Measuring the dynamic impact of the Financial Inclusion on Economic Growth: An econometric approach using ARDL model

قياس الأثر الديناميكي للشمول المالي على النمو الاقتصادي: دراسة قياسية باستخدام نموذج ARDL

Nadjet Ouis [1], Djelloul Cherifi [2], Youcef Souar[3]

[1] University of Saida (Algeria), ITMAM Laboratory, nadjet.ouis@univ-saida.dz
[2] University of Saida (Algeria),MECAS Laboratory,djelloul.cherifi14@gmail.com
[3] University of Saida (Algeria), MIFMA Laboratory, syoucef12@yahoo.fr

Received:14/10/2022 *Accepted14/11/2022* *Published:26/01/2023*

Abstract:

This paper aims to measure the dynamic impact of financial inclusion on economic growth in Algeria during the period 2004-2018 using the autoregressive distribution lag model (ARDL), where financial inclusion is measured by its indicators: loans, deposits, number of bank branches, and the GDP per capita is a variable representing economic growth. The study findings show the existence of a long-term equilibrium relationship between the financial inclusion indicators and economic growth, with a positive and significant impact of both loans and the number of bank branches on economic growth.

Keywords: Loans, Deposits, Number of Bank Branches, Economic Growth.
JEL Classification Codes: G21, O47

ملخص:

تهدف هذه الدراسة إلى قياس الأثر الديناميكي للشمول المالي على النمو الاقتصادي في الاقتصاد الجزائري خلال الفترة 2004–2018 و ذلك باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعة ARDL حيث تم قياس الشمول المالي بمؤشراته: القروض، الودائع و عدد الفروع البنكية وتم استخدام نصيب الفرد من الناتج المحلي الإجمالي كمتغير يمثل النمو الاقتصادي .وقد توصل البحث إلى مجموعة من النتائج أهمها وجود علاقة توازنية طويلة الأجل بين مؤشرات الشمول المالي والنمو الاقتصادي، مع وجود أثر ايجابي معنوي لكل من القروض و عدد الفروع البنكية على النمو الاقتصادي.

كلمات مفتاحية: قروض، ودائع، عدد الفروع البنكية، نمو اقتصادي.
تصنيفات JEL : G21، O47

***Corresponding author**: Nadjet Ouis, **e-mail :** ouisnadjet15011995@gmail.com*

1. INTRODUCTION

One of the United Nations' 2030 objectives is to make a gradual transition from growth and development to sustainable growth and development. Inclusive growth is one of the methods suggested for achieving this goal. All of the various definitions of inclusive growth refer to new approaches to addressing social inequalities, particularly in developing countries. These include income and asset inequalities, both financial and human, as well as inequalities in access to education, health, and economic opportunities, as well as in all aspects of life. Several theoretical and empirical arguments in favor of inclusive growth have been advanced.

Some researchers have proposed financial inclusion as a powerful antidote to the lack of inclusive growth. In this regard, empirical assessment of the impact of financial inclusion on economic growth is becoming a pressing need, particularly in advanced and developing countries over the last decade. Therefore **what is the impact of the financial inclusion on economic growth in Algeria?**

The answer to this problem leads to develop two hypotheses that can be formulated as follows:

- The financial inclusion's dimensions affect positively the economic growth in Algeria during the study period.
- There is a long-term equilibrium relationship between the dimensions of financial inclusion and economic growth.

2. Definitions of the Financial Inclusion:

Financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs - transactions, payments, savings, credit and insurance - delivered in a responsible and sustainable way. (Bank)

The Bank of Algeria defines financial inclusion as the availability and use of all financial services by various segments of society, including institutions and individuals, particularly those who are marginalized, through official channels, including current and savings accounts, payment and transfer services, insurance services, finance and credit services, and more tailored financial services. It also works to protect the rights of consumers of financial services by supporting them so that they can properly manage their funds and savings to prevent some consumers from resorting to informal channels and tools. (d'Algérie)

According to these definitions, financial inclusion has three dimensions: access, use, and quality. The ease with which individuals can access financial products and services provided by formal institutions, is referred to as access. The efficient use of financial products is referred to as use. It has to do with the frequency and regularity with which the financial system is used. Finally, the characteristics of access and use determine quality (quality and efficiency). (Rakhrouf & Benilles, 2021)

3. The impact of the financial inclusion on economic growth (Literature Review):

From a theoretical standpoint, financial inclusion has been argued to be one of the most important determinants of economic growth. Earlier approaches by (Schumpeter, 1911) demonstrated that finance stimulates growth. Several empirical studies have been conducted to investigate the relationship between financial inclusion and economic growth.

- The study of (Demirguc-Kunt & Klapper, 2012) provides the first analysis of the Global Financial Inclusion (Global Findex) Database, a new set of indicators that measure how adults in 148 economies save, borrow, make payments, and manage risk. The data showed that 50 percent of adults worldwide had an account at a formal financial institution, though account penetration varied widely across regions, income groups and individual characteristics. Furthermore, 22% of adults say they have saved at a formal financial institution in the last year, and 9% say they have taken out a new loan from a bank, credit union, or microfinance institution in the last year. Despite the fact that half of the world's adults were still unbanked, at least 35% of them reported barriers to account use that could be addressed by public policy. High cost, physical distance, and a lack of proper documentation were among the most commonly reported barriers, though there were significant differences across regions and individual characteristics.

- The study of (Nasir, Kaneez, & Jameel, 2019) examined the impact of FI on economic growth in Pakistan from 1985 to 2017 using Autoregressive Distribution Lag (ARDL) and the Error Correction Model (ECM). The principal component analysis was used to assess financial liberalization (PCA). It discovered that economic growth and FI are cointegrated, and that FI positively impacts economic growth in the short run with a one-year lag, implying that Pakistan may stimulate its economic growth by emphasizing financial system improvement through increased FI.
- The (Van, Vo, Nguyen, & Vo, 2019) research aimed to provide a comprehensive understanding of the relationship between financial inclusion and economic growth in emerging markets. First, the authors created a multidimensional index so that the level of financial inclusion can be measured on a global scale. Second, the panel econometric technique was used to estimate the impact of financial inclusion on economic growth based on this newly developed index. The finding supported a positive relationship between financial inclusion and economic growth. A stronger relationship was found for countries with low income and a lower degree of financial inclusion.
- Using PVAR and the Toda-Yamamoto VAR bivariate causality model (Erlando, Riyanto, & Masakazu, 2020) empirically examined the role of financial inclusion on economic growth, poverty alleviation, and income inequality in Eastern Indonesia. The bivariate causality model results showed a strong relationship between financial inclusion, economic growth, poverty, and income distribution in Eastern Indonesia. Socioeconomic growth had a positive impact on financial inclusion but it had a negative impact on poverty. Meanwhile, financial inclusion had a positive impact on inequality, resulting in widespread income inequality in Eastern Indonesia.

- The (RATNAWATI, 2020) study focused on the impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in several Asian countries from 2009-2018. Financial inclusion was measured by 3 dimensions, namely banking penetration, access to banking services, and use of banking services. Poverty ratio below the national poverty line and the Gini coefficient were used as indicators of poverty and income inequality. Financial stability was measured by Bank Z-Score and bank nonperforming loans. The results from the hypothesis test showed that all dimensions of financial stability simultaneously had significant influence on economic growth, poverty, income inequality, and financial stability. On the other hand, the partial impact of financial inclusion dimension on economic growth, poverty alleviation, income inequality, and financial stability in ten countries of Asia had not been optimal.
- (Peterand & Oden, 2020) examined the effects of financial inclusion on economic growth in Nigeria from 2000 to 2018. The variables were estimated using archival data from the Central Bank of Nigeria's Statistical Bulletin. The dependent variable of financial inclusion, as measured by the contribution of financial institutions to GDP, was regressed on the explanatory variables of loan to small and medium enterprises (LSME), rural bank deposit (RBD), and inflation as the control variable (INF) using auto-regressive distribution lag, and Wald tests showed that these variables have a significant effect on economic growth in Nigeria.
- The study of (Sayed, Abbas, & Touny, 2020) sought to investigate the impact of financial institutions on Egypt's GDP growth, with a particular emphasis on FI indicators such as the number of ATMs and deposits in various financial institutions. The authors used multiple regression models to analyze the data, and the study's findings revealed a positive relationship between GDP and the number of ATMs, as well as a negative relationship between GDP and total deposits.

- The (Douma, Bennaceur, & Bendob, 2020) study's findings demonstrated the role of islamic banks in reinforcing financial inclusion which contributes to higher economic growth rates in Saudi Arabia, Kuwait, and Qatar, during the period of 2004 2015.
- The (Albiman & Bakar, 2021) study examined whether financial inclusion through improved access contributed positively to economic growth by estimating panel data on 45 countries between 2004 and 2017 using the GMM method. The study investigated the linear and nonlinear effects of financial inclusion using three different indicators, including the financial inclusion index. According to the findings, financial inclusion promotes economic growth. These findings were consistent across the SSA region, regardless of upper middle income.
- (Wei & Samaraweera, 2021) developed a financial inclusion index using principal component analysis and an econometric approach of panel data (8 countries in South Asia from 2004 to 2018) with vector error correction models and a Granger causality test. According to the study's findings, financial inclusion had a long-run positive impact on human capital development in South Asian countries while having a short-run positive impact on economic growth. Domestic credit to the private sector had an impact on the economy's short-run growth and human capital development. Government intervention to improve access to financial services, including ATMs and commercial banking, is a policy which allows digital finance to accelerate the achievement of sustainable development goals in South Asian countries.

4. Data and Empirical Results:

4.1 Data:

The variables were chosen in accordance with economic theory and previous studies, and the annual time series data range from 2004 to 2018.

Symbols	Variables	Sources
GDP per capita	Gross Domestic Product per capita	World Development Indicators
TBL	Total Bank Loans	Bank of Algeria

TBD	Total Bank Deposits	
NBB	Number of Bank Branches	

4.2 Empirical Results:

- **Time series stationarity tests:**

Table 1: The unit root test results for the study variables

Variables	ADF		PP		Order of Intergration
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
LGDP per capita	-2.5790	-0.7058	-2.5713	-2.6531	/
	(0.12)	(0.94)	(0.1214)	(0.2663)	
D(LGDP per capita)	-4.5223	-4.6343	-4.2896	-4.4656	I(1)
	(0.0045)	(0.0147)	(0.0067)	(0.0189)	
LTBL	-0.2263	-3.3955	-0.2138	-2.1074	/
	(0.9139)	(0.0953)	(0.9158)	(0.4982)	
D(LTBL)	-2.9542	-2.8169	-5.2217	-4.7656	I(1)
	(0.0660)	(0.2170)	(0.0015)	0.012	
LTBD	-4.9774	-1.5419	-4.5116	-1.0267	I(0)
	(0.0026)	(0.0475)	(0.0041)	(0.0259)	
LNBB	-0.9455	-2.1819	-1.5621	-1.3349	/
	(0.7388)	(0.4596)	(0.4744	(0.8336)	
D(LNBB)	-2.3293	-2.3858	-2.3463	-2.3554	I(1)
	(0.0399)	(0.0382)	(0.0173)	(0.0001)	

Source: Created by authors using Eviews 10 outputs

We note that all of the series are integrated of order 1 (stationary after the first difference), but the variable of total bank deposits remains stationary at level (without differentiation).

As a result, the series are integrated in different orders, rendering the cointegration test of Engle and Granger. The ARDL bounds test for cointegration is appropriate (Pesaran, 2001).

- **Determination of the optimal ARDL model:**

The ARDL model (1,0,0,0) is the most optimal amoung the 19 others presented, because it has the lowest AIC value (see Appendices).

- **The ARDL bounds test for cointegration:**

The cointegration test of Pesaran (2001) requires that the ARDL model be estimated beforehand, as per the automatic procedure on Eviews 10. The calculated test statistic, or fisher's F value will be compared to the critical values (which form bounds) as follows:

if Fisher > upper bound : cointegration exists
if Fisher < lower bound : cointegration does not exist
if lower bound < Fisher < upper bound : there is no conclusion

The results confirm the existence of a cointegration relationship between the series under study (the value of F-statistic is greater than the upper bound) (see Appendices) which makes it possible to estimate the long-term effects of LTBL, LTBD, LNBB on LGDP per capita.

- **Estimation of the long-term model:**

We note that the variable of total bank loans is significant at the level of 5% and has a positive relationship with economic growth, which is consistent with the content of the economic theory. That is the more bank loans granted by one unit leads to a 0.14 unit increase in economic growth.

In terms of total bank deposits variable, it's insignificant and inversely related to economic growth, necessitating public awareness about the importance of banking investment in contributing to Algerian economic growth.

Furthermore, at the level of 5%, the number of bank branches variable is significant and it is directly related to economic growth, as well as agreeing with economic theory (see Appendices).

- **Estimation of error correction model:**

The adjustment coefficient is statistically significant, negative, and between zero and one in absolute value (see Appendices), implying the existence of a long-term relationship between the variables, according to Jones and Joulfaian (1991). And as a result, in the long run, 95% of short-term errors can be corrected.

- **Stability test:**

Two tests are used to test the structural stability of the estimated parameters, namely (Brown 1975) the CUSUM and the CUSUM of squares, to ensure that the data in this study contains no structural changes.

There is no structural change because the model is stable in its entirety, as the two curves are located within the confidence interval (the upper and lower bounds) at the level of significance 5% (see Appendices), and thus the estimated coefficients of the model are structurally stable during the time period under study.

5. CONCLUSION

Through this research paper, we used an econometric study with the autoregressive model for distribution lag to measure the dynamic impact of financial inclusion indicators on economic growth in Algeria from 2004 to 2018, and the results can be summarized as follows:

- The variables have a long-term relationship, which means that they behave similarly in the long run.
- There is a positive, significant relationship between total bank loans, the number of bank branches and economic growth, but an insignificant inverse relationship between total bank deposits and economic growth (in the long run).

6. Bibliography List :

Albiman, M. M., & Bakar, H. O. (2021). The Role of Financial Inclusion on Economic Growth in Sub Saharan African (SSA) Region. *Athens Journal of Business & Economics, X*(Y), 1-21.

Erlando, A., Riyanto, F., & Masakazu, S. (2020). Financial inclusion, economic growth, and poverty alleviation: evidence from eastern Indonesia. *Heliyon, 6*.

Peterand, E., & Oden, O. (2020). Effects of Financial Inclusion on Economic Growth in Nigeria (2000 – 2018). *IOSR Journal of Research & Method in Education (IOSR-JRME), 10*(1), 44-49.

Van, L.-H., Vo, A., Nguyen, N., & Vo, D. (2019). Financial Inclusion and Economic Growth: An International Evidence. *EMERGING MARKETS FINANCE AND TRADE, 55*, 239-263.

Wei, J., & Samaraweera, G. (2021). Financial Inclusion's Role in Economic Growth and Human Capital in South Asia: An Econometric Approach. *Sustainability, 13*(4303), 1-18.

Demirguc-Kunt, A., & Klapper, L. (2012). *Measuring Financial Inclusion The Global Findex Database.* The World Bank.

Douma, H., Bennaceur, F., & Bendob, A. (2020). The relationship between financial inclusion, Islamic banking and economic growth in selected countries (Saudi Arabia, Kuwait and Qatar) during 2004-2015. *Aggregates of Knowledge, 6*(2), 649-662.

La banque d'Algérie. (s.d.). *Brochure sur l'inclusion financiére*. Consulté le 09 01, 2021, sur https://www.bank-of-algeria.dz/pdf/inclusion7.pdf

Nasir, A., Kaneez, F., & Jameel, A. (2019). Impact Of Financial Inclusion On Economic Growth In Pakistan. *Journal of Managerial sciences 167, 13*(3), 166-174.

Rakhrouf, Y., & Benilles, B. (2021). L'inclusion financière : un levier au service d'une croissance économique inclusive en Algérie. *Les Cahiers du MECAS, 17*(1), 298-309.

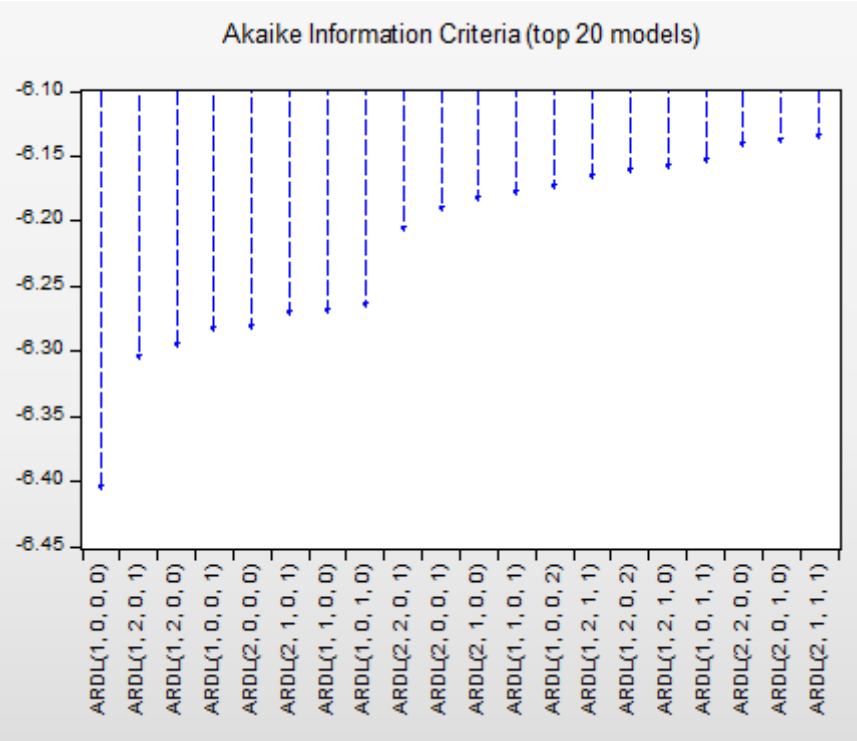
RATNAWATI, K. (2020). The Impact of Financial Inclusion on Economic Growth, Poverty, Income Inequality and Financial Stability in Asia. *Journal of Asian Finance, Economics and Business, 7*(10), 073–085.

Sayed, M. N., Abbas, N. A., & Touny, M. A. (2020). The Impact of Financial Inclusion on GDP Growth in Egypt. *Scientific Journal for Economic & Commerce*, *50*(2), 379-400.

Schumpeter, J. (1911). *The Theory of Economic Development.* Cambridge: Harvard University Press.

The World Bank. (n.d.). *Financial Inclusion*. Retrieved 09 01, 2021, from https://www.worldbank.org/en/topic/financialinclusion/overview

7. Appendices:

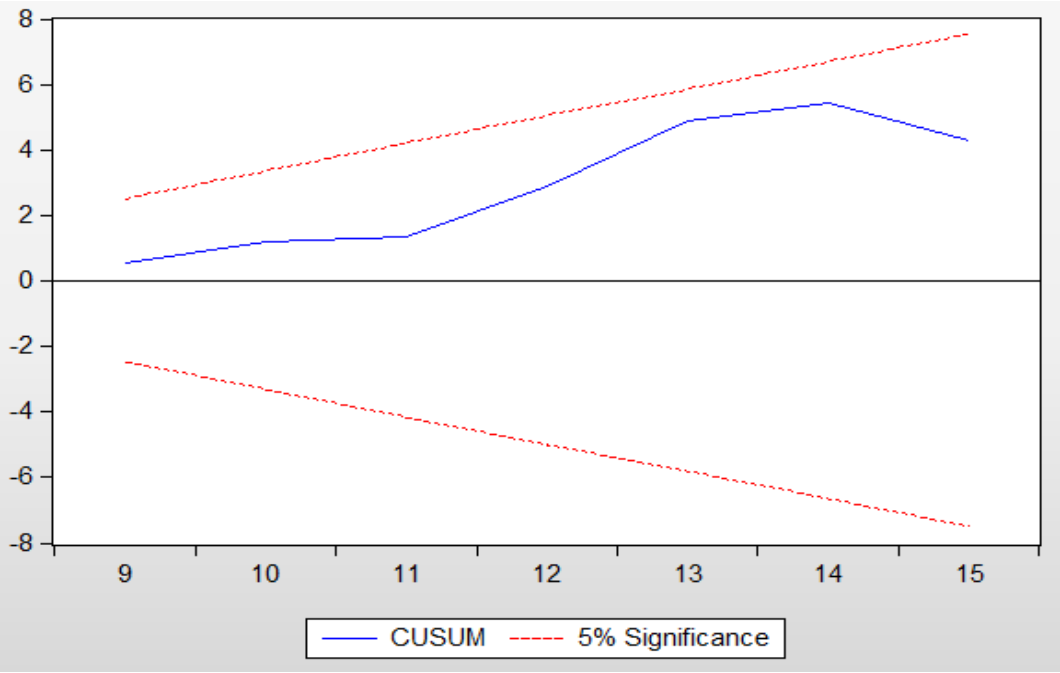


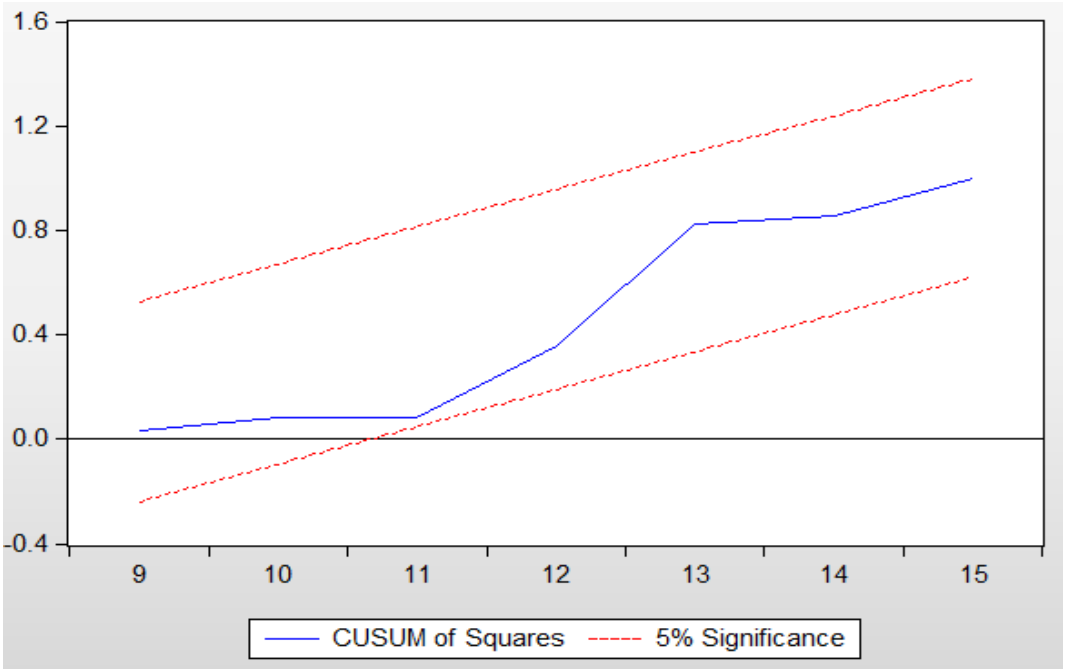
F-Bounds Test — Null Hypothesis: No levels relationship

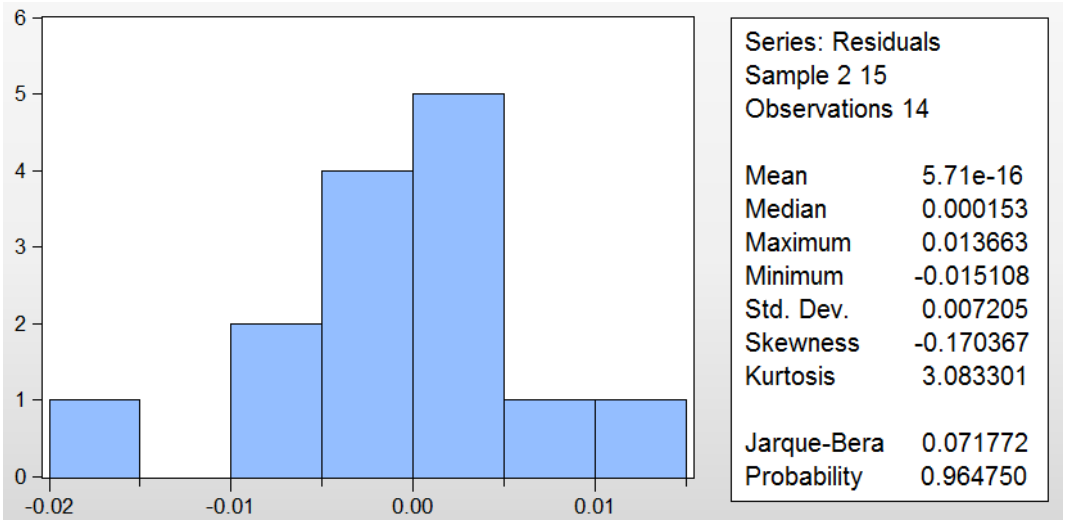
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.059813	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTBL	0.140382	0.024547	5.718867	0.0007
LTBD	-0.020700	0.025983	-0.796707	0.4518
LNBB	0.475002	0.170510	2.785769	0.0271
C	14.52754	0.958248	15.16051	0.0000







Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.598609	Prob. F(2,7)	0.2680
Obs*R-squared	4.389536	Prob. Chi-Square(2)	0.1114

Heteroskedasticity Test: ARCH

F-statistic	0.054419	Prob. F(1,11)	0.8198
Obs*R-squared	0.063996	Prob. Chi-Square(1)	0.8003

Ramsey RESET Test
Equation: UNTITLED
Specification: LGDP_PER_CAPITA LGDP_PER_CAPITA(-1) LTBL LTBD LNBB C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.412214	8	0.6910
F-statistic	0.169921	(1, 8)	0.6910