Measuring the Effect of Government Borrowing Crowding Out of Private Credit in Iraq Using the ARDL Model

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Abstract

The research aims at testing the hypothesis of the monetarists, i.e. the hypothesis of internal government borrowing crowding out of private credit in Iraq for the period of 2010-2021. The ARDL model and the limits test for co-integration were used. The results were not in favor of the crowding out hypothesis as the value of the internal government borrowing parameter was less than zero with a long-term and short-term relationship between the two variables.

Keywords: *internal government borrowing, private credit, the hypothesis of the monetarists, Iraqi economy*

Introduction:

The government has strong incentives to fund its expenditures through domestic and international borrowing; however, access to the international credit market may sometimes be limited. Thus, the government has recently resorted to borrowing more from local sources. The financial sector, especially the banking system, in most developing countries was subject to large-scale government interventions and interest rates are often set administratively by the central bank. The Iraqi economy suffered for the period (2010-2021) from several internal and external shocks, represented by the double shock of 2014 during ISIS invasion of a third of Iraqi territory, as well as the drop in global oil prices, the effects of which continued until 2018. This was followed by the combined shock of the Covid-19 pandemic and the accompanying drop in global oil prices and an internal financial crisis due to the government's inability to pay the salaries of employees.

The significance of the research:

The novelty of the topic, as it deals with a contemporary problem that exists in the Iraqi economy at the present time.

The problem of the research:

Answering the following question: Does the monetary hypothesis apply in explaining the relationship between government borrowing and private credit on the Iraqi economy for the period 2010-2021?

The aim of the research:

- To measure and test the relationship between internal government borrowing and private credit quantitatively.
- Presenting some proposals to the Central Bank of Iraq, the banking sector and private investors, as well as the government to facilitate the entry of credit to the various sectors and thus promote economic growth.

Research hypothesis:

There is no crowding out of the internal government borrowing with private bank credit.

First. Theoretical Framework of the Monetary Hypothesis

The monetarists or Chicago School economists believe that "one dollar of internal government borrowing displaces more than one dollar out of private domestic credit due to the crowding out effect." Following this approach, it is believed that the increase in government spending financed by internal borrowing leads to a decrease in private sector savings for two main reasons:

1. With expansionary fiscal policy, private savers buy government bonds and thus have less savings to finance private sector investments.
2. In addition, higher government borrowing tends to raise interest rates, and these higher interest rates reduce investment.

Secondly. Crowding Out Hypothesis Measurement and Testing

The research used the ARDL test to estimate the following equation:

$$\Delta PD_t = a_0 + \sum_{i=0}^{r} a_{1i}\,\Delta PD_{t-1} + \sum_{i=0}^{r} a_{2i}\,\Delta GD_{t-i} + \sum_{i=0}^{r} a_{3i}\,\Delta Y_{t-i} + \sum_{i=0}^{r} a_{1i}\,\Delta RG_{t-1} + \sum_{i=0}^{r} a_{2i}\,\Delta Inf_{t-i} + \sum_{i=0}^{r} a_{3i}\,\Delta R_{t-i} + \beta_1 pd_{t-1} + \beta_2 gd_{t-1} + \beta_3 y_{t-1} + \beta_3 rg_{t-1} + \beta_3 inf_{t-1} + \beta_3 r_{t-1} \varepsilon t \ldots\ldots (1)$$

Where:

PD Private Banking Credit, GD Internal Government Borrowing, Y Gross Domestic Product, RG Real Growth Rate, Inf Inflation Rate, R Lending Interest Rate, and Figure 1 reflects the research variables. The analysis focuses on the value of the internal government borrowing parameter[2] in the short and long term β_2 and a_2 if it is crowding out of private credit by government borrowing. If the parameter value is greater than zero b>0, it will reflect the monetarists hypothesis that there is a clear crowding out of private credit by government borrowing.

The ARDL test was preferred because the research variables are of different levels between the level and the first difference.

The ARDL Bound test was conducted to find out whether the variables of private credit, internal government borrowing, the logarithm of gross domestic product, real growth rate, inflation rate and lending interest rate have a co-integration relationship from Equation (1), and the maximum delay length was generated automatically using the (SC) criterion.

It is evident from Table (1) that the calculated F-statistic value is greater than the value of up bound (Bounds test) as defined by Pesaran, and accordingly we reject the null hypothesis and accept the alternative with the existence of integration and a long-term relationship between them at significant 1%, 5% and 10%. Therefore, the ARDL model can be used to estimate the long and short-term dynamics of domestic private credit, domestic government borrowing, the logarithm of GDP, the real growth rate, the inflation rate, and the lending interest rate.

Based on the foregoing, the optimal model that gives the lowest value for the AIC criterion is the ARDL (4,4,4,4,1) model for estimating the equilibrium relationship in the long term, as shown in Figure (2).

Table (2) shows the results of estimating the model, as it is clear that the transactions were statistically significant, and the equation reflects 97% of the factors affecting private credit, which is a high percentage that shows the efficiency of the estimated equation. Further, the results do not conflict with the assumptions of economic theory. It is noted that the value of internal government borrowing parameter is less than zero, which does not support the monetary hypothesis, that is, there is a crowding out of internal government borrowing to credit directed to the private sector.

Several tests are conducted on the extracted equation to measure the long-term transactions, including:

a. **Variation Heterogeneity Test:**

It is clear from Table (3) that there is no problem of heterogeneity of variance and the calculated F value is not significant with a probability greater than 0.05, and that the Chi-square parameter is not significant with a probability of (05432) and (1,000).

b. LM Test for Autocorrelation:

Table (4) indicates that there is no sequential autocorrelation if the calculated F value is not significant, with a probability greater than 5%, which amounted to (0.092).

c. **Q-star Test:**

The Q-star test confirms the results of the LM test. The model is found to be free of the residual square correlation of the model.

d. **Random Error Distribution Test**:

Figure (3) shows that the statistic does not reject the null hypothesis that the distribution of random errors does not follow a normal distribution.

1. **Estimating the Long and Short-term Parameters and the Error-correction Parameter**

The long-term relationship is extracted from the error term - the relationship of variables at the level as shown in Table (6). The equation in the table is the error correction parameter equation that indicates the long-term relationship between the model variables, as follows:

PD = 5.4848 + 0.1380GD + 1.9830Y + 0.3102RG-0.3796Inf-0.5508R ..... (2)

This equation above shows the long-term relationship. It does not support the monetary hypothesis that there is a crowding out from internal government borrowing to private credit. The GDP also has a positive relationship with private credit, because an increase in output by one unit leads to a rise in credit by 1.9, and a rise in the real growth rate of the economy leads to an increase in credit allocated to the private sector by 0.31, while a rise in the inflation rate and the lending interest rate by one unit leads to reducing private credit by 0.37 and 0.55, respectively. This economic analysis does not contradict the economic theory and is consistent with its meaning.

The last step in the ARDL model is to estimate the error correction model (ECM), which represents the relationship between the five variables in the short-term, using the ARDL (4,4,4,4,1) model. Table (17) shows the following:

a. It is found that the corrected error parameter takes a negative sign as expected and it is statistically significant and with a zero probability of (-1.330783) that is, during a season and a month of the year, the balance is adjusted in the short term and this supports the relationship in the long-term.
b. The value of the internal government borrowing parameter is less than one, which supports the Keynesian hypothesis as well, and that the increase in internal government borrowing stimulates private credit to rise.
c. The existence of a direct short-term relationship between the gross domestic product, which reflects the level of economic activity in the country and the domestic credit provided to the private sector. The rise in economic activity by one unit stimulates the growth of domestic credit by 4.89.

d. The existence of an inverse short-term relationship between the inflation rate and the interest rate of lending with private credit. The rise of each of them leads to a reduction in the private domestic credit to 0.41 and 0.31 per unit.

To verify that the data used in the standard model is free of structural stability, the researcher uses the structural stability test in the form of two tests that complement one another: CUSUM and CUSUMSQ.

Figure (4) and (5) show that the estimated coefficients of the ARDL model used for research variables are structurally stable and consistent with the results in the short- and long-term.

Third. Results and Recommendations

1. **Results**

The research hypothesis was refuted, that the hypothesis that explains the relationship between internal government borrowing and bank credit provided to the private sector is the monetary hypothesis. The use of the ARDL model was justified by the standard, that the research variables were integrated, some at the level and others with the first difference. Accordingly, it was necessary to choose this model as Johansen's co-integration assumes that all the variables are in the first difference. There is no support for the monetary hypothesis in the long and short terms, as the internal government borrowing parameter was less than one, with a positive short and long-term relationship of private credit with GDP and economic growth, and a negative short and long-term relationship with the domestic inflation rate and the borrowing interest rate.

2. **Recommendations**

The researcher recommends addressing the defects in the credit process to enhance the monetary policy transmission mechanism and mobilize and grow private credit, especially to support small and medium-sized companies. Moreover, orienting internal government borrowing towards investment fields, developing the national economy, and establishing special bank credit offices under the supervision of the

Central Bank of Iraq as a way to improve their efficiency, governance, and consequently creditworthiness in order to enhance the availability and dissemination of credit information. Finally, encouraging the establishment of private investment banks to play a more active role as an alternative means of financing as this supports the role of the private sector in the national economy.

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Chart 1 Time trend of the variables

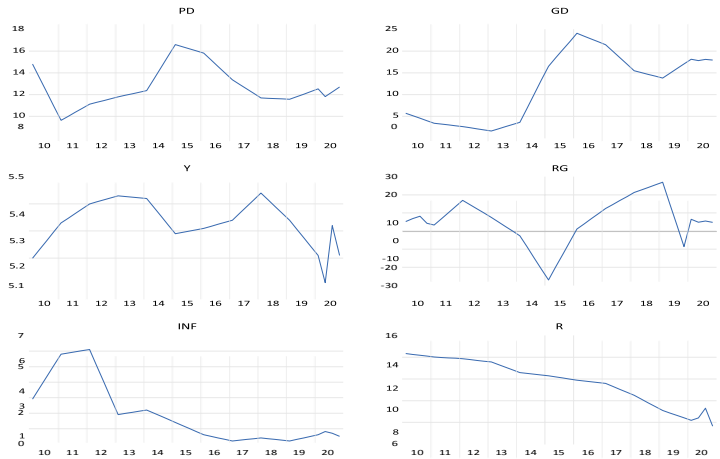


Table 1 Cointegration Test

Null Hypothesis: No levels relationshipF-Bounds Test

Test Statistic	Value	Signif.	I(0(	I(1(

	Asymptotic: n1000=			
3	2.08	%10	28.56455	F-statistic
3.38	2.39	%5	5	K
3.73	2.7	%2.5		
4.15	3.06	%1		
	Finite Sample: n=40		40	Actual Sample Size
3.353	2.306	%10		
3.92	2.734	%5		
5.256	3.657	%1		

Diagram 2 Optimal model

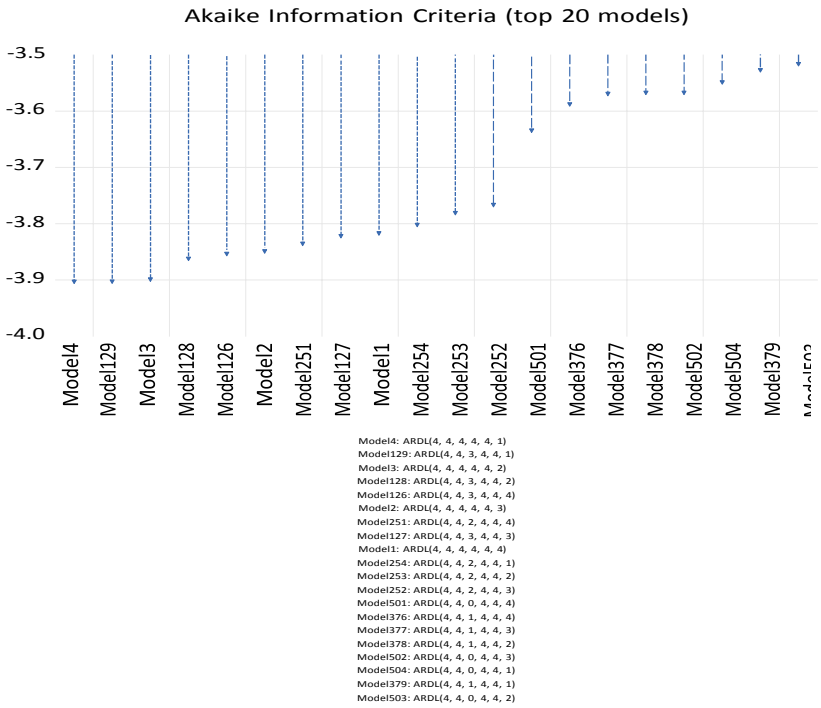


Table 2 Long-term parameters

Dependent Variable: PD
Method: ARDL
Date: 07/11/22 Time: 20:11
Sample (adjusted): 2011Q1 2020Q4

Included observations: 40 after adjustments
Maximum dependent lags(4 :Automatic selection)
Model selection method :Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): GD Y RG INF R
Fixed regressors: C
Number of models evalulated12500 :
Selected Model: ARDL(4, 4, 4,4 ,4 ,1)

Prob *.	t-Statistic	Std. Error	Coefficient	Variable
0.3808	0.907249	0.041267	0.037440	PD(-1)
0.1189	1.669336	0.042960	0.071715	PD(-2)
0.7416	0.336791	0.044002	0.014819	PD(-3)
0.0000	8.770035	0.035499	0.311327	PD(-4)
0.0000	24.94468	0.015566	0.388287	GD
0.8583	0.182107	0.023894	0.004351	GD(-1)
0.6771	0.425966-	0.023470	0.009997	GD(-2)
0.4592	0.762857	0.023672	0.018058	GD(-3)
0.0000	11.06287	0.018838	0.208402	GD(-4)
0.0180	2.705152	0.418805	1.132931	Y
0.0100	3.011811	0.946321	2.850141	Y(-1)
0.0173	2.727328	1.214152	3.311391	Y(-2)
0.4406	0.795521	1.414432	1.125210	Y(-3)
0.0274	0.819304	1.027787	0.842070	Y(-4)
0.8780	0.156508-	0.002623	0.000410	RG
0.1340	1.598085	0.003486	0.010557	RG(-1)
0.3401	0.990359	0.003592	0.003557	RG(-2)
0.6800	0.421862	0.004569	0.001928	RG(-3)
0.0026	3.715354	0.003514	0.663056	RG(-4)
0.0000	10.45732-	0.039359	0.41586-	INF
0.6579	0.453116	0.046105	0.00891-	INF(-1)
0.7725	0.295230	0.045132	0.01324-	INF(-2)
0.8238	0.227200-	0.043800	0.00951-	INF(-3)
0.0041	3.481468-	0.033848	0.21841-	INF(-4)
0.0035	3.562078	0.103089	0.36213-	R
0.0087	3.086306	0.118528	0.36812-	R(-1)
0.1604	1.488706-	4.903067	7.29927-	C

12.71925	Mean dependent var	0.988906	R-squared
1.825757	S.D. dependent var	0.978917	Adjusted R-squared
-3.90313	Akaike info criterion	0.030699	S.E. of regression
-2.76314	Schwarz criterion	0.012251	Sum squared resid
-3.49095	Hannan-Quinn criter.	105.0627	Log likelihood
.215706	Durbin-Watson stat	5305.202	F-statistic
		0.000000	Prob (F-statistic)

Table 3 Heteroskedasticity test

Heteroskedasticity Test :Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

0.7008	Prob. F(26,13)	0.796432	F-statistic
0.5432	Prob. Chi-Square(26)	24.57305	Obs*R-squared
1.0000	Prob. Chi-Square(26)	3.206041	Scaled explained SS

Table 4 LM test

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

0.0987	Prob. F(2,11)	7.522886	F-statistic
0.0000	Prob. Chi-Square(2)	23.10666	Obs*R-squared

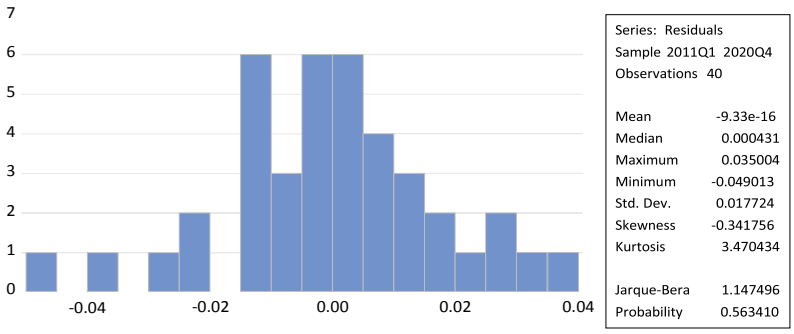
Table 5 Q-Qstar test

Date: 07/12/22 Time: 01:28
Sample (adjusted): 2011Q1 2020Q4
Included observations: 40 after adjustments

Prob*	Q-Stat	PAC	AC		Partial Correlation	Autocorrelation
0.122	2.3936	0.236	0.236	1	| **| . |	| **| . |
0.225	2.9800	0.063	0.115	2	| . | . |	| .*| . |
0.105	6.1320	0.237	0.263	3	| **| . |	| **| . |
0.010	13.245	0.314	0.390	4	| **| . |	| ***| . |
0.020	13.327	0.132-	0.041	5	| . |*. |	| . | . |
0.038	13.357	0.122-	0.024-	6	| . |*. |	| . | . |
0.059	13.565	0.075-	0.064	7	| . |*. |	| . | . |
0.093	13.605	0.159-	0.027-	8	| . |*. |	| . | . |
0.135	13.650	0.154	0.029	9	| .*| . |	| . | . |
0.154	14.445	0.095-	0.119-	10	| . |*. |	| . |*. |
0.197	14.692	0.002-	0.065-	11	| . | . |	| . | . |
0.251	14.825	0.024	0.047-	12	| . | . |	| . | . |
0.317	14.849	0.043-	0.020-	13	| . | . |	| . | . |
0.305	16.140	0.055-	0.141-	14	| . | . |	| . |*. |
0.307	17.203	0.075-	0.126-	15	| . |*. |	| . |*. |
0.338	17.770	0.093-	0.090-	16	| . |*. |	| . |*. |
0.369	18.327	0.010	0.087-	17	| . | . |	| . |*. |
0.323	20.181	0.078-	0.156-	18	| . |*. |	| . |*. |
0.329	21.139	0.036	0.109-	19	| . | . |	| . |*. |
0.389	21.139	0.104	0.000-	20	| .*| . |	| . | . |

*Probabilities may not be valid for this equation specification.

Diagram 3 Random Error Distribution Test



Tabel 6 long term relationship

Levels Equation
Case 2: Restricted Constant and No Trend

Prob .	t-Statistic	Std. Error	Coefficient	Variable
0.0000	32.24204	0.004279	0.137960	GD
0.0192	2.672407	0.742033	1.983014	Y
0.0430	2.242581-	0.004541	0.010184	RG
0.0000	11.55186-	0.032860	-0.379598	INF
0.0000	20.57117	0.026776	-0.550822	R
0.1697	1.453801-	3.772809	5.484912-	C

EC = PD + (0.1380*GD*1.9830 + Y +0.3102*RG -0.3796*INF -0.5508*R-

)5.4849

Tabel 7 ECM

ARDL Error Correction Regression
Dependent Variable: D(PD)
Selected Model: ARDL(4, 4, 4,4 ,4 ,1)
Case 2: Restricted Constant and No Trend
Date: 07/12/22 Time: 00:15
Sample: 2010Q1 2020Q4
Included observations: 40

ECM Regression
Case 2: Restricted Constant and No Trend

Prob .	t-Statistic	Std. Error	Coefficient	Variable
0.0000	20.96210	0.017566	0.368223	D(PD(-1)
0.0000	14.03946	0.021120	0.296508	D(PD(-2)
0.0000	15.70315	0.019826	0.311327	D(PD(-3)
0.0000	55.32900	0.007018	0.388287	D(GD)
0.0000	16.80621	0.011921	0.200341	D(GD(-1)

0.0000	16.40274	0.011604	0.190343	D(GD(-2)
0.0000	18.82661	0.011070	0.208402	D(GD(-3)
0.0003	4.896477	0.231377	1.132931	D(Y(
0.0000	6.314187	0.212871	1.344110	D(Y(-1)
0.0003	4.970710	0.395775	1.967281	D(Y(-2)
0.1766	1.428829	0.589343	0.842070	D(Y(-3)
0.7190	0.367737	0.001116	0.000410	D(RG(
0.0000	6.018608	0.001258	0.007571	D(RG(-1)
0.0000	6.434861	0.001729	0.011128	D(RG(-2)
0.0000	7.529538	0.001734	0.013056	D(RG(-3)
0.0000	22.50228-	0.018291	-0.411586	D(INF(
0.0001	5.381944	0.021269	-0.114468	D(INF(-1)
0.0001	5.914117	0.021608	-0.127792	D(INF(-2)
0.0000	6.509373	0.018103	-0.117841	D(INF(-3)
0.0000	13.34714	0.027512	-0.367213	D(R(1)
0.0000	53.86170-	0.024707	-1.330783	CointEq(-1*(

0.044312	Mean dependent var	0.988818	R-squared
0.515495	S.D. dependent var	0.977574	Adjusted R-squared
4.203136-	Akaike info criterion	0.025393	S.E. of regression
3.316474-	Schwarz criterion	0.012251	Sum squared resid
3.882547-	Hannan-Quinn criter.	105.0627	Log likelihood
		.2157065	Durbin-Watson stat

Diagram5 CUSUM of square

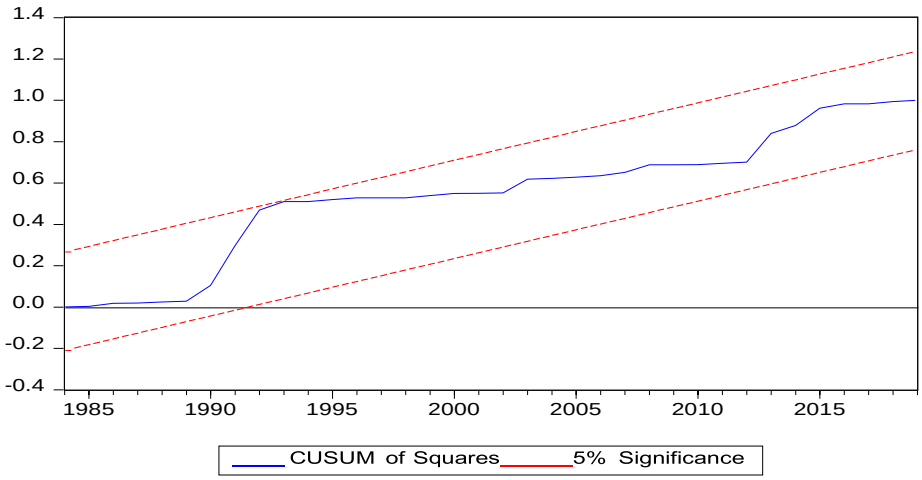
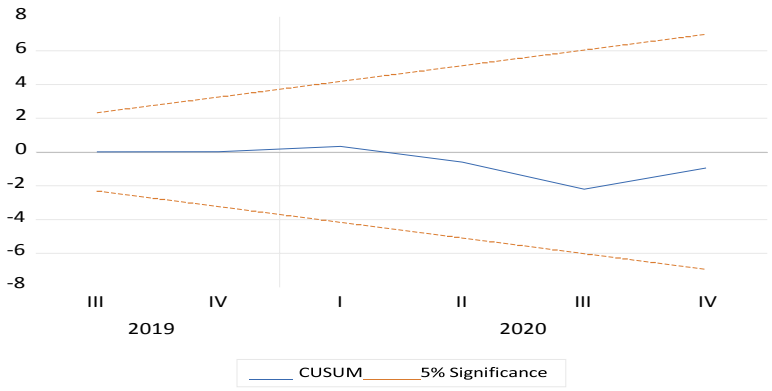


Diagram 6Cumulative Residual Residual Test CUSUM


8
6
4
2
0
-2
-4
-6
-8
III
IV
I
II
III
IV
2019
2020
CUSUM
5% Significance