Certain Factors on Agricultural Unemployment in Iraq (2001–2023)

5. Econometric Description

The key factors affecting agricultural unemployment in Iraq can be identified using modern econometric methods. Since the data are time series, they may be non-stationary, necessitating specific tests to determine their stability. Once stability is verified, an appropriate model can be selected to explain the relationship between the dependent variable (agricultural unemployment) and the independent variables. A set of independent variables was used over a twenty-three-year period to obtain more accurate results. The relationship of the factors affecting agricultural unemployment was specified as follows:

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$$Ut = F(b_1 GDP, b_2 INV, b_3 INF)$$

$$Ut = a - b_1 GDP - b_2 INV + b_3 INF$$

Where:

- (Ut) : Agricultural unemployment
- (GDP) : Agricultural GDP
- (INV) : Agricultural investment
- (INF) : Inflation

Before estimating the model, it is necessary to examine the stability of the main variables. There are several methods to test for stationarity, which can be classified as follows:

1. Time Series Plot Method for Detecting Stationarity: Before applying any formal test to a time series, it is essential to plot it against time to understand its nature and behavior. The time series plot provides a preliminary indication of the potential properties of the series. For example, if the plot shows a general upward or downward trend, this indicates that the mean changes over time, meaning the series is non-stationary. Figures (5) and (6) display the plots of the studied economic variables at the level and after taking the first difference. It is observed that variables (X_1) and (X_3) are stationary at the level because their plots appear as horizontal lines without an upward or downward trend, indicating that these time series are integrated of order zero (I(0)). After taking the first difference, all variables become stationary with no unit root, as the plots show horizontal lines, meaning they are integrated of order one (I(1)).

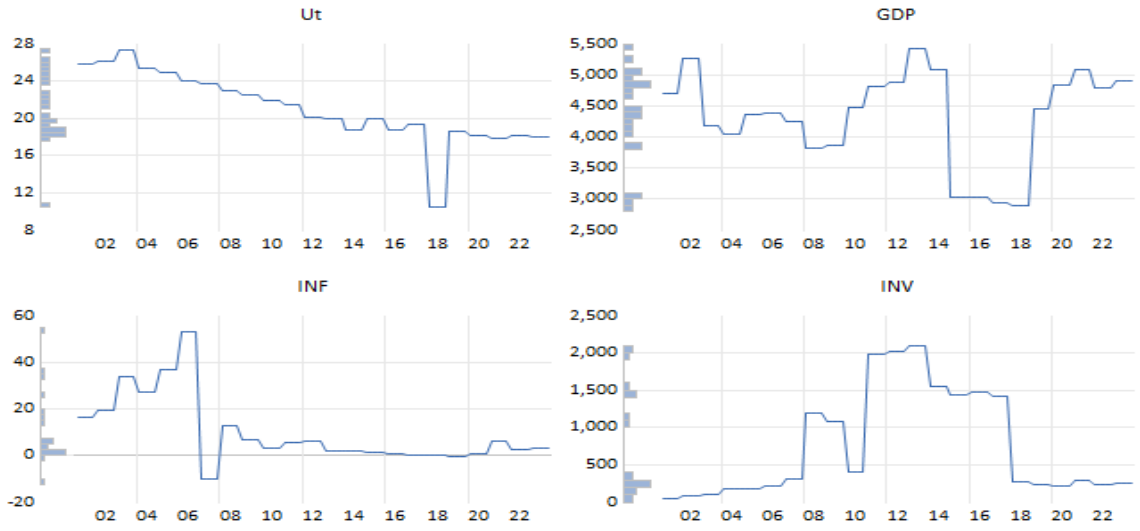

Figure (5) Time Series Plot Method for Detecting the Stationarity of the Variables at the Level.

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Source: These charts were made by the researcher based on the outputs of EViews 12.

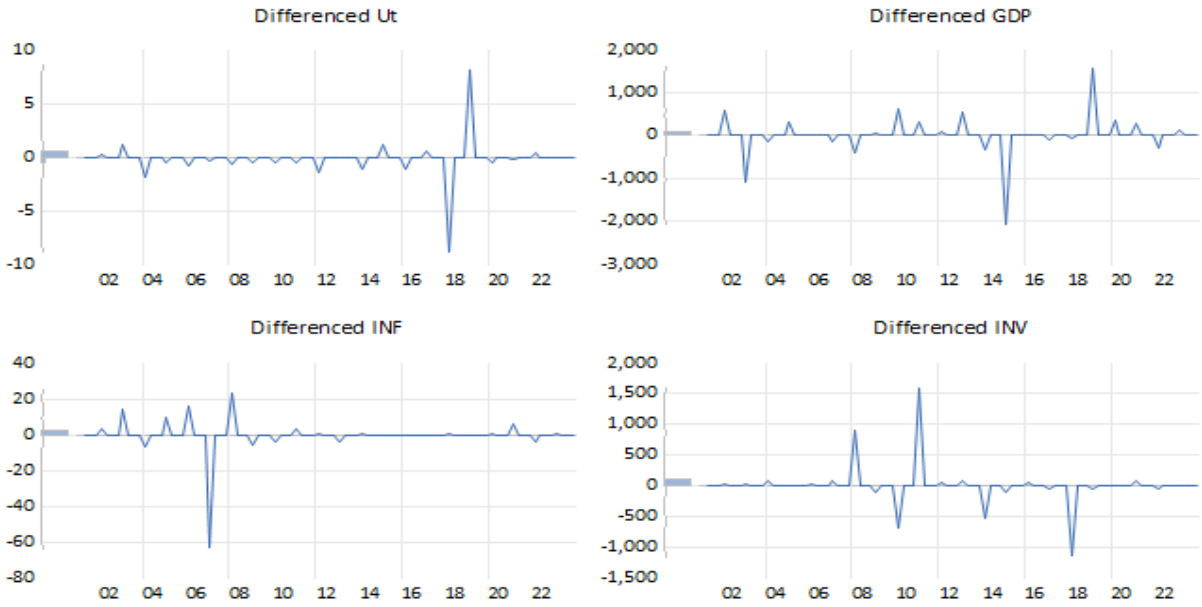

Figure (6) Time Series Plot Method for Detecting the Stationarity of the Variables at the First Difference.

Source: Prepared by the researcher based on the outputs of EViews 12.

2: Unit Root Test for Time Series Stationarity Using Phillips-Perron (PP) Method

The unit root test aims to examine the properties of the time series for each variable in the studied function, ensure the stationarity of economic time series, and determine the integration order of each variable. Table (2) presents the Phillips-Perron (PP) test results for the variables in the studied function. The results indicate that the time series for the variables (UT, INF) are stationary at the level at a 5% significance level, while all variables (UT, GDP, INF, INV) in the studied function are stationary at the first difference I(1) at a 1% significance level. This indicates that the variables differ in their degree of stationarity, which implies that using the Ordinary Least Squares (OLS) method is inappropriate since OLS assumes that all variables are integrated of the same order (i.e., stationary at the level). To avoid misleading results from OLS, it is necessary to use a method suitable for variables with different levels of stationarity. Therefore, the models will be estimated using the Autoregressive Distributed Lag (ARDL) model.

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Table (2) Unit Root Test for Time Series Stationarity Using the Phillips-Perron (PP) Method

UNIT ROOT TEST RESULTS TABLE (PP)					
INV	INF	GDP	UT		At Level
-1.7709	-2.7230	-2.1682	-1.8714	t-Statistic	With Constant
0.3926	0.0741	0.2193	0.3443	Prob.	
n0	*	n0	n0		
-1.6099	-3.5992	-2.1199	-3.7560	t-Statistic	With Constant&Trend
0.7816	0.0354	0.5277	0.0235	Prob.	
n0	**	n0	**		
-1.1207	-2.2665	-0.2833	-0.9357	t-Statistic	Without Constant&Trend
0.2368	0.0234	0.5813	0.3088	Prob.	
n0	**	n0	n0		
d(INV)	d(INF)	d(GDP)	d(UT)		At First Difference
-9.3816	-9.3844	-9.3813	-9.4222	t-Statistic	With Constant
0.0000	0.0000	0.0000	0.0000	Prob.	
***	***	***	***		
-9.4157	-9.3309	-9.3579	-9.3760	t-Statistic	With Constant&Trend
0.0000	0.0000	0.0000	0.0000	Prob.	
***	***	***	***		
-9.4340	-9.4340	-9.4340	-9.4340	t-Statistic	Without Constant&Trend
0.0000	0.0000	0.0000	0.0000	Prob.	
***	***	***	***		
(*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant					

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There are several criteria used to determine the optimal lag length for the Autoregressive Distributed Lag (ARDL) model, the most important of which are the Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (H-Q). Table (3) shows that, according to these criteria, the optimal lag length for the ARDL model is 1.

Table (3) Determination of Optimal Lag Lengths

VAR Lag Order Selection Criteria						
VAR Lag Order Selection Criteria Endogenous variables: UT GDP INF INV Exogenous variables: C Date: 11/03/25 Time: 22:08 Sample: 2001Q1 2023Q4 Included observations: 91						
HQ	SC	AIC	FPE	LR	LogL	Lag
45.12781	45.19366	45.08329	4.46e+14	NA	-2047.290	0
38.66520*	38.99440*	38.44256*	5.83e+11*	601.3441*	-1729.137	1

Source: Prepared by the researcher based on outputs from Eviews12.

3- Preliminary Estimation of the Autoregressive Distributed Lag (ARDL) Model for the Effect of Study Variables on Unemployment in Iraq (2001–2023)

After confirming the stability of the time series of the variables using unit root tests for the variables affecting unemployment, the preliminary estimation of the ARDL model was conducted using the statistical software Eviews12. Table (4) shows that the adjusted R^2 value is 0.90, indicating that the independent variables included in the estimated model explain approximately 90% of the variation in the dependent variable. This suggests that the explanatory factors have the greatest impact on the function, while the remaining 10% is unexplained, attributed to variables not included in the model and absorbed by the random error term. The F-test value is 137.84, with a probability level of 0.000, which is less than 0.05 and even below 0.01. This indicates that the estimated model is statistically significant as a whole and can be relied upon for planning and future forecasting.

Table (4) Preliminary Estimation of the ARDL Model

				Dependent Variable: UT
				Method: ARDL
				Date: 11/03/25 Time: 22:20
				Sample (adjusted): 2001Q2 2023Q4
				Included observations: 91 after adjustments
			Maximum dependent lags: 2 (Automatic selection)	
			Model selection method: Akaike info criterion (AIC)	
			Dynamic regressors (1 lag, automatic): GDP INF INV	
				Fixed regressors: C @TREND
				Number of models evalulated: 8
				Selected Model: ARDL(1, 0, 0, 1)
Prob.*	t-Statistic	Std. Error	Coefficient	Variable
0.0000	10.02817	0.070102	0.702993	UT(-1)
0.0450	2.034671	0.000171	0.000348	GDP
0.7408	0.331838	0.011546	0.003831	INF
0.0056	2.846376	0.000513	0.001459	INV
0.0016	-3.253850	0.000515	-0.001676	INV(-1)
0.0011	3.366861	1.847492	6.220250	C
0.0023	-3.138063	0.009857	-0.030931	@TREND
20.99956	Mean dependent var		0.907799	R-squared
3.703882	S.D. dependent var		0.901213	Adjusted R-squared
3.215657	Akaike info criterion		1.164146	S.E. of regression
3.408800	Schwarz criterion		113.8399	Sum squared resid
3.293578	Hannan-Quinn criter.		-139.3124	Log likelihood

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1.835393	Durbin-Watson stat	137.8414	F-statistic
		0.00000	Prob(F-statistic)

Source: Prepared by the researcher based on the outputs of the EViews 12 program

4- Cointegration Test Using the Bounds Testing Approach for the Effect of Study Variables on Unemployment in Iraq (2001–2023)

To verify the existence of cointegration, which indicates a long-run equilibrium relationship between the variables affecting unemployment, the bounds testing approach is employed. This relies on the F-statistic to test the null hypothesis (H_0 : b = 0), which states that there is no cointegration among the model variables, against the alternative hypothesis (H_1 : b ≠ 0), which asserts the presence of cointegration. As shown in Table (5), the calculated F-statistic value is 4.97, which exceeds the critical F-values at both the lower and upper bounds. This leads to the rejection of the null hypothesis (H_0 : b = 0) and acceptance of the alternative hypothesis (H_1 : b ≠ 0), confirming the existence of a long-term equilibrium (cointegration) relationship among the variables in the agricultural unemployment model.

Table (5) Cointegration Test Using the Bounds Testing Approach

			F-Bounds Test		Null Hypothesis: No levels relationship
I(1)	I(0)	Signif.	Value		Test Statistic
	Asymptotic: n=1000		4.979587		F-statistic
4.45	3.47	10%	3		k
5.07	4.01	5%			
5.62	4.52	2.50%			
6.36	5.17	1%			

Source: Prepared by the researcher based on the outputs of the EViews 12 program.

Estimation and Interpretation of the Short- and Long-Run Relationship Model According to the ARDL Approach for the Effect of Study Variables on Unemployment in Iraq (2001–2023)

Table (6) presents the results of estimating the Autoregressive Distributed Lag (ARDL) model using the Conditional Error Correction Model (CECM), which aims to analyze the relationship between the dependent variable (UT) and each of the Gross Domestic Product (GDP), Inflation (INF), and Investment (INV) in both the short and long run during the study period.

1. Short-Run Relationship

The estimation results show that the coefficient of the change in investment, D(INV), is positive and statistically significant at the 1% level, indicating a positive short-term effect of investment on the dependent variable (UT). This reflects that an increase in investment leads to an immediate and temporary improvement in UT within the same period. Additionally, GDP exhibits a positive and statistically significant effect at the 5% level, suggesting that improved economic performance positively influences UT in the short run. In contrast, the inflation coefficient (INF) is not statistically significant, implying a weak short-term impact of general price level changes on UT during the study period.

2. Error Correction Coefficient

The error correction term (ECM) has a value of -0.297 and is statistically significant at the 1% level, satisfying the necessary and sufficient condition. This indicates that short-term disequilibrium in agricultural unemployment can be corrected toward the long-run equilibrium. With ECM = 0.084, it would take approximately 3.367 years (three years and four months) to return to equilibrium, demonstrating the model's stability and its ability to revert to its long-term path.

3. Long-Run Relationship

The long-run estimation results indicate that the GDP coefficient is positive and statistically significant at the 5% level, showing a positive long-term relationship between economic growth and UT. This highlights the central role of economic growth in improving the dependent variable over the long term. Inflation (INF), while positive, is not statistically significant, indicating that inflation had no clear or stable long-term effect on UT during the study period. The investment coefficient (INV) is negative and not statistically significant, suggesting that investment, despite its economic importance, did not have a meaningful long-term impact on UT. This may be attributed to the nature of investments or other structural factors not included in the model.

Table (6) Estimation and Interpretation of the Short- and Long-Run Relationship Model Using ARDL

Conditional Error Correction Regression				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0011	3.366861	1.847492	6.220250	C
0.0023	-3.138063	0.009857	-0.030931	@TREND
0.0001	-4.236793	0.070102	-0.297007	UT(-1)*
0.0450	2.034671	0.000171	0.000348	GDP**
0.7408	0.331838	0.011546	0.003831	INF**
0.2579	-1.139064	0.000191	-0.000218	INV(-1)

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0.0056	2.846376	0.000513	0.001459	D(INV)
Case 2: Restricted Constant and No Trend				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0444	2.041225	0.000574	0.001171	GDP
0.7384	0.335018	0.038505	0.012900	INF
0.2671	-1.117145	0.000656	-0.000733	INV
EC = UT - (0.0012*GDP + 0.0129*INF -0.0007*INV)				

Table (7) Error Correction Coefficient for the ARDL Model

ARDL Error Correction Regression				
Dependent Variable: D(UT)				
Selected Model: ARDL(1, 0, 0, 1)				
Case 5: Unrestricted Constant and Unrestricted Trend				
				Date: 11/03/25 Time: 22:58
				Sample: 2001Q1 2023Q4
				Included observations: 91
ECM Regression				
Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0000	4.325467	1.438053	6.220250	C
0.0006	-3.545599	0.008724	-0.030931	@TREND
0.0042	2.945196	0.000495	0.001459	D(INV)
0.0000	-4.541995	0.065391	-0.297007	CointEq(-1)*
-0.086374	Mean dependent var		0.269475	R-squared
1.315857	S.D. dependent var		0.244285	Adjusted R-squared
3.149723	Akaike info criterion		1.143899	S.E. of regression
3.260090	Schwarz criterion		113.8399	Sum squared resid
3.194249	Hannan-Quinn criter.		-139.3124	Log likelihood
1.835393	Durbin-Watson stat	0.000005	10.69750	F-statistic

Source: Prepared by the researcher based on outputs from EViews 12

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6- Diagnostic Tests for the Effect of Study Variables on Unemployment in Iraq (2004–2023)

After obtaining the short- and long-term relationships of the variables affecting unemployment using the ARDL model, the model's adequacy was assessed through diagnostic tests. Table (8) shows the following:

- Breusch-Godfrey Serial Correlation LM Test: F-statistic = 0.65, p-value = 0.5207. Since the p-value is greater than 5%, the null hypothesis of no serial correlation in the residuals is accepted.
- ARCH Heteroskedasticity Test: F-statistic = 0.391, p-value = 0.533. With a p-value above 5%, the null hypothesis of no heteroskedasticity is accepted.
- Ramsey RESET Test: F-statistic = 1.242, p-value = 0.268. Again, since the p-value exceeds 5%, the null hypothesis that the functional form is correctly specified is accepted.

Thus, the model is considered valid and reliable for inference.

Table (8) Diagnostic Tests

Breusch-Godfrey Serial Correlation LM Test:					
0.5207		Prob. F(2,82)	0.657896		F-statistic
0.4874		Prob. Chi-Square(2)	1.437147		Obs*R-squared
Heteroskedasticity Test:ARCH					
0.5330		Prob. F(1,88)	0.391817		F-statistic
0.5276		Prob. Chi-Square(1)	0.398945		Obs*R-squared
Ramsey RESET Test , Equation: UNTITLED					
Probability			df	Value	
0.2683			83	1.114543	t-statistic
0.2683			(1, 83)	1.242206	F-statistic

Source: Prepared by the researcher based on outputs from **EViews 12**

7- Stability Test of the Estimated Model Using CUSUM and CUSUM of Squares for the Effect of Study Variables on Unemployment in Iraq (2001–2023)

The structural stability of the estimated ARDL model for short- and long-term relationships was assessed using the CUSUM and CUSUM of Squares tests. These tests are crucial because they evaluate:

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1. Whether the data used in the study contain any structural breaks.
2. The consistency and stability of short-term parameters relative to long-term parameters.

These tests are commonly applied for ARDL models. If the plotted statistics remain within the critical bounds at the 5% significance level, it indicates that all estimated parameters are stable and there are no structural changes.

- CUSUM Test (Figure 7): The plot remained within the 5% critical bounds, indicating no structural changes and that long-term parameters are consistent with short-term parameters.
- CUSUM of Squares Test (Figure 8): Parameters were generally stable throughout the study period, except for deviations beyond the 5% critical bounds in 2018 and 2019, indicating structural changes in unemployment during those years.

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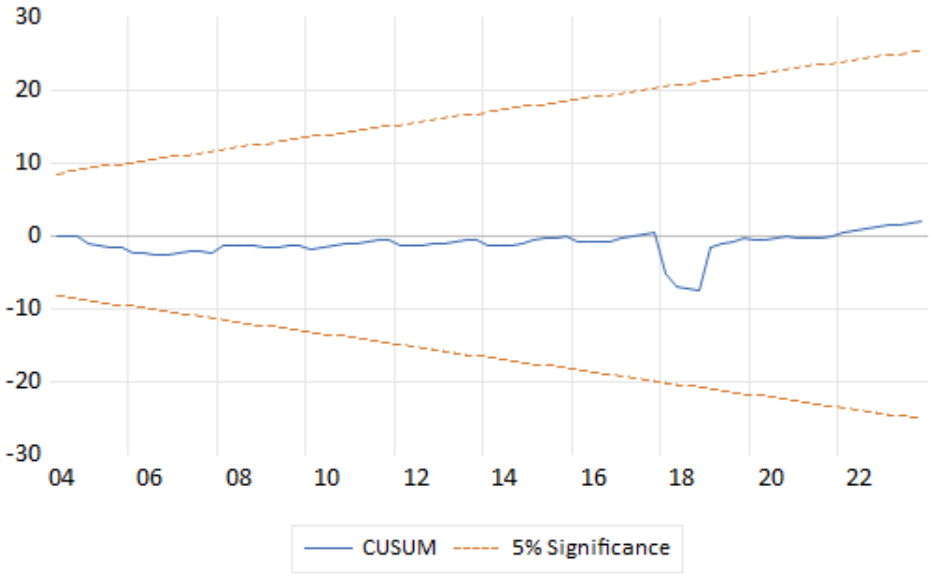

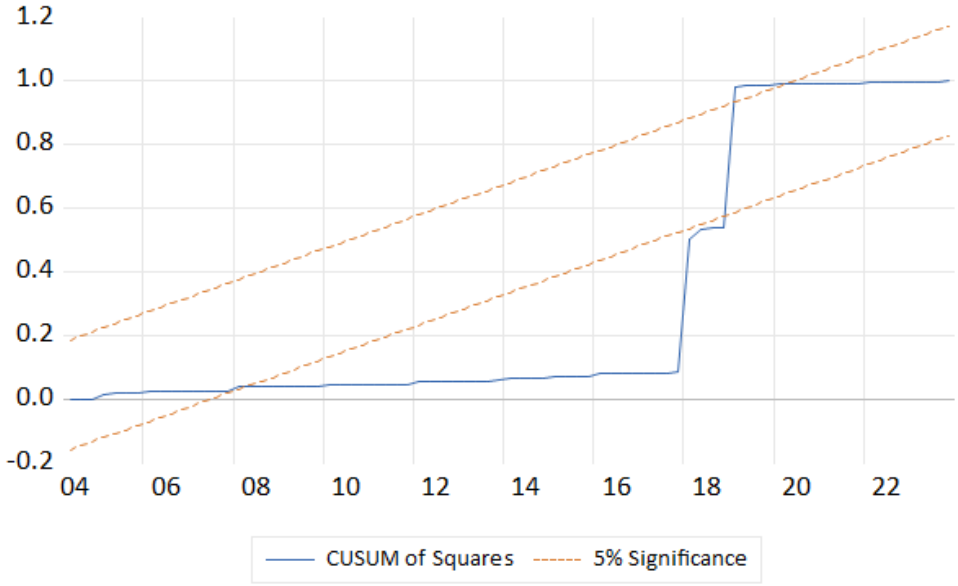

Figures 7&8: Stability Test of the Estimated Model Using CUSUM and CUSUM of Squares for Wheat Consumption Function in Iraq (1990–2024)

Source: Prepared by the researcher based on outputs from EViews 12

Fifth: Conclusions

1. The relationships among the study variables are balanced in the long term. Economic growth is the most influential and stable variable in explaining changes in the dependent variable, while investment shows a positive effect only in the short term, and inflation does not have a significant effect in either the

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short or long term during the study period.
2. Diagnostic tests confirm that the ARDL model used in the study exhibits a high degree of statistical and economic efficiency in analyzing both short- and long-term effects of variables influencing unemployment.
3. The Breusch–Godfrey Serial Correlation LM Test indicated no serial correlation among the model residuals, with a p-value above the 5% significance level, confirming the independence of random errors and validity of the model estimates.
4. The ARCH Heteroskedasticity Test results showed no heteroskedasticity, indicating stable variance of the residuals over time and reinforcing the reliability of the estimated results.
5. The Ramsey RESET Test confirmed no misspecification in the functional form, suggesting that explanatory variables were appropriately modeled and the ARDL model reflects the true economic relationship among the variables.
6. Despite partial structural changes, the model remains statistically acceptable. The overall stability of parameters supports the reliability of both short- and long-term results for economic analysis and final conclusions.
7. These findings highlight the importance of accounting for extraordinary economic events when interpreting unemployment trends in 2018–2019. Future studies could include dummy variables to capture the effects of such structural changes more accurately.

Sixth: Recommendations

1. Policymakers should focus on variables that have a significant long-term impact on unemployment, as addressing unemployment requires sustainable structural policies rather than temporary measures.
2. Adopt short-term economic policies targeting the reduction of unemployment fluctuations, based on short-term relationship results, to absorb economic shocks and minimize their negative effects on the labor market.
3. Enhance government spending efficiency and direct it toward productive sectors capable of creating sustainable jobs, particularly sectors with high labor absorption capacity.
4. Improve the investment environment by supporting the private sector and providing appropriate incentives, increasing labor demand and reducing long-term unemployment.
5. Update economic data regularly and conduct future studies using alternative econometric models for comparison and to verify stability of results over different periods.
6. Ensure similar diagnostic tests are applied in future econometric studies to guarantee model validity and the accuracy of derived conclusions.

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