

Impact of External Debt on Economic Growth in Brazil: An ARDL Bound Testing Approach

Brezilya'da Dış Borçların Ekonomik Büyüme Üzerindeki Etkisi: ARDL Sınır Testi Yaklaşımı

Abstract

For developing countries, sustainable economic growth is one of the key macroeconomic objective. However not every country has enough capital to support GDP growth. Even that the country hasn't enough national capital, the government can borrow some capital as external debt to support GDP growth. The aim of this study is to investigate the relationship between economic growth and external debt for the Brazilian economy. In this study, the effect of various variables such as the ratio of external debt to GDP, ratio of debt service stock to GDP, the ratio of national expenditure to GDP, real Exchange rate, trade openness were investigated in the long run and short run. Accordingly, the effect of external debt on economic growth was determined with the help of ARDL Bound Test. The data used in the study covers the period of 1970-2015. According to the findings, a long-term relationship was found between external debt and growth rate in Brazil. It was concluded that external debt had a negative effect on the economic growth. According to this result, it is thought that developing countries external borrowing, providing sustainable debt and converting debt into investments will increase the GDP.

Öz

Gelişmekte olan ülkeler için sürdürülebilir ekonomik büyüme kilit makroekonomik hedeflerden biridir. Ancak her ülkenin GSYH büyümesini destekleyecek kadar sermayesi yoktur. Ülkenin yeterli ulusal sermayesi olmasa bile, hükümet GSYH büyümesini desteklemek için bir miktar dış borç olarak borç alabilir. Bu çalışmanın amacı Brezilya ekonomisindeki ekonomik büyüme ve dış borç arasındaki ilişkiyi incelemektir. Bu çalışmada, uzun ve kısa vadede dış borcun GSYH'ye oranı, borç hizmet stokunun GSYH'ye oranı, milli harcamaların GSYH'ye oranı, reel döviz kuru ve dışa açıklık değişkenlerin ekonomik büyümeye etkisi araştırılmıştır. Buna göre, dış borcun ekonomik büyüme üzerindeki etkisi ARDL Sınır Testi yardımıyla belirlenmiştir. Araştırmada kullanılan veriler 1970-2015 dönemini kapsamaktadır. Bulgulara göre, Brezilya'da dış borç ile büyüme oranı arasında uzun vadeli bir ilişki bulunmuştur. Dış borcun ekonomik büyüme üzerinde negatif etkisi olduğu sonucuna varılmıştır. Bu sonuca göre, gelişmekte olan ülkelerin dış borçlanmasının, sürdürülebilir borç sağlanmasının ve borçların yatırımlara dönüştürülmesinin GSYH'yi artıracığı düşünülmektedir.

Introduction

One of the key macroeconomic objectives of a nation is the achievement of sustainable economic growth. To achieve this goal, every government requires a substantial amount of capital finance though investment expenditures on infrastructural and productive capacity development (Umaru et al, 2013). As a result the growth of their gross domestic product (GDP) is a key for the development. However if the country haven't enough finance capacity, government can borrow to keep on growing.

Borrowing to promote economic growth is the way governments refer for sustainable growth. To create trigger environment for people to invest in various sector of their economies, governments should invest infrastructure investments. Obudah and Tombofa (2013) argued what the reasons for the borrowing of the countries included. Among these reasons is the ability to finance increased

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government expenditures, to finance budget expenditures and to increase production. If the government want faster growth rate, it can barrow more and more but barrowing also has risky aspects. If the government borrow much than it can pay back, this will lead the economy risky and unstable. As a result of borrow more than government can pay, can lead to crises that can negative effect on growth rate and economic structure.

Brazil covers a wide geography starting from the middle of the South American continent to the Atlantic Ocean. Neighbors are from south to north: Uruguay, Argentina, Paraguay, Bolivia, Peru, Colombia, Venezuela, Guyana, Suriname, French Guyana. It covers a large part of the South American continent has a long coast to the Atlantic Ocean. It is a neighbor to all countries except for Ecuador and Chile which are located in South America due to Brazil's large territory. As the 9th word largest economy is Brazil also 5th in terms of population. Brazil's population is about 207.6 million and the GDP of the Brazilian economy is about 1.796 (\$) trillion. As one of the largest economy and populations Brazil is the one of the most important country the World in point of economy. Therefore, in this study we will work on impact of external debt on economic growth in Brazil.

Purpose of the study is to reveal relationship between economic growth and external debt. In this study we will use The ARDL bound testing approach to cointegration and error correction models for the periods 1970-2015; In order to investigate the existence of long-run equilibrium relationship among variables (Stella Ada et all, 2016). Variables to study with are; GDPGR (annual growth rate of real GDP), EDS/GDP (ratio of external debt to GDP), DSS/GDP (ratio of debt service stock to GDP), NEXP/GDP (ratio of national expenditure to GDP), EXCH [real exchange rate (BRL/USD)], TRD (trade openness). This study consists of introduction, as the second chapter literature review, as the third chapter methodology, as the fourth chapter applied empirical method and data set, as the last chapter results and suggestions.

1. Literature

Inadequate national resources make it inevitable to borrow. External borrowing is particularly important for under developed and developing countries. Therefore the effect of external debt on economic growth have been studied and discussed by many researchers. Babic and Primorac(1986) in the study on the Yugoslavian economy the effects of variable such as total debt, consumption, investment and external debt on economic growth were examined. As a result of the study, it has been reached that the foreign debt has made the Yugoslavian economy dependent on the outsid. Geiger (1990) he has done a study on debt and economic growth in Latin American countries. He has made analyzes in different South American countries using real GDP growth rate, the ratio of net transfers to GDP, debt services, ratio of debt service to GDP data. For most countries the result support the that the marginal effect of the debt burden on the economy decrease as a debt burden increases. Many countries adapt to an increasing debt burden and learn ways to manage the problems involved in servicing a large debt.

Wijnbergen (1991) he did research on Mexico and as a result of the study, the increase in external debt caused an increase in inflation rates. Mexico needs to be more cautious in order to have a positive impact on growth in foreign debt. Wally and Tamaschke (1994) he conducted a survey on the countries of northern Africa (Algeria, Egypt, Morocco) with the years 1975-1989. The study concluded that the level of heavy debt in the three African countries would have a negative impact an economic growth. Singh (1999) in his study of India, analyzed the Granger Causality test and consequently Granger Causality show no relationship between the series.

Chaudhary et al. (2001) they have studied the effect of foreign debt on economic growth on South Asian countries(Pakistan, India, Bangladesh, Nepal, Sri Lanka, Maldives, Bhutan). As a result of the study, it has been found that the external debts of the southern Asian countries have a accumulated at an unsustainable rate. It was seen that external debt negatively affected growth. Kraay and Nehru (2006) they have worked with a total of 93 countries as low-income and middle-income. They used such as real exchange changes, real GDP growth, total debt variables. The results indicates that the probablity of debt distress is already high in many low-income countries and is

likely to increase sharply if the large scale development finance required to meet the Millennium Development Goals is provided in the form of concessional lending at historical.

Sen et al. (2007), they was examined two different groups as Latin American countries(Arjantine, Brazil, Colombia, Mexico, Venezuela) and Asian countries(China, India, Indonesia, Philippines, South Korea and Thailand). In the Panel Data Analysis, the following variables were used: per capita of GDP, ratio of debt to GDP, ratio of debt service to exports, ratio of capital stock to GDP, total labour force, external debt to export. The study has reached the conclusion that borrowing in Latin America affects growth considerably. The negative impact of debt stock on GDP growth seems robust. Similarly, for Asian countries, borrowing has also had a negative impact on growth. But this effect is less.

Jayaraman and Lau (2009), in the study they have conducted, the impacts on the external debt and economic growth of the Pasific countries are investigated. Panel performed the unit root test. Then they did Granger causality analysis. According to empirical studies, foreign debt, budget deficit and exports are additionally causal linkages in the short run, although there is no long-run relationship between external debt and growth. Between econmic growth and the external debt, a short-term dual causality was found. Uysal et al.(2009) in the study, the relationship between external debt and economic growth was investigated trough Augment Dickey Fuller Test(ADF) and Phillips-Peron (PP) unit root test, Vector Autoregressive Model(VAR), cointegration and Granger Causality analysis. The findings of the study showed that external debt in short and long run affected the economic output level negatively.

Greenidge et al.(2010) the study was based on the external borrowing of CARICOM countries. This paper also results indicates that some of the time period required to achieve this target are too long, given the assumed parameters, but it is expected that with greater fiscal effort and more growth in output these period can be shortened considerably. Akram(2011) his study examined the effect of debts in the Pakistani economy with data from 1992 and 2006 using external debt stock, export, import, investment and openness data. ADF unit root test, ARDL and VECM tests were applied for this purpose. As a result of the study, there is a negative correlation between external debt and GDP per capita in both short term and long term in Pakistan.

Muhanji and Ojah(2011) they have worked with countries like Cote'Ivoire, Ghana, Kenya, Malawi, Nigeria, Senegal, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. They made analyzes using external debt, imported investments, inflation, consumption imports, interest rate, exchange rate, exports and output variables. According to results show that both world commodity price and world interest rate shock impact external debt accumulation in the majority of African countries. Interestingly, world commodity price shocks lead to an increase in external debt while world interest rate shocks appear to discourage accumulation of external debt.

Butts et al.(2012) using short term external debt and real GDP growth data for 1970-2003, they examined the impact of short-term external debt on economic growth. In this context, ADF and PP unit root tests, ARDL Boundary Test and Granger Causality Analysis were done. Results there is indirect Granger Causality from economic short term external debt for the consumption effects. There is a evidence that economic exchange rate and international reserves are determinents of short-term external debt.

Ali and Mustafa(2012) they have used annual data for 1970-2010 in their studies on Pakistan. In the study, ADF unit root test, Johansen cointegration test and finally Vector Error Correction Model(VECM) were used. Gül et al.(2012) they used various test by obtaining 6 different Turkish Republic's(Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan) 1994-2010 data. As a result of the analyzes, one-way causality was found to growth from long-term external debt. Afonso and Jalles(2013) he conducted a survey on 155 OECD countries using 1970 and 2008 data. The higher the level of borrowing as a result of the study, the greater the economic growth for the OECD countries.

Panizza and Presbitero(2014) as a result of their work show a negative relationships between debt and growth. However, this relationships between debt and growth can be lost by correcting intrinsic value. Doğan and Bilgili(2014) they investigated the effect of foreign debts on economic

growth in Turkey using 1974-2009 data. In the study they used investment, human Capital, openness, population, growth of GDP, ratio of private external debt to GDP and ratio of public external debt to GDP variables. According to result of the main growth variables such as investment and human capital have positive impact on growth as a expected. As a result, economic growth and growth variables did not follow a linear path.

Ramzan and Ahmad(2014) they have studied the 1970-2009 data of Pakistan in their work on external debt on economic growth. ADF, PP unit root test and ARDL Boundary test were performed by using external debt and growth of GDP data. The results show that external debt has a negative impact on growth, but this adverse effect can be reduced or even reversed in the presence of sound macroeconomic policy. Bal and Rath(2014) they have done research on debts and economic growth on the Indian economy. The following variables were used in the study: economic growth, domestic debt, external debt, debt service, export, total factor productivity. In their study, the result from the ARDL model show that there is a long run equilibrium relationship between variables. In the Error Correction Model(ECM), it is seen that all variables affect economic growth in the short run and these results are consistent with a predicted expectation.

Teles and Mussolini(2014) the data of 74 countries are used in the study they have done. The following variables were used in the study: economic growth, GDP, investment as a percentage of GDP, trade, inflation, debt to GDP ratio. Casares(2015) in his work he explored the relationship between external debt and economic growth. As a result of the study, it has been found that external debt affects economic growth positively.

Spilioti and Vamvoukas(2015) between 1970 and 2013, they used growth rate of GDP, government debt, the gross domestic product per head of population, the gross national saving, the sum exports of goods and services, the sum import of goods and services data and examined the impact of government borrowing on economic growth for the Greek economy. The empirical results suggest a positive and statistically significant impact of debt on GDP growth. Puig and Rivero(2015) they tested the relationship on debt and growth with Granger causality analysis. In the study EMU countries (Greece, Ireland, Italy, Portugal, Spain, Austria, Belgium, Finland, France, Germany) data between 1980 and 2013 were used. The result of evidence is presented on the possible existence of bi-directional casual relationship between public debt and economic growth in both central and peripheral countries of the European Economic and Monetary Union.

Godwin et al.(2016) they investigated the impact of foreign debt on growth on the Nigerian economy. They used annual growth rate of real GDP, ratio of external debt to GDP, ratio of debt service stock to GDP, ratio of national expenditure to GDP, exchange rate and trade openness data in the study. First ADF and PP unit root tests were performed. Later ARDL Boundary test was performed and Granger Causality Analysis was performed to determine whether there was a causal relationship between the variables. The result of this study indicates a long-run relationship among the variables and external debt impacts negatively significant on output. The findings also established a unidirectional causality between external debt and economic growth.

Ushahembaljrshar et al.(2016) similarly, they worked on the Nigerian economy. However they have examined the relationship between the national debt and economic growth. They used the data of 1981-2014 in the study. ADF unit root test, Granger Causality and Johansen Cointegration analysis were applied. The results of all the variables were not stationary at level but achieved stationary after first difference at %5 level of significance. The regression result showed a significant relationship between external debt and economic growth in the Nigeria. However, external debt stock impacted positively while external debt service impacted negatively on the annual growth rate of the Nigerian economy both in the long run and the short run.

Siddique et al.(2016) they have worked on economies of 40 countries that are heavily indebted. Six different panel unit root test were performed and then the effects of external forces on economic growth was investigated by the ARDL test. According to approach GDP and merchandise export growth accelerated fastest since 2000, while debt levels have fallen since 2000. The estimation results indicate firstly that, capital formation's share of GDP has positive impact on HIPC's GDP in the short run as well as long run. Secondly, debt as a share of GDP has a negative influence in the short run

as well as in the long run. Thirdly, in the long run the mercandise trade as a percentage of GDP has a positive influence on GDP.

Karagöz and Çağlar(2016) they conduced a panel unit root test with data from 17 OECD countries. Overall result of study shows that for the OECD countries the foreign debt and growth relationships is a positive one. Although there are some countries in the world that have a negative relationship, for the case of OECD at least, positive relationships are indicative of good policy administration. Chen et al.(2016) they have studied 65 developed and developing county economies. As a result of their work, the effect of government investment on economic growth was seen to decrease as the level of borrowing increased. Similarly, if the size of the public debt stock increases especially when the public debt to GDP ratio is higher than %59,72, the effect of public debtors on economic growth is reduced and positive result turns out to be negative effect.

Semmler and Tahri(2017) using data from 1998-2012, they heve studied on the economy of Italy, Spain and Germany. As a result of their work, they have reached a slow-moving debt criss in the other two economies but for Germany this findings is not valid. Puig and Rivero(2017) they used variables such as real growth rate, level of output, public debt to GDP ratio, population growth, human capital, openness and inflation. The result show that debt in all countries outside Belgium is beginning to have negative effects on growth. Also, if the consequences indicates that the detrimental effect of a debt change on growth does not have the same intensity and intensity across all Economic and Monetary Union (EMU) countries, focusing on average rates and impacts may not be appropriate for defining policies. In particular, findings show that the rate of fiscal regulation in Greece and Spain should be lower than in other countries.

Musibau et al. (2018) examined the relationship of external debt with economic grpwth in the countries of the Economic Community of West African Countries (ECOWAS). As a result of their study using the data of 1980-2015 period, a causal relationship was determined from foreign debts to economic growth in both the long term and the short term. Kharusi and Ada (2018), analyzed the 1990-2015 period data using the ARDL method to determine the impact of external debt on economic growth in Oman. The results show that external debt negatively affected economic growth in Oman during the period in question.

Gövdeli (2019), investigated the impact of external debt, openness and consumer price index on economic growth using data from the 1970-2016 period. According to the findings obtained from the study using ARDL merhod in Turkey it has a positive impact of external debt on economic growth. Edo et al. (2020), investigated the relationship between external debt and exports with economic growth in sub-Saharan African countries esing 2005:Q1-2017:Q4 period data. The results showed that external debts positively affected economic growth in the period in question.

Table 1. External Debt and Economic Growth Relationship Literature Summary

Author(s)	Period	Countries	Methodology	Conclusion
Geiger(1990)	1974-1986	Latin American Countries	Ordinary Least Square (OLS)	Negative
Wally and Tamaschke (1994)	1975-1989	Algeria, Egypt, Morocco	Ordinary Least Square (OLS)	Negative
Sen et al.(2007)	1970-2000	Latin American Countries	Pooled Ordinary Least Squares (POLS)	Negative
Akram(2011)	1992-2006	Pakistan	ARDL, VECM Causality Test	Bidirectional Casual Relationship
Butts et al.(2012)	1970-2003	Pakistan	ARDL Bound Test, Granger Causality Analysis	External ebt => economic growth
Doğan and Bilgili (2014)	1970-2009	Turkey	Ordinary Least Square (OLS)	Positive
Ramzan and Ahmad (2014)	1970-2009	Pakistan	ARDL	Negative
Bal and Rath(2014)	1980-2011	India	ARDL	Positive
Spilioti and Vamvoukas(2015)	1970-2013	Greece	Ordinary Least Square (OLS)	Positive
Puig and Rivero (2015)	1980-2013	EMU	Granger Causality	Bidirectional Casual Relationship

Ushahembaljrshar et al. (2016)	1981-2014	Nigeria	Granger Causality, Johansen Cointegration	Negative
Puig and Rivero (2017)	1980-2015	EMU	Ordinary Least Square (OLS)	Negative
Musibau et al. (2018)	1980-2015	ECOWAS	Causality Test	External debt => economic growth
Kharusi and Ada (2018)	1990-2015	Oman	ARDL	Negative
Gövdeli (2019)	1970-2016	Turkey	ARDL	Positive
Edo et al. (2020)	2005:Q1-2017:Q4	Sub-Saharan African	Causality Test	Positive

2. Data and Methodology

In the study, while the annual growth rate in GDP is used as a dependent variable, real change rate, the ratio of external debt stock to GDP, the ratio of external debt to GDP, the ratio of national expenditures to GDP, trade openness are included in the model as independent (explanatory) variables. This data used in the study consisted of 46 observations between 1970-2015 and all data used were obtained from The World Data Bank system. The reason for choosing this period range in the model is due to the fact that all data belonging to Brazil is collected on a common ground in the period 1970-2015. The ARDL Bound Test was applied to investigate the effects of foreign debt ratios and other variables on economic growth and analyzed by using Eviews program for this propose.

Using the obtained data, the model is formulated as follows:

$$\begin{aligned}
 \ln GDPGR_t = & b_0 + b_1 \ln EDS/GDP_t + b_2 \ln DSS/GDP_t + b_3 \ln NEXP/GDP_t + b_4 \ln EXCH_t + b_5 \ln TRD_t \\
 & + u_t
 \end{aligned}
 \tag{1}$$

Data used in the application is coded as follow:

GDPGR: Annual Growth Rate of Real GDP

EDS/GDP: Ratio of External Debt to GDP

DSS/GDP: Ratio of Debt Service Stock to GDP

NEXP/GDP: Ratio of National Expenditure to GDP

EXCH: Real Exchange Rate

TRD: Trade Openness

In the model, the coefficients of b_1, b_2, b_3, b_4 and b_5 show the elasticity of the growth of with the variables such as external debt to GDP, ratio of external debt to GDP, ratio of national expenditures to GDP, real exchange rate and trade openness. Also u_t indicates the error terms.

In this study, which investigated the long-term relationship between economic growth and external debt, the border test developed by Pesaran et al. (2001) was used. In case of some series level value and some of them in the first differences are stationary, autoregressive distributed lag model (ARDL) bound test approach is used to investigate existence of a long-run relationship between the variables. The ARDL model has many advantages. First, it prevents the occurrence of problems before the test, which is seen in conventional cointegration tests. Secondly, it permits the retrieval of a sufficient number of delays and facilitates the data generation process by means of the entire deriving method. According to traditional cointegration tests, this approach gives effective result in small volume samples. Finally, the dynamic error correction model (ECM) derived from the ARDL Bound Test combines short-circuited dynamics with long-running dynamics without causing information loss (Banerjee at al., 1993:51-52).

The test is used to test the statistical significance of delayed levels of variables in the conditional unrestricted equilibrium error correction model. The ARDL Bound Testing approach consists essentially of tree steps. In the first step, it is tested whether there is a long-term relationship between the variables involved in the analysis. Longitudinal and short-term elasticities are obtained in the presence of cointegration relation between the mentioned variables and in successive stages

respectively (Narayan and Smyth, 2006:337). We adapted this model to the formula as follows by the adapting our study.

$$\begin{aligned} \Delta GDPGR_t = & b_0 + b_1 \Delta EDS/GDP_t + b_2 \Delta DSS/GDP_t + b_3 \Delta NEXP/GDP_t + b_4 \Delta EXCH_t + b_5 \Delta TRD_t \\ & + b_6 GDPGR_{t-1} + b_7 \Delta EDS/GDP_{t-1} + b_8 \Delta DSS/GDP_{t-1} + b_9 \Delta NEXP/GDP_{t-1} \\ & + b_{10} \Delta EXCH_{t-1} + b_{12} \Delta TRD_{t-1} + u_{t-1} \end{aligned} \quad (2)$$

The lag length test is constructed using delay length measures to obtain the optimal number of lag for each variable. This is followed by the prediction of an unlimited error correction model by a single equation with the number of selected delays, as shown in the equation 3.

$$\begin{aligned} \Delta GDPGR_t = & b_0 + \sum_{i=1}^a b_1 \Delta GDPGR_{t-i} + \sum_{i=1}^a b_2 \Delta EDS/GDP_{t-i} + \sum_{i=1}^a b_3 \Delta DSS/GDP_{t-i} \\ & + \sum_{i=1}^a b_4 \Delta NEXP/GDP_{t-i} + \sum_{i=1}^a b_5 \Delta EXCH_{t-i} + \sum_{i=1}^a b_6 \Delta TRD_{t-i} + b_7 GDPGR_{t-1} \\ & + b_8 EDS/GDP_{t-1} + b_9 DSS/GDP_{t-1} + b_{10} NEXP /GDP_{t-1} + b_{11} EXCH_{t-1} + b_{12} TRD_{t-1} \\ & + \varepsilon_t \end{aligned} \quad (3)$$

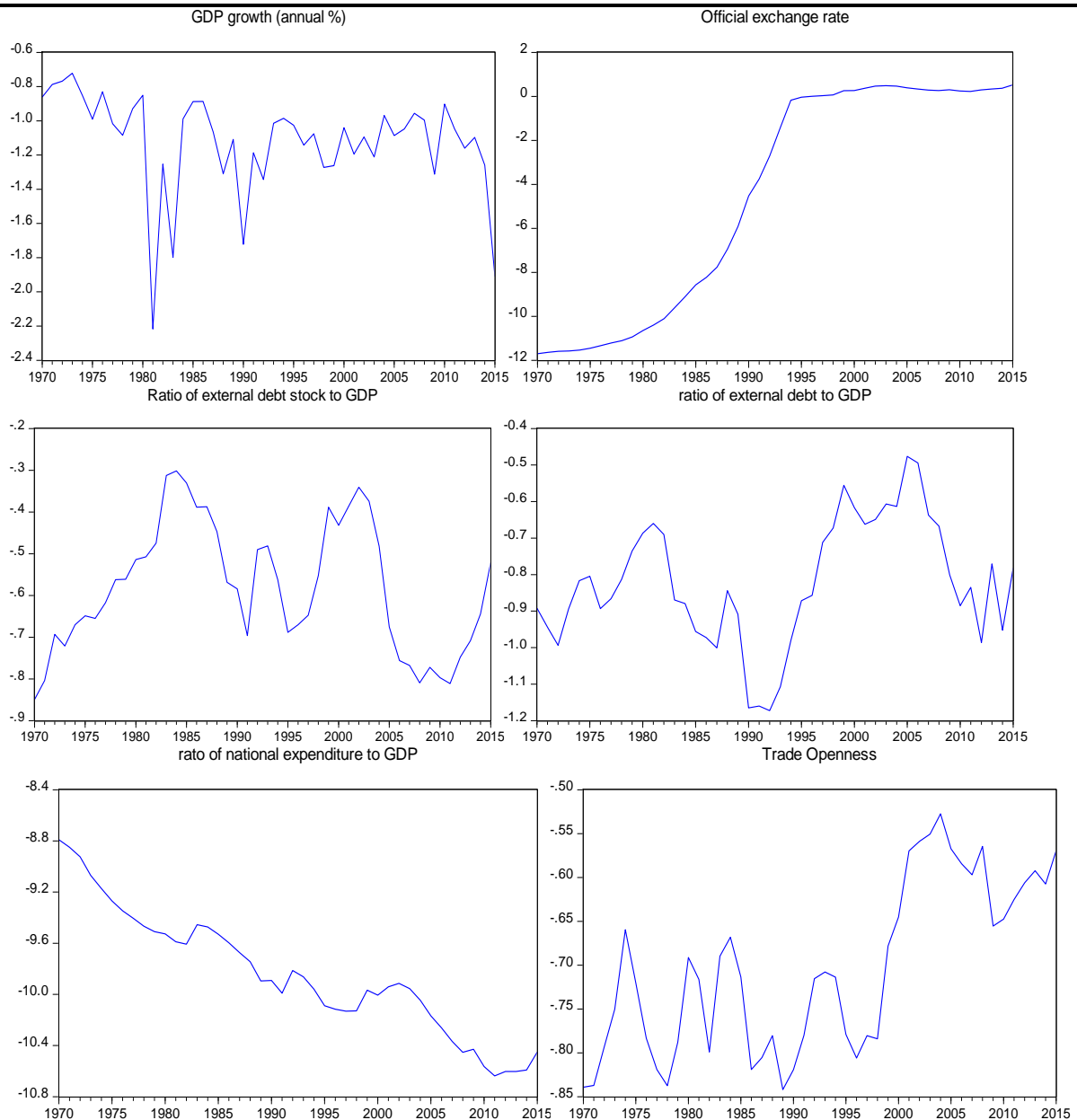
In the equation Δ is the first difference operator. The optimal lag length is a . All other variables remain the same. The Wald Test is obtained by applying F statistics on the coefficient of unlimited ε_t variables. F statistic are used to test the existence of a long-term relationship and are compared at the level of %5 significance. If the F statistics are above the upper boundary value, the null hypothesis that there is no cointegration between variables is rejected. However, if it falls below the lower bound value, the null hypothesis is accepted. If the F statistical values are within the bound values, the result is insufficient. If it is determined that there is a long cyclical relationship between variables, short-term dynamics can be derived predicting the ε_t lags as specified. ε_t is defined as error correction is the term 4.

$$\begin{aligned} \varepsilon_t = & \Delta GDPGR_t - b_0 - \sum_{i=1}^a b_1 (GDPGR)_{t-i} - \sum_{i=1}^a b_2 \left(\frac{EDS}{GDP}\right)_{t-i} - \sum_{i=1}^a b_3 (DSS/GDP)_{t-i} \\ & - \sum_{i=1}^a b_4 \left(\frac{NEXP}{GDP}\right)_{t-i} - \sum_{i=1}^a b_5 (EXCH)_{t-i} - \sum_{i=1}^a b_5 (TRD)_{t-i} \end{aligned} \quad (4)$$

3. Empirical Results and Discussion

First, the tendency of all variables was examined. When the graphs of the variables in Figure 1 are examined, it is seen that the variables such as growth in GDP, ratio of external debt stock to GDP, ratio of external debt to GDP and trade openness are not the trends. While the positive tendency of the exchange rate rises from a very low level to a peak level, the ratio of public expenditures to GDP is following a negative trend. The trends of all the variables used in this study before trading are as in the following Figure 1.

Figure 1. Graphs of Variables Included in the Model



For all observations of the variance of the error term it is called heteroscedasticity situation is not the same. The variance of the conditional variance of the error term is a frequent problem especially in horizontal-cross sectional data analysis.

$$H_0 = \sigma^2(\text{constant variance})$$

$$H_1 \neq \sigma^2(\text{varying variance})$$

Null hypothesis indicates that variance is constant. The alternative hypothesis shows that variance is variable. Variable variance tests investigate that there is no correlation between the error term and the explanatory variables.

Table 2. Heteroscedasticity Test

Heteroscedasticity Test	F-Statistic	Prob.
Breusch-Pagan-Godfrey	2,79	0,01
Harvey	1,69	0,12

When we look at the probability values, the variance problem in the Harvey test does not appear, but the variance problem varies according to the Breusch-Pagan-Godfrey test. Since the probability

value in the Breusch,Pagan and GodfreyTest is $0,01 < 0,05$, H_0 hypothesis will be rejected and the residues at statistical significance level of 0.05 have varying variance. In the Harvey test, H_0 hypothesis is accepted as probability value is $0,05 < 0,12$. Statistically, at 0.05 significance leve have constant variance.

Table 3. Autocorrelation Test

Breusch-Godfrey Serial Correlation Test			
F-Statistic	0,44	Prob.F(2,32)	0.64
Obs*R-squared	1.69	Prob. Chi-square(2)	0,55

The Table 2 above present the result of the Breusch-Godfrey test for autocorrelation. Table 2, prob.F 0,64 and Prob.Chi-square 0,55; it was determined that there was no autocorrelation problem.

Table 4. ARDL Long Run Form and Bound Test

Conditional Error Correction				
Variable	Coefficient	Std. Error	t-statistic	Prob.
c	3,991233	2,032269	1,963929	0,0578
GDPGR(-1)*	-1,175732	0,155154	-7,577862	0,0000
EXCH(-1)*	0,048562	0,018858	2,575192	0,0145
DSS/GDP**	-0,007442	0,377136	-0,019734	0,9844
EDS/GDP**	-0,829693	0,349903	-2,271206	0,0235
NEXP/GDP(-1)	0,577298	0,210589	2,741355	0,0097
TRD**	0,068175	0,568135	0,119998	0,9052
D(EXCH)	-0,100458	0,195385	-0,514152	0,6105
D(EXCH)(-1)	-0,320572	0,211285	-1,517200	0,1385
D(NEXP/GDP)	-1,856572	0,661322	-2,807363	0,0082

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as $Z = Z(-1) + D(Z)$.

When the number of observations and annual data are taken into consideration, the maximum lag length is determined as 4. This most appropriate lag length is determined using the Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC).

Table 5. ARDL Error Correction Regression

ECM Regression (Restricted Constant and No Trend)				
Variable	Coefficient	Std. Error	t-statistic	Prob.
D(EXCH)	-0,100158	0,156099	-0,643553	0,5242
D(EXCH)(-1)	-0,320561	0,173691	-1,845586	0,0737
D(NEXP/GDP)	-1,856557	0,438382	-4,235057	0,0002
CointEq(-1)*	-1,175732	0,135595	-8,670931	0,0000

* p-value incompatible with t-Bounds distribution

As shown in Table 4, the term CointEq(-1) error correction is negative. In the long run, a statistically significant relationship was found between the growth in GDP and the real exchange rate, the ratio of national expenditures to GDP.

Table 6. ARDL F-Bound Test

Null hypothesis: No levels relationship	Critic Value %1	Critic Value %5
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k	F-Statistic	I(0)	I(1)	I(0)	I(1)
5	9,129612	3,06	4,15	2,39	3,38

* k is the number of independent variables.

When Table 5 is examined, it is seen that the calculated F-statistic is bigger than the sub-critical value. Therefore, the basic hypothesis that there is no cointegration relation between variables is rejected.

Conclusion

Investigation of relationship between external debt and GDP growth rate, has begun with Keynes, who advocates that the government should intervene in the economy when necessary. The Keynesian school has argued that developing countries can make positive contributions when used to support external debt to growth. Harrod-Domar has shown that increasing income can be achieved by borrowing by investing. Taking these views into account, the external debt and growth rate relationship is deal with more extensively in later periods.

As a developing country, we have examined the relationship between borrowing and growth rate in Brazil with ARDL Bound Test for the period 1970-2015. We also applied Heteroscedasticity Test, Auto Correlation Test, ARDL Long Run Form and Bound Test, ARDL Error Correction Regression, ARDL F-Bound Test. As a result, in parallel with the literature, there was no short-run relationship between external borrowing and GDP growth, but a one-way relationship was found from long-term as external debt to GDP growth.

According to the long term coefficient estimation results of ARDL, 1% increase in the ratio of foreign debt to GDP causes a decrease of approximately 0,83% on real economic growth in Brazil. Similarly, in the studies of Uysal et al. (2009), Akram (2011), Puig and Rivero (2017), there was a long-term negative relationship between foreign debt and economic growth. These results show that economic growth was negatively affected if foreign debt increased in Brazil. According to the 2015 data based on the study, the ratio of foreign debt increases to gross national product in Brazil 30,8%. When 2018 data are analyzed, this rate has decreases to 30.3%. According to the findings obtained from this study, it is thought that channeling foreign debts to investments through the right sectors will positively affect the national economy. It is thought that these sectors should be directed towards the country's potential and production of export products. Economic growth is considered to be negatively affected due to the fact that external debts are not converted into investments by using them efficiently. In the direction of the this result, it is recommended that developing countries use external debt to support GDP growth, by ensuring sustainable debt and by ensuring debts turn into investments.

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