Testing the Explanatory Hypotheses of the Relationship between Government Loan and Private Credit in Iraq Using the ARDL Model

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Abstract

The research aims at testing the explanatory hypotheses of the relationship between internal government loan to private credit in Iraq for the period 2010-2021. The ARDL model and the limits test for co-integration were used. The results supported the Keynesian hypothesis that the relationship is positive and supports private credit, because the value of the internal government loan parameter was less than zero with a long-term and short-term relationship between the two variables.

Keywords: *internal government loan, private credit, the explanatory hypotheses, Iraqi economy*

Introduction:

In most developing countries subject to extensive government interventions, interest rates are often set administratively by the central bank. If interest rates are not determined by market clearing, the 'availability of credit' will be more important in understanding the effects of government loan on private credit. Despite the implementation of financial liberalization and openness in most developing countries in recent years, government interventions remain significant in many of the countries. Even if the banking sector is fully liberalized, the effects of government loan on private credit for developing countries may still be mediated primarily through the availability of credit, since credit markets are less developed and credit rationalization may be more important. The Iraqi economy suffered for the period (2010-2021) from several internal and external shocks, represented by the double shock in 2014, the occupation of a third of Iraqi territory by ISIS, as well as the drop in global oil prices, whose effects lasted until 2018, followed by the compound shock of the Covid-19 pandemic and the accompanying drop in oil prices. The global financial crisis and an internal crisis due to the government's inability to pay the salaries of employees. Loan from the domestic market at a rate higher than that in the international market places an additional burden on the budget and creates the possibility of excluding the private sector from receiving the available funds. Expanding the local loan is likely to have serious long-term repercussions. During this critical period, high lending rates, along with many other constraints, are expected to reduce liquidity and impede the role of the private sector in Iraq.

The imoprtant of the research:

The lack of studies that deal with the relationship between internal government loan and bank credit provided to the private sector in the Iraqi economy.

The problem of the research:

The relationship between internal government loan and bank credit provided to the private sector is ambiguous. There are three hypotheses that explain this relationship: The first hypothesis: the Keynesian hypothesis, a positive relationship between the two variables (crowding on). The second: the monetary hypothesis, an inverse relationship between the two variables (crowding out). The last is the rational expectations hypothesis that there is no relationship between the two variables (Ricardian equivalence hypothesis).

The aim of the research:

- A theoretical framework for the relationship between the two variables and the hypotheses that explain them.
- Measuring and testing the relationship between internal government loan and private credit quantitatively.
- Presenting recommendations 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:

The relationship between internal government loan and private bank credit is a crowding-in relationship.

First. Theoretical Framework of the Monetary Hypothesis

1. The Monetary Hypothesis

The monetarists or Chicago School economists believe that "one dollar of internal government loan 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 loan leads to a decrease in private sector savings. This is for two main reasons: With expansionary fiscal policy, private savers buy government bonds and thus have less savings to finance private sector investments. In addition, higher government loan tends to raise interest rates, and these higher interest rates reduce investment.

2. The Keynesian Hypothesis

The Keynesian view holds that the fact that banks obtain safe government assets allows them to take on more risks and thus increase lending to the private sector, i.e., the effect of crowding in which is based on Keynesian supply and demand analysis that the economy has flexibility due to not reaching the full level of usage and the rigidity of prices and wages, aggregate demand will increase thanks to expansionary fiscal policies. Consequently, the overall output in the economy will expand. In fact, the increase in aggregate demand will help economic growth to accelerate the increase in total revenue; with the consequent stimulus investment will also increase. Thus, the Keynesian view, which identifies a positive relationship between public expenditure and private investment, states that there is no crowding-out effect in the economy but a crowding-in effect.

3. Ricardian Equivalence

Within the neo-classical theory of rational expectations, Barrow revived the idea of the Ricardian equivalent. It states that government debt is a deferred tax. Barrow resembles the government's debt without the private sector, which must be paid in the future, and the government will resort to raising taxes in the future to pay it off. These expected taxes are completely expected from the private sector, and it is calculated for them by increasing savings equivalent to those future taxes. Therefore, the increase in government demand financed by loan is equivalent to a decrease in the demand of the private sector, so that the sum of the effect remains neutral. Nevertheless, the private sector lending to the government at the aggregate level is also a saving equivalent to the expected future tax. If the government loan is equivalent to the tax, then why there are negatives added to loan that are not mentioned when theorizing about government taxes?

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 Loan, 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 loan parameter[2] in the short and long term β_2 and a_2 if it is crowding out of private credit by government loan. If the parameter value is less than zero $\beta_1<0$, it means that the Keynesian hypothesis dominates and that there is a stimulus or crowding in in private credit by government loan and/or that the absolute value of the parameter is less than one $1>|\beta_1|$ then this supports the hypothesis mentioned. If the value of the parameter is greater than zero $0 < \beta_1$, it will reflect the monetary hypothesis and that there is a clear crowding out of private credit by government loan. And the third case, which is the case of Ricardian equivalence, when the effect of the Keynesian hypothesis cancels out the effect of the Keynesian hypothesis in total, then the value of the parameter $\beta_1 \approx -1$, which is a case where there is no effect of internal government loan on private credit.

The ARDL test was preferred because the search 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 loan, the logarithm of gross domestic product, real growth rate, inflation rate and lending interest rate have a cross-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, the researcher rejects the null hypothesis and accepts 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 loan, 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 run, 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, and the results do not conflict with the assumptions of economic theory. It is noted that the value of internal government loan parameter is less than zero, which does not support the Keynesian hypothesis, that is, there is a crowding in of internal government loan 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 supports the Keynesian hypothesis that there is a crowding-in from internal government loan 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 turns out 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 loan parameter is less than one, which supports the Keynesian hypothesis as well, and that the increase in internal government loan 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 and 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 proven, that the hypothesis that explains the relationship between internal government loan and bank credit provided to the private sector is the Keynesian 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, and the fact that 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 loan 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 loan interest rate.

2. Recommendations:

The researcher recommends addressing the defects in the credit process to enhance the monetary policy transmission mechanism, mobilize, and grow private credit, especially to support small and medium-sized companies. Moreover, orienting internal government loan 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. Furthermore, encouraging the establishment of private investment banks to play a more active role as an alternative means of financing; this supports the role of the private sector in the national economy..

References

- Anyanwu, A., Gan, C., & Hu, B. (2017). Government domestic debt, private sector credit, and crowding outeffect in oil-dependent countries. Journal of Economic Research, 22(2), 127-151.

-Balcerzak, A. P., & Rogalska, E. (2014). Crowding out and crowding in within Keynesian framework. Do weneed any new empirical research concerning them. Economics & Sociology, 7(2), 80-93.

- Başar, S., & -Temurlenk, M. S. (2007). Investigating crowding-out effect of government spending for Turkey: A structural var approach. Atatürk Universities İktisadi vet Diary Balmier Derris, 21(2), 95-104.

- Anyanwu, A., Gan, C., & Hu, B., op cit, p131.

- Manda S. Does Government Borrowing Crowd Out Private Sector Investment in Zimbabwe? Asian J Econ Bus Account. 2019;(August):1–9.

Chart 1 Time trend of the variables

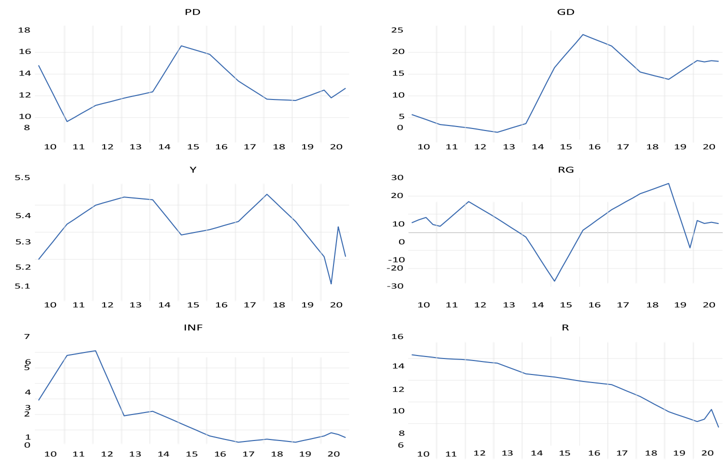


Table 1 Cointegration Test

Null Hypothesis: No levels relationshipF-Bounds Test

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

	Asymptotic: n1000=			
3	2.08	%10	28.5645	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

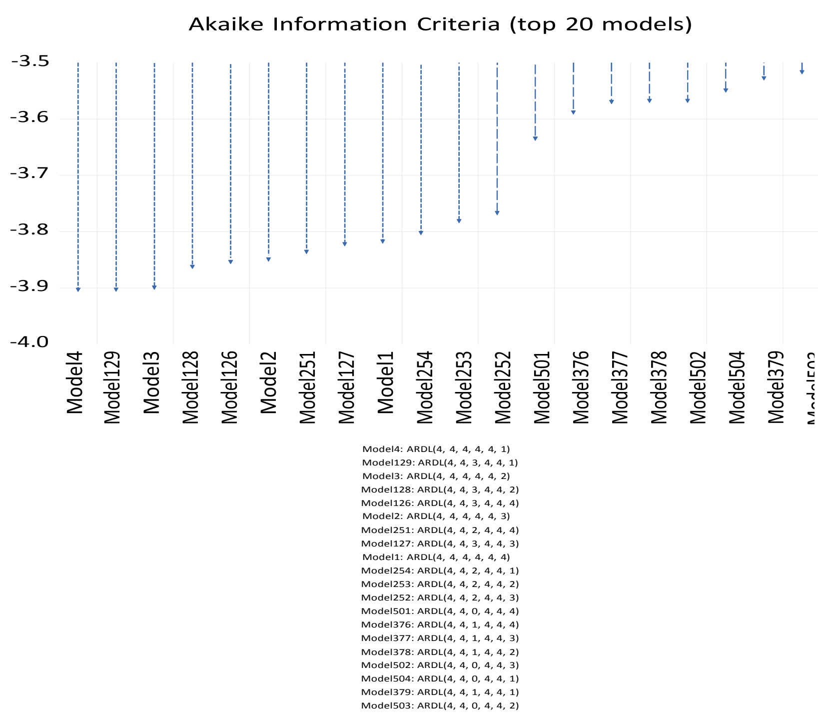


Table 2 Long-term parameters

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

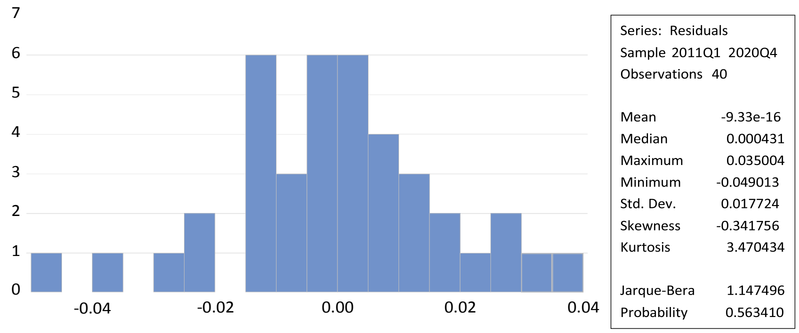
Table 5 Q-Qstar test

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

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

*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

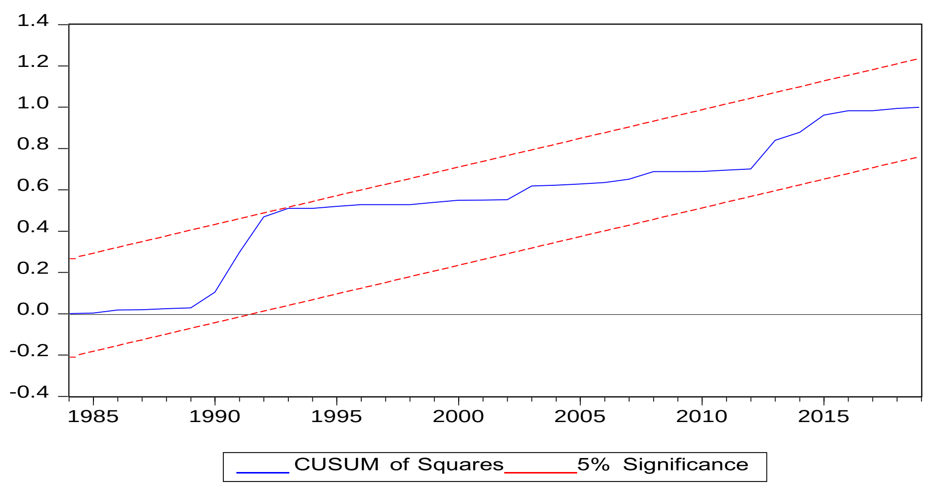
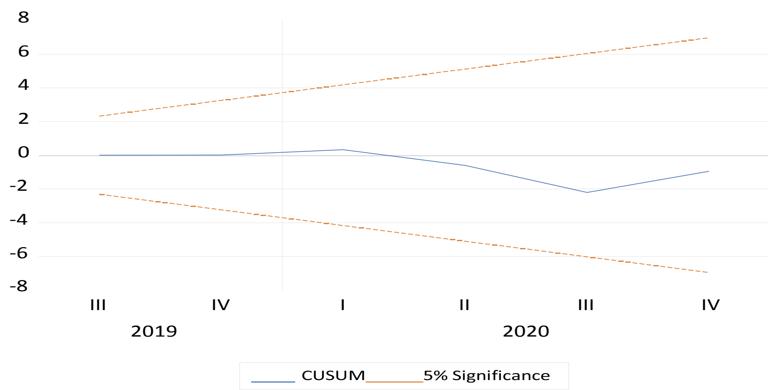


Diagram 6Cumulative Residual Residual Test CUSUM



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