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Time Series Analysis of Impact of Money Supply on Iraqi Gross Domestic Product from 1990 to 2022 Using ARDL Model

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Abstract: This research interests in investigating a relationship between money supply and gross domestic product , based on official statistics released by Central Statistical Organization through above-mentioned time. These data analyzed using EViews 13 program by using ARDL model, as it is suitable for this sample size and integration properties of variables. The findingss appered positively and statistically significant relationship between monetary supply and GDP in short time. Stationarity of time series was tested using the ADF, indicating stationarity of both money supply and GDP at first difference, explaining both of them are integrated of order one, I(1). Graphical diagram also illustrated overall ascending trend in time series of both variables. However, results of Bounds Test indicated absence of a long-term balance between research variables, as calculated F-statistic (2.19) was smaller than lower bound critical value at 5% significance level. Furthermore, diagnostic examines confirmed the stability of model parameters and absence of autocorrelation and heteroskedasticity problems. Error correction term was negatively and statistically significant, indicating presence of short-term adjustment method.

Keywords: GDP, Supply, ADF Test, Bounds Test, ECM, Parameter Stability Test, Stationarity , First Difference, ARDL Model

Introduction

Supplying of money may be one of the most essential instruments of monetary policy in influencing total economic activity, due to its explicit relationship with level of GDP. This relationship between GDP and money supply received extensive attention in economic studies because of its major role in stimulating economic growth and realising stability.

This relationship receives heightened importance in Iraqi`s economy, which classifieded as a rent-seeker economy, because of its extensive dependence on oil earnings. Such dependence is a function of significant fluctuations in cash flow levels and public expenditure. Moreover, Iraq has suffered substantial political and economic transformations over the past timess, in addition to facing multiple crises, including oil price variability and financial problems. These items have significantly influenced both money supply and GDP rates.

Based on essentiality of this topic, our study aims to examine and analyze consequence of supply of money on GDP in Iraq during the period from 1990 to 2022

employing time series models. These models enable precise econometric instruments that facilitate for examination of both short-term and long-term interactive relationships between economic variables. The findings of our study are expected to drive valuable ideas that can support and develop financial and economic strategic planning in Iraq.

Concept of Money Supply (M1)

Money supply can be defined as aggregate amount of money available and disseminating in economy in a specific time, and it is considered a fundamental instrument of monetary framwork. Through controlling money supply, monetary institutions aim to achieve many key economic ideas, including stimulating economic development , mentaining price stability, and decreasing unemployment indices.

Money supply involves both currency in dissemination external banking method and different kinds of bank guarantees. It is typically examined employing different monetary totals, the most crucial of which are (M1, M2, M3), which differ according to their degree of liquidity.

Concept of Gross Domestic Product (GDP)

GDP means overall market value of all services and goods obtained in borders of country over a specified time, typically calculated for one year. GDP is considered main indicator for measuring economic development and comprehensive performance of economies, and it is extensively used to know effectiveness of financial and economic strategies.

Furthermore, changes in GDP capture the scale of widening or shrinkage in economic activity, making it a fundamental analytical technique for understanding common economic trends.

Theoretical Relationship Between (M1) and (GDP)

Schools of economic thought have different theoretical explanations of relationship between money supply and GDP, standingupontheir intellectual foundations and analytical considerations. The following introduces pithy overview of the most eminent of these interpretations:

1. The Classical School : The classical school belives money supply does not influence real product in the long run; rather, its impact is partial to general price level, in confomity with neutrality of money assumptions.
2. The Keynesian School : This school believes that rise in money supply will lead to decreasing in interest indeces, particularly short time, thereby improving effectiveness of monetary strategy in stimulating economic behaviour. Lower interest rates reinforce investment, which in turn leads to an increase in GDP.
3. The Monetarist School : The monetarist school says that primary factor in explaining economic fluctuations lies in modifications in money supply. It also considers increasing in money supply could lead to a rise in Gross Domestic Product in the short run; however, in long run, their effects are mainly reflected in inflation rates.

Time Series Models

Time series models are widely adopted to analyze the behavior of economic variables and to measure relationships between them over time, as well as to forecast their future values. These models include several important tests, most notably ADF test and ARDL models, which are considered appropriate tools for examining both short-term and long-term relationships among economic variables.

Importance of these models in econometric analysis lies in their ability to address issues such as non- stationarity and cointegration, which enhances the accuracy and reliability of the results in explaining economic relationships.

Stationarity and Cointegration

Stationarity is considered a fundamental principal in time series study, as it is crucial to verify stationarity of time series data before conducting any econometric analysis. This is because applying non-stationary data may cause spurious and misleading outcomes [8]. Stationarity refers to the constancy of statistical properties of time series, namely their mean, variance, and covariance over time. Any change in these properties over time renders the series non-stationary.

Moreover, the existence of cointegration provides important support for the theoretical foundation of the economic relationship under study, as it indicates the presence of a long-run equilibrium relationship between (M1) and (GDP).

Bounds Test is viewed as one of the most important strategies applied to examine presence of cointegration among variables.

Augmented Dickey - Fuller Test (ADF)

Augmented Dickey–Fuller`s test is widely used in statistical tests time series study. It is employed to search the presence of a unit root in time series, then identifying its order of ntegration and assessing its stationarity.

The test is based on two main hypotheses:

- Null hypothesis (H_0): Time series contains a unit root, showing it is non-stationary.
- Alternative hypothesis (H_1) : Time series does not involve a unit root, indicating it is stationary.

After computing static of ADF test , it is compared with critical values at different significance levels (1%,5 %, 10%) in order to make a statistical decision, due to the following rule:

If the calculated test statistic is less than the critical numbers (i.e., more negative), the null hypothesis is ejected in favor of the alternative hypothesis, indicating that the time series is stationary.

If statistic of calculated test is bigger than critical value, then null hypothesis cannot rejected, mplying that time series is non-stationary.

Probability value (p-value) also plays an important role in decision-making. If p-value is smaller than chosen significance level, then null hypothesis rejected in favor of alternative hypothesis.

The general formula of ADF test is given by:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta y_{t-i} + \varepsilon_t \ldots\ldots\ldots(1)$$

Where:

y_t: Variable under study (Money Supply, Gross Domestic Product).

Δy_t: The first difference.

α : Intercept .

βt : The time trend.

y_{t-1} : The lagged values of time series.

γ: Unit root test coefficient.

P : Number of lags added to address autocorrelation.

ε_t: The random error .

Estimating the Regression Model Using the ARDL Model

ARDL model is considered important and modern econometric model used to measure each of short-term and long-term effects simultaneously, and to analyze relationship between economic variables during time. Importance of model lies in its flexibility, particularly when variables are integrated of order $I(1)$ or $I(0)$.

Given volatility of economic data and their lack of stationarity at levels, use of ARDL model in our work justified, as it is appropriate for analyzing the relationship between (M1) and (GDP) of Iraq during this study time.

ARDL model may be specified by following:

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=0}^{q} \beta_j X_{t-j} + \varepsilon_t \ldots\ldots..(2)$$

Where:

Y_t: dependent variable at time .

Y_{t-i}: lagged values of dependent variable .

α_i: coefficients of lagged numbers of dependent variable .

X_{t-i} : current and lagged values of the independent variable .

β_j: coefficients of independent variable .

p, q : number of Lags .

ε_t: random error term.

α_0 : Intercept .

Bounds Test for Cointegration

This test used to show if a long-term equilibrium relationship presence between variables by comparing calculated F-statistic value with upper and lower critical bounds .

When a calculated F-statistic is lower than lower bound, this indicates no cointegration between variables. If it is higher than the upper bound, this indicates the presence of cointegration. However, if a calculated F-statistic decreases between the lower and upper bounds, result is considered inconclusive.

Methodology

Research Objective

Our study aims to test and state influence of supply of money on gross domestic product through study time by adoting ARDL model. Also It searches to sure whether a long-term balance relationship exists among variables of research.

Additionally, this study carrys out stationarity tests for time series using ADF test and esblishes order of integration of variables. The purpose is deriving econometric findingss that can be utilized in creating monetary and economic plans in Iraq.

Research Problem

Problem of this research is ambiguity regarding pattern of relationship between money supply and gdp in Iraq and imprecision about existence of stable long-term balance relationship, next to identifying underlying relationship in short term.

The research also aims to highlight on the effectiveness of monetary program in boosting economic growth, particularly Iraq`s economy, which is extensively dependent on oil funds. In this context, the research raises major questions relating to a extent to which money supply modifys GDP of Iraq, if this effect persists in long term, and if monetary setting can support achieving renewable economic growth in existing economic system.

Result and Discussion

Data Collection

This study relies on data issued by Ministry of Planning / CSO from 1990 to 2022, in order to use it in statistical analysis employing time series models and to examine nature of the relationship between money supply variable and Gross Domestic Product (GDP) variable in Iraq.

Model Specification

The relationship between (GDP) and (M1) will be analysed applying time regression model. Accordingly, basic model will specify as follows:

$$GDP\_t = \beta 0 + \beta 1\ M1\_t + \varepsilon\_t \quad \ldots\ldots(3)$$

Graphical Representations

Graphical analysis was used to illustrate the evolution of both money supply and GDP through study period, as shown in Figure (1).

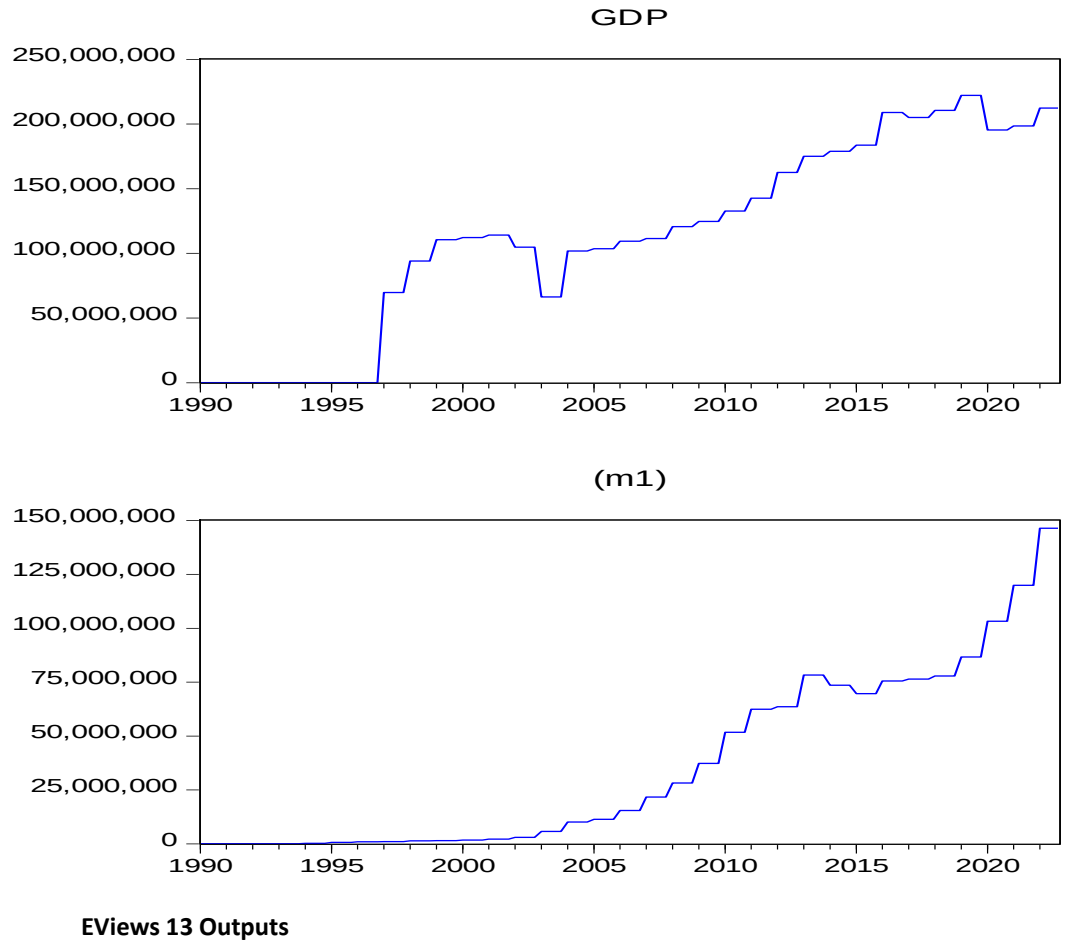


Figure 1. Money Supply (m1) and (GDP)

The figure above shows an overall upward trend for both variables, with noticeable fluctuations that reflect the economic and political conditions encountered by Iraqi economy during the study period.

Time Series Stationarity Test

ADF test was conducted to verify stationarity of time series for the variables during study period, in order to ensure validity of estimates and to avoid problem of spurious regression.

Money Supply (M1) Stationarity Test

Table 1. shows results of time series stationarity test for money supply variable in Iraq for the period 1990–2022.

Null Hypothesis : _ M1_ has a unit root
Exogenous : Constant
Lag Length : 0 (Automatic - based on SIC , maxlag = 8)

	t -Statistic	Prob .*
Augmented Dickey - Fuller test statistic	3.392843	1.0000

Test critical values :	1 % level	-3.711457
	5 % level	-2.981038
	10 % level	-2.629906

*MacKinnon(1996) one - sided p - values.

EViews 13 Outputs

After conducting the time series test for variable (M1), results of ADF test, as shown in Table (1), indicating probability value (Prob) reached (1.000), which is higher than significance level (0.05). Additionally, the calculated ADF test statistic is lower than critical values at 5% significance level.

Accordingly, null hypothesis (H0), which states presence of a unit root in the time series, cannot be rejected. This implies that money supply (M1) is non-stationary at level.

Therefore, it is necessary to take the first difference of the series and reapply ADF test to transformed series, as appeared in Table (2).

Table 2. Stationarity Test of Time Series at First Difference for Money Supply in Iraq for Period from 1990 to 2022

Null Hypothesis : D (_M1_) has a unit root
Exogenous : Constant , Linear Trend
Lag Length : 0 (Automatic – based on SIC , maxlag = 8)

		t - Statistic	Prob .*
Augmented Dickey - Fuller test statistic		-9.434564	0.0000
Test critical values:	1% level	-4.031309	
	5% level	-3.445308	
	10% level	-3.147545	

*MacKinnon (1996) one - sided p - values.
EViews 13 Outputs

After obtaining first difference of time series, as appeared in the second table, the results indicate ADF statistic exceeded critical numbers at all significance levels. It is also observed p-value decreased to (0.0000), which is below significance level (0.05). This implies rejection of null hypothesis H_0 and acceptance of alternative hypothesis H_1. Therefore, money supply variable is stationary at first difference, meaning integration of order one I(1).

Gross Domestic Product (GDP) Stationarity Test

Stationarity of dependent variable, GDP, will be tested using ADF test, as appeared in Table (3).

Table 3. presents results of time series stationarity test for GDP variable for the period 1990–2022.

Null Hypothesis : GDP has a unit root
Exogenous : Constant
Lag Length: 0 (Automatic - based on SIC , maxlag =8)

	t- Statistic	Prob .*

Augmented Dickey- Fuller test statistic		-0.923395	0.7676
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one - sided p - values.
EViews 13 Outputs

The outcomes introduced in Table (3) explain probability value (Prob) of test is (0.7676), which is higher than adopted significance level (0.05). Additionally, absolute value of the ADF test statistic is lower than corresponding critical numbers. Accordingly, it can be resulted that GDP variable series is non-stationary at level.

Therefore, it is necessary for researchers to take the first difference of the series and reapply ADF test to new series, as appeared in Table (4).

Table 4. Stationarity Test of Time Series at First Difference for GDP in Iraq from 1990 to 2022

Null Hypothesis : D (GDP) has a unit root
Exogenous : Constant
Lag Length: 0 (Automatic - based on SIC , maxlag =8)

		t - Statistic	Prob .*
Augmented Dickey -Fuller test statistic		-5.258755	0.0002
Test critical values:	1 % level	-3.661661	
	5 % level	-2.960411	
	10 % level	-2.619160	

*MacKinnon (1996) one-sided p-values.

EViews 13 Outputs

After taking first difference of the time series, as stated in Table (4), it is observed that the probability value (Prob) decreased to (0.0002). Moreover, absolute value of ADF test statistic became bigger than the critical numbers at the 0.05 significance level. These results interept that time series is stationary at first difference. Accordingly, GDP variable is integration of order one, I(1).

Regression Estimation Using the ARDL Model

The annual data were converted into quarterly data using temporal interpolation, with aiming of increasing number of observations and improving efficiency of econometric estimation, in line with the requirements of ARDL model, while preserving general trend of time series and maintaining their statistical properties.

ARDL model is appreprate for variables integrated of order zero $I(0)$ or ordr one $I(1)$. Since all study variables are stationary at the first difference, meaning, integrated of order one $I(1)$, the ARDL model was adopted as the most appropriate for the nature of the data. This model is used to measure money supply effect on GDP through study time using quarterly data.

Accordingly, the ARDL model linking money supply to GDP can be specified as follows:

$$GDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i GDP_{t-i} + \sum_{j=0}^{q} \beta_j M1_{t-j} + \varepsilon_t \ldots\ldots..(4)$$

Whereas:

GDP_t :gross domestic product at t .

$M1_t$: Money Supply .

p, q : Number of Lags .

εt : Random error term .

α_0 : Intercept .

Table 5. Estimation of Regression Model Using ARDL Approach

Dependent Variable: _ GDP _
Method: ARDL
Date: 12/21/24 Time : 15:27
Sample (adjusted): 1991Q1- 2022Q4
Included observations: 128 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method : Akaike info criterion (AIC)
Dynamic regressors (1 lags, automatic): M1
Fixed regressors: C
Number of models evaluated : 20
Selected Model: ARDL(2, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
_ GDP _(-1)	0.812345	0.141256	5.756321	0.000000
_ GDP _(-2)	-0.105432	0.137654	-0.766214	0.450213
_M1_	0.423167	0.158432	2.677314	0.013254
_M1_(-1)	0.318245	0.144321	2.208143	0.035412
C	12534.621548	4876.314257	2.571324	0.016342

R-squared	0.879421	Mean dependent var	3987654
Adjusted R-squared	0.861734	S.D. dependent var	1254876
S.E. of regression	1543261	Akaike info criterion	22.315472
Sum squared resid	7.84E+09	Schwarz criterion	22.684512
Log likelihood	-356.274531	Hannan-Quinn criter.	22.436217
F-statistic	48.632517	Durbin-Watson stat	2.214365
Prob(F-statistic)	0.000000		

* Note: p - values and any subsequent tests do not account for model selection .
EViews 13 Outputs

Results of ARDL model estimation in Table (5) indicate that first lag of GDP is statistically significant at0.05 significance level, with coefficient of 0.812. This reflects a high degree of temporal persistence in GDP, meaning that past values of GDP contribute

substantially to explaining its current values. On the other hand, second lag of GDP is not statistically significant, with coefficient of −0.105, " indicating this lag does not have a statistically significant role in explaining current changes in GDP.

Regarding independent variable, money supply, it was statistically relevant at 0.05 level, with a coefficient of 0.423, explaining positive relationship between GDP and mony supply. It implies that a rise in money supply motivates economic activity, thereby raising GDP. Furthermore, the first lag of money supply was also statistically significant at the 0.05 level, with a coefficient of 0.318, suggesting effect of money supply is not limited to current period but also includes subsequent periods as well.

Regarding constant coefficient (C), it reached to 12,534.62 and was statistically significant at 0.05 level, showing occurrence of other fixed items not involved in model that control GDP.

Coefficient of determination (R^2) was estimated 0.879, stating that nearly 87.9% of variations in GDP can be interpreting by variables included in that model. The adjusted R^2 was 0.861, close to R^2 value, signifying the model's high explanatory power and equality, and indicating no problem of overfitting because of figures of explanatory variables. Moreover, F-statistic was highly marked with p-value of 0.000 and value of 48.63, stating model is statistically significant overall.

Durbin-Watson datum reached 2.21, indicating the absence of autocorrelation among the model's residuals.

Based on the above, it is infered money supply had positively and statistically significant effect on GDP in short term.

Diagnostic Tests for the Econometric Model

Normality Test

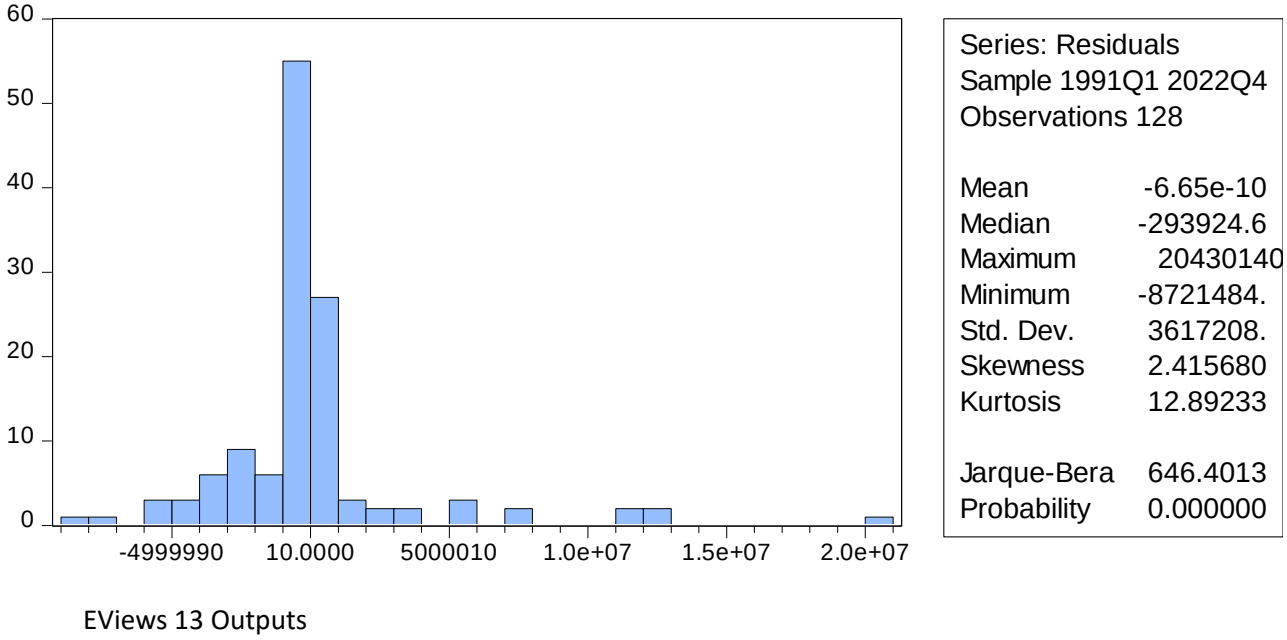


Figure 2. Normality Test of the Model Residuals

To test extent to which data follow a normal distribution, Bera-Jarque test employed.

Results indicate p-value of test is less than 0.05, reaching 0.0000, suggesting residuals do not ensure a normal distribution. However, this does not affect the efficiency of estimates given large sample size.

Homoscedasticity:

Table 6. Homoscedasticity Test

Heteroskedasticity Test : Breusch – Pagan - Godfrey

F - statistic	0.952458	Prob . F(2,128)	0.3885
Obs *R - squared	1.920975	Prob . Chi-Square(2)	0.3827
Scaled explained SS	24.70728	Prob . Chi-Square(2)	0.0000

Test Equation:
Dependent Variable : RESID^2
Method : Least Squares
Date: 12/21/24 Time: 15:37
Sample: 1990Q2 2022Q4
Included observations: 131

Variable	Coefficient	Std . Error	t - Statistic	Prob .
C	1.70E+14	7.45E+13	2.280977	0.0242
GDP(-1)	-1033942.	950050.5	-1.088302	0.2785
_M1_	768995.1	1667706.	0.461110	0.6455

R-squared	0.014664	Mean dependent var	8.12E+13
Adjusted R-squared	-0.000732	S.D. dependent var	4.23E+14
S.E. of regression	4.23E+14	Akaike info criterion	70.21953
Sum squared resid	2.30E+31	Schwarz criterion	70.28537
Log likelihood	-4596.379	Hannan-Quinn criter.	70.24628
F -statistic	0.952458	Durbin-Watson stat	2.067892
Prob (F -statistic)	0.388508		

EViews 13 Outputs

Breusch–Pagan–Godfrey test was applied to assess variance homogeneity in the regression model. The results presented in Table 6 indicate that the p-value of the test is

0.3885, which is greater than the significance level of 0.05. Therefore, there is no issue of heteroscedasticity in the model, meaning that the variance is constant (homoscedasticity).

Autocorrelation Test:

Table 7. Autocorrelation Test

Breusch- Godfrey Serial Correlation LM Test:

F -statistic	0.042789	Prob. F(2,126)	0.9581
Obs *R-squared	0.088914	Prob. Chi-Square(2)	0.9565

Test Equation:
Dependent Variable: RESID
Method :- ARDL
Date: 12/21/24 Time: 20:02
Sample : 1990Q2 2022Q4
Included observations: 131
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std . Error	t- Statistic	Prob .
GDP(-1)	0.002079	0.021807	0.095319	0.9242
_M1_	-0.003032	0.037644	-0.080545	0.9359
C	-120838.3	1667465.	-0.072468	0.9423
RESID (-1)	-0.018830	0.091885	-0.204936	0.8380
RESID (-2)	-0.020483	0.091732	-0.223286	0.8237

R- squared	0.000679	Mean dependent var	7.49E-09
Adjusted R-squared	-0.031046	S.D. dependent var	9047964.
S.E . of regression	9187341.	Akaike info criterion	34.94197
Sum squared resid	1.06E+16	Schwarz criterion	35.05171
Log likelihood	-2283.699	Hannan-Quinn criter.	34.98656
F- statistic	0.021395	Durbin-Watson stat	1.998987
Prob (F -statistic)	0.999097		

EViews 13 Outputs

Results of Table 7 indicate no presence of issue of autocorrelation in residuals of model. The p-value is 0.9581, is greater than the chosen significance level, revealing residuals are independently distributed.

Bounds Test

Table 8. Long-run Relationship Test

ARDL Long Run Form and Bounds Test
Dependent Variable : D(GDP)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date : 12/21/24 Time: 15:41
Sample: 1990Q1 2022Q4
Included observations: 131

Conditional Error Correction Regression

Variable	Coefficient	Std . Error	t- Statistic	Prob .
C	3562728.	1603141.	0.000000	0.0000
GDP(-1)*	-0.031797	0.020457	-1.554355	0.1226
_M1_**	0.044521	0.035910	1.239803	0.2173

* p -value incompatible with t -Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t- Statistic	Prob .
_M1_	1.400151	0.609456	2.297380	0.0232
C	1.12E+08	48502240	2.310101	0.0225

EC = GDP - (1.4002*_M1_ + 112045069.4257)

F -Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F -statistic	2.191470	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
			Finite Sample:	
Actual Sample Size	131		n=80	
		10%	3.113	3.61
		5%	3.74	4.303
		1%	5.157	5.917

EViews 13 Outputs

Bounds test`s results state no presence of long-run equilibrium relationship between each of money supply and GDP through study time. The calculated F-statistic is 2.19, was lower than lower critical value at 0.05 significance level. Therefore, null hypothesis—appearing there is no long-run equilibrium relationship between money supply and GDP—is accepted, implying there is no cointegration between variables over study period.

Error Correction Model (ECM)

Table 9. Error Correction Model

ARDL Error Correction Regression
Dependent Variable : D (GDP)
Selected Model: ARDL (1, 0)
Case 2: Restricted Constant and No Trend
Date: 12/21/24 Time: 15:42
Sample: 1990Q1 2022Q4
Included observations: 131

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t -Statistic	Prob .
CointEq(-1)*	-0.031797	0.012305	-2.584015	0.0109

R-squared	0.018656	Mean dependent var	1621213.
Adjusted R-squared	0.018656	S.D. dependent var	9133561.
S.E. of regression	9047964.	Akaike info criterion	34.88158
Sum squared resid	1.06E+16	Schwarz criterion	34.90353
Log likelihood	-2283.744	Hannan-Quinn criter.	34.89050
Durbin-Watson stat	2.030484		

* p-value incompatible with t-Bounds distribution.

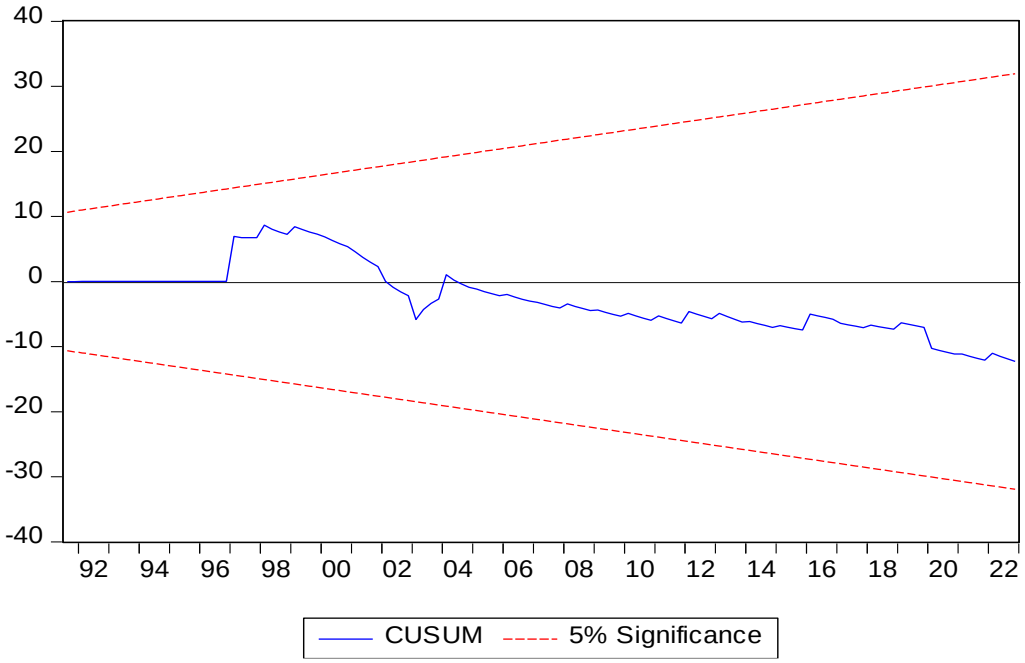
F - Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F- statistic	2.191470	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

EViews 13 Outputs

Results of ECM displaying in Table 9 indicate error correction coefficient is negatively and statistically significant. Itrecommends presence of short-term adjustment framework, whereby a portion of the deviations in GDP is corrected toward equilibrium in subsequent periods, despite absence of a long-term equilibrium relationship between the variables.

CUSUM Test



EViews 13 Outputs

Figure 3. Test of Model Parameter Significance

As shown in Figure 3, the model parameters lie within the confidence bounds, indicating parameter stability, and absence of fundamental structural transformations over study period.

Conclusion

1. Results of the ADF test indicated money supply and GDP, are non-stationary at 0.05 significance level. The results further showed these variables became stationary after first differencing, explaining they are integrated of order one, $I(1)$.
2. ARDL model indicated that money supply had positive and significant outcomes on GDP, as evidenced by significance of lagged coefficients. However, this effect should be interpreted within the short- run framework, given the absence of a long-run equilibrium relationship according to Bounds Test. Therefore, it can be concluded that monetary policy is capable of stimulating economic performance and temporarily increasing GDP.
3. Results of Bounds Test indicated no presence of a long-term equilibrium relationship between money supply and GDP in the study period. This implies effect of money supply on GDP does not persist in long run and does not reflect a permanent economic stability.
4. ECM indicated error correction coefficient is negatively and statistically significant, recommending presence of short-term adjustment instrument. This is because, in subsequent periods, a portion of deviations in GDP can be gradually corrected toward equilibrium.

5. The standard model diagnostic tests indicated model is untainted by autocorrelation and heteroscedasticity, enhancing efficiency of the model in estimation and reliability of its results.
6. Although residuals do not trail normal distribution, indicated by normality test results, this does not affect efficiency of the estimates due to the large sample size. This is attributed to the fact that the Iraqi economy experienced severe economic shocks during the study period.
7. Results of CUSUM structural stability test indicated model parameters are stable and lie within the statistical confidence bounds, suggesting the absence of significant structural changes affecting the model's results in study period.

Recommendations

1. It is imperative to verify stationary of time series data prior to estimation by employing unit root tests such as ADF test or PP test to ensure validity of results and avoid spurios regression.
2. ARDL model should be deployed due to its statistical flexibility and suitability for small and medium sample sizes.
3. The equality and explanatory power of the model should be evaluated using a comprehensive set of statistical indicators, including the adjusted coefficient of determation, the F-test, and information criteria such as AIC and SC .
4. Bounds Test should be conducted to verify presence of a long-tem balance relationship among variables before intepreting results.
5. Diagnostic tests must be applied to consistency and stability of the estimated model, such as CUSUM test, aimint confirmation parameter stability over time and their resistence to structural shocks.
6. Excessive use of lag lengths should be avoided, as it may lead to loss of degrees of freedom and introduce estimation distortions in the model.
7. The robustness of the main results is supported by the alternating the study period or incorporating additional variables, in order to verify the stability of the findings.

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