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Causality Relationship Between Current Deficit and Economic Growth: The Example of Brazil *

Cari Açık ve Ekonomik Büyüme Arasındaki Nedensellik İlişkisi: Brezilya Örneği

Emine Türkan Ayvaz Güven [1] ⓘD

ABSTRACT

The concepts of current deficit and economic growth which are related to each other are among the most important macroeconomic indicators that provide with information about a country's economic structure. Especially seen in the recent years; the high growth rates coming along with globalization process cause current account to have deficits by increasing the need for intermediate goods in production and by satisfying these needs via importing these goods. The increased current deficits affect growth process in a negative way by increasing sovereign risk and refer to the outbreak of crises; and also, they affect the short and long-term future plans of the domestic and foreign investors. The aim of this study is to investigate the relationship between current deficit and economic growth in terms of Brazil. In practice, current account deficit and economic growth variables are used. First, the unit root test was applied to the variables, and then the cointegration test was performed. Finally, the Granger Causality Test was applied for the causality relationship between the variables. As a result of the Johansen Co-integration Test applied to these variables, it is concluded that the subject variables are co-integrated. In order to determine the causality relationship between variables, Granger Causality Test was applied and as a result of the test, the variables were found to be related to one another; also, a mutual –two way- relationship between economic growth and current deficit was found for Brazil.

Keywords: Economic Growth, Current Deficit, Granger Causality Test

ÖZET

Birbiriyle ilişkili olan, cari açık ve ekonomik büyüme kavramları, bir ülkenin ekonomik yapısı hakkında bilgi veren en önemli makroekonomik göstergeler arasında sayılır. Küreselleşme süreci ile beraber özellikle son yıllarda oluşan yüksek büyüme oranları, üretimde ara mallarına olan ihtiyacı arttırarak, bunların ithalat yolu karşılanmasına böylece, cari işlemler hesabında açık oluşmasına neden olmaktadır. Artan cari açıklar ise, ülke riskini çoğaltarak büyüme sürecini negatif etkilemekte, krizlerin çıkabileceğini işaret etmekte, ayrıca yerli ve yabancı yatırımcıların, gelecekle ilgili kısa ve uzun vadeli planlarını etkilemektedir. Çalışmanın amacı, cari açık ve ekonomik büyüme arasındaki ilişkiyi Brezilya için araştırmaktır. Uygulamada, cari açık ve ekonomik büyüme değişkenleri kullanılmıştır. İlk olarak değişkenlere birim kök testi yapılmış, arkasından Eş-tümleşme Testi yapılmıştır. Son olarak da değişkenler arasındaki nedensellik ilişkisi için Granger Nedensellik Testi uygulanmıştır. Bu değişkenlere uygulanan Johansen Eştümleşme Testi sonucunda, değişkenlerin eştümleşik oldukları bulunmuştur. Değişkenler arasında nedensellik ilişkisini belirleyebilmek için, Granger Nedensellik Testi uygulanmış ve çalışmanın sonucunda, değişkenler birbiriyle ilişkili çıkmış, ayrıca, ekonomik büyüme ile cari açık arasında, Brezilya için çift yönlü ilişki bulunmuştur.

Anahtar Kelimeler: Ekonomik Büyüme, Cari Açık, Granger Nedensellik Testi

INTRODUCTION

Brazil was discovered in 1500 by Pedro Alvares Cabral, a Portuguese sailor. Brazil, which was a colony of Portugal in the beginning, declared its independence in 1822 to firstly become the Empire of Brazil, and then the Federal Republic of Brazil ruled by the presidential system in 1889. Brazil, whose capital is Brasilia, is the most crowded country of the South America Continent with 26 states and a population of 205.506.000 . Furthermore, being the fifth biggest country of the world with a surface area of 8.514.876,599 km², it constitutes nearly the half of the South America Continent. Brazil has borders with nearly all countries in the South America Continent, excluding Chile and Ecuador. Three different races and a mix of them can be mentioned in Brazil. The whites coming from Europe, and the blacks coming from Brazil constitute the structure of Brazil (Kiper, 2012: 1-2).

Being considered among the first 20 countries with the highest export amount today, Brazil is among the high-potential countries such as Russia, India and China. However, it cannot be said that it reached its current position so easily. Brazil had the years of crises and political uncertainties twice in its history, and encountered many economic problems including high inflation, income inequality. It eluded this period through the strong macroeconomic policy practices, whose foundations were laid in the 1990s. Today, it is considered among the biggest economies of the world (Akademikbakiş, 2014).

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[1] Assistant Professor, Manisa Celal Bayar University, Ahmetli Vocational Higher School, Manisa, Turkey

The history of Brazil is divided into five different economic period, each being the major export production of its era. The first one is the period between 1500-1550, in which the Brazilian wood used to provide the European textile with red dye was dominant. The second period is the Sugar Period between 1530-1650, in which the Portuguese dominated the shores, and sugar was produced of sugarcane. The third period is the one in which gold and silver were discovered between 1690-1750. The fourth one is the period that started with the reduction of the gold production towards the end of the 19th century and lasted until 1920, covering the coffee production. The industrialization that started as of 1930 can be considered a summary of the Brazilian economic structure. In this period, Brazil needed the labor force to have a production surplus by an agriculture-based policy, which led to the appearance of the slavery system. The search for cheap labor force and immigrations started with the ban of slavery. The economic system had a remarkable impact on the political structure in this period. Many military coups were made openly as if there were ethnic or religious reasons, but failed to achieve their objectives. The industrialization period, which constitutes the fifth period, continued until the 1990s (Kiper, 2012: 1-4).

Brazil became one of the leading countries of the world by its rich natural resources, its big surface area, its population and its developing domestic market. But in addition to all these factors, it has always been in the front row by the escalation in its inflation rate. As a result of the failure of the strict monetary and financial policies conducted in the 1970s, and the enforcement of the fixed currency rate system for the first time and the execution of transactions eliminating the indexation by limiting the nominal interest rates, it faced the hyper-inflation problem in 1990. Furthermore, Brazil could not get the opportunity to close the deficits in its current accounts due to the moratorium in terms of its external debts in this period (Eriş, 2001: 8).

In the 1980s, Brazil adopted an outward-oriented economy instead of an import-substitution economy. In 1980s and 1990s, the inflation increased and period of stagnation started by the impact of the 1982 Mexican crisis. In the 1968-1973 period, Brazil became the country with the highest growth rate in the world by a growth rate of approximately 10%. By the adoption of the anti-inflationist policies in the following years, the inflation rate reduced to 40%, but this situation brought along a decrease in the growth rate. The economic growth performance in the 1990s is 43% more than the economic growth performance in the 1980s in average. The economic growth, which was approximately 2.1% in the 1982-1991 period, became 3% in the 1992-2001 period. While the growth rate was 2% in the 1980s, it reached 4% in 1993-1997 (Yakar, 2001: 130). Although it was not possible to find a new loan in 1984, a 7.4-billion-dollar foreign exchange outflow occurred in Brazil equally to the foreign trade balance. Brazil failed to sustain its investments as it could not find loans in the international arena, along with the financial problem that occurred.

By the liberalization in the 1990s, the privatization gained momentum in Brazil, and therefore the structuring of the public sector and the financial reforms increased the amount of foreign capital inflow. However, these regulations caused the foreign trade balance to be deteriorated by negatively affecting the local producers.

The 1990s can be analyzed in two groups as the first five-year period and the second five-year period.

The general economic characteristics of the first five-year period can be sorted as follows (Pinheiro et al., 1999):

✓ A high and increasing inflation,

✓ Escalations in the general level of the prices, the increasing public sector debts, and the rising government deficits,

✓ Elimination of the external sources of financing and the decrease of value in the currency as a result of the crisis in the 1980s,

✓ The fact that the balance of payments had current account surplus, and that the foreign exchange reserves decreased by the foreign capital inflow formed between 1991-1993.

The macroeconomic progresses made in the second five-year period of the 1990s are as follows:

✓ A low and decreasing inflation,

✓ Increasing financial deficits,

✓ A currency which was more powerful compared to the 1991-1994 period,

✓ Serious problems that occurred in the current balance.

Some crises that occurred in other countries in this period caused the Brazilian economy to lose its balance. These are the 1995 Mexican Crisis, the 1998 Russian Crisis and the Asian crisis that appeared in the end of 2001. Furthermore, Brazil also faced a crisis in its own country between the end of 1998 and the beginning of 1999. These negative progresses brought along some problems. Some of these problems were the high deficits in the current accounts, the stagnation in the economy, the increase of the government debt as a result of the escalation of the short-term interest rates by the Central Bank of Brazil. The external shocks and some negative progresses diminished the

power of the economy, the interest rates increased, and the expectations of the private sector were negatively affected (Paula and Alves, 2007: 7).

The main economic indicators of the Brazilian economy between 1990-2000 are shown in Table 1.

Table 1: Basic Economic Indicators of Brazil in the 1990-2000 Period

Years	GDP (Billion $)	Growth Rate (%)	Export (Billion $)	Import (Billion $)	Current Balance (Billion $)	Consumer Price Index (2005=100)	Producer Price Index (1994=100)
1990	501	-4.3	33	29	-3.78	0.001	0,002
1991	509	1.5	35	32	-1.40	0.006	0.01
1992	506	-0.5	41	33	6.14	0.06	0.13
1993	530	4.5	45	42	-0.59	1.28	29.6
1994	558	5.3	47	51	-1.68	27.75	704.9
1995	583	4.4	46	66	-18.38	46.06	1119.2
1996	596	2.1	46	70	-23.5	53.32	1286.7
1997	616	3.4	51	80	-30.45	57.02	1332.4
1998	616	0.1	54	80	-33.41	58.84	1553.3
1999	618	0.2	57	68	-25.33	61.7	1834.6
2000	644	4.3	64	75	-24.22	66.04	2065.8

Source: IMF (16.10.2022), OECD (16.10.2022), The World Bank (16.10.2022).

In the 1990s, the Brazilian economy changed its inward-oriented economy form, and started to implement an outward-oriented policy. As it can be seen it Table 1, there were increases in import and export. It can be seen that Brazil had current deficits throughout the 90s, excluding 1992. When the economic growth data are analyzed, it is attention-grabbing that there was a negative growth in 1990 and 1992, that the growth turned positive in other years, among which 1994 was the highest. It can be seen that the Consumer and Producer Price Indexes always increased compared to the year before, between 1990-2000.

The main economic indicators of the Brazilian Economy between 2001-2020 are shown in Table 2.

Table 2: Basic Economic Indicators of Brazil in the 2001-2020 Period:

Years	GDP (Billion $)	Growth Rate (%)	Export (Billion $)	Import (Billion $)	Current Balance (Billion $)
2001	554.18	1.3	58.2	55.6	-23.22
2002	506.04	2.7	60.3	57.2	-7.64
2003	552.38	1.2	73.2	48.3	4.18
2004	663.73	5.7	96.7	62.8	11.68
2005	882.04	3.2	118.5	73.6	13.40
2006	1089.25	4	137.8	91.3	13.65
2007	1366.85	6.1	160.6	120.6	1.55
2008	1653.53	5.2	197.9	173.2	-28.2
2009	1622.31	-0.3	153.0	127.6	-24.3
2010	2142.91	7.5	201.9	181.6	-47.37
2011	2474.64	2.7	256.1	226.2	-52.4
2012	2247.75	1.0	242.5	223.1	-54.2
2013	2246.07	2.3	245.7	240.3	-73.3
2014	2244.13	0.1	265.5	268.3	-68.5
2015	2090.35	0.3	220.1	212.4	-73.8
2016	1988.36	0.2	202	182	-20.2
2017	2064.20	1.3	191	171	-20.8
2018	1917.23	1.8	240	182	-59.4
2019	1873.85	1.2	224	177	-47.4
2020	1658.23	-1.2	210	159	-51.7

Source: IMF (16.02.2023), OECD (16.02.2023), The World Bank (16.02.2023).

In 2001, some international shocks, the stagnation in the Japanese economy, and the crises of Turkey and Argentina caused a regression in the Brazilian economy. The economic growth decreased from 4.3% to 1.3%, while the inflation started to continue at 7% rate. On the other hand, the balance of payment current account deficit became 23.2 billion dollars by decreasing compared to the previous year. Nevertheless, the proportion of the balance of payment current account deficit to the GDP remained at 4% due to the devaluation in Real. Therefore, Brazil became weak in the financial markets due to the deficits in the current accounts, and the need for capital inflow. Moreover, while the external debt was 20.8% in 1997, it reached 37.7% in 2001 (Bevilaqua and Marcia, 1999: 3-10).

LITERATURE

Most of the econometric studies analyzing the relation between current deficit and economic growth showed that the increases in the economic growth rates cause deficits in the current account balance.

Chinn and Prasad (2000) used the Fixed Effects Model (FEM) and the LS in order determine the medium-term determinants of the current deficit's proportion to the GDP for 18 industrialized countries and 71 developing countries with data covering the years 1971-1995. In the end of the study, a strong positive relation was put forward between the current balance and growth rate only in the industrialized countries.

Calderon and others (2001) tested the relation between the current deficit and growth via Generalized Method of Moments (GMM) for a total of 64 countries, 30 of which are African countries and the remaining 34 developing countries. The results obtained are as follows: They put forward that there was a positive relation between the current deficit and growth rate in the African countries, which was caused by different income flexibilities, contrary to the developing countries. Moreover, they determined that a 1% increase in the growth rates would cause a 0.22% decrease in the current deficit.

Zanghieri (2004) researched the relation between the current deficit-growth through the methods such as FEM and GEM in 10 new member countries of the European Union for the 1990-2003 period. Zanghieri claimed that there is a positive relation between the current balance and government deficits, and negative one between the financial deepening rates and current balance.

Dominguez (2005) analyzed the economic condition of the country following the economic crisis that occurred in the Singaporean economy in 1997 by using the LS method for the 1999-2003 period, and concluded that the increases in the national income would cause deteriorations in the current balance.

Aristovnik (2006) analyzed the current deficit-economic growth relation via panel data for the 1992-2003 period for 26 countries from Eastern Europe and former Soviet countries. The empirical findings obtained show that the escalations in the growth rate would expand the current deficits, and that a 1% increase in the growth rate would cause a 0.54% rise in the current deficit.

Pacheco-Lopez and Thirlwall (2007) researched the economic growth rates-current balance with the help of the time-series analysis for the 1977-2002 period in 17 Latin American countries. They concluded that when the economic growth rates increased, the current deficits also increased in the countries discussed.

Bitzis and others (2008) researched the factors affecting the current deficit in Greece in the 1995-2006 period by using the co-integration analysis. As per the findings obtained, the changes in the real effective exchange rate and the real interest rate are the variables having the highest impact on the current account.

Malik and others (2010) tested the impacts of the number of tourists and the growth rate of the Pakistani economy on the current deficit through the Johansen Co-integration, Error Correction Model (ECM) and Granger Causality methods by using the annual data of the 1972-2007 period. As per the results of the Granger Causality test, however, there is a unilateral causality relation from the current deficit to the growth rate, and a unilateral relation from the number of tourists to both current deficit and growth rate.

Brzozowski and Prusty (2011) tested the impact of the GDP volatility on the current balance in 175 developing countries, Turkey included, through the FEM and LS methods, with the annual data of the 1981-2009 period. As per the findings obtained, the growth rate-current balance relation is negative in the short run, and positive in the long run. Furthermore, the impact of the GDP volatility on the current balance is negative in low-income countries, and positive in high-income countries.

Yaghoubi Nia (2015) analyzed the short-term and long-term relations between the current deficit, oil prices and energy import for Turkey via Johansen and Juselius Co-integration and Error Correction techniques by using the 2005-2014 period's data. The findings obtained are as follows: there is a bilateral relation between the current deficit and energy import in the long run. In the short run, however, no causality was found from the energy import to the current deficit, while a causality was found from the current deficit to the energy import.

Barbaros, Bay and Kalaycı (2018) analyzed the relationship between Turkey's GDP, energy consumption and current account deficit data for the years 1980-2013. As a result of the analyzes made, it was seen that the series which are stationary at the I (1) level are cointegrated and they move together in the long run. As a result of the Granger Causality Test, it was seen that there was no causality among the mentioned variables.

Doğan (2021) examined the relationship between economic growth, energy consumption and current account deficit in Turkey. As a result of econometric analysis; It has been observed that the increases in energy consumption increase economic growth and the current account deficit increases due to the energy demand resulting from economic growth.

Topkaya (2022) examined the effects of defense expenditures on economic growth and current account deficit for the period 2000-2020 in the United States, India, China, Japan, Israel and Turkey. As a result, a negative relationship was found between economic growth and defense expenditures, and a positive relationship with the current account deficit.

ECONOMETRIC APPLICATION FOR BRAZIL

The data set to be used in the study is annual, covering a long term including 1980 and 2020. Annual data were preferred in order for the study to include both long-term and short-term relations. The time series belonging to the variables used were compiled by having been taken from the OECD and IMF data. All of the econometric analyses were made by using the 8th edition of the E-Views package program. The abbreviations of the variables are shown in Table 3.

Table 3: Variables Used in the Application for Brazil

Variable's Name	Symbol	Definition of the Data	Source of the Data
Current Deficit	CD	Billion Dollars	OECD
Economic Growth	GDP	Billion Dollars	IMF

Brazil's Stability Tests

ADF and PP unit root tests were applied for the level values and first differences of the variables and the results are shown in Table 4.

Table 4: ADF and PP Unit Test Results of Brazil Level and Initial Difference Values

Variables	ADF (constant)	ADF (trend and constant)	PP (constant)	PP (trend and constant)
LOGCD	-2.352 [0.205] (0)	-2.526 [0.245] (0)	-2.542 [0.172] (1)	-2.550 [0.235] (2)
LOGGDP	-0.932 [0.900] (1)	-2.721 [0.280] (1)	-0.826 [0.930] (0)	-2.221 [0.616] (1)
Δ LNCD	-5.375*** [0.0001] (0)	-5.375*** [0.0006] (0)	-5.517*** [0.0001] (8)	-5.810*** [0.0002] (7)
Δ LNGDP	-4.215*** [0.0073] (0)	-4.140*** [0.0128] (0)	-4.247*** [0.0021] (1)	-4.178*** [0.0114] (1)
Critical Value 1%	-3.823	-4.074	-3.823	-4.074
Critical Value 5%	-2.995	-3.665	-2.995	-3.665
Critical Value 10%	-2.521	-3.125	-2.521	-3.125

Not: Δ symbol shows the first differences. The critical values for the ADF and PP were obtained by MacKinnon (1996). The values inside [ ] show the probability values. The values inside ( ) provide the lengths of delay. The ***, ** and * symbols show that the empty hypothesis claiming that the series is not steady respectively on the 1%, 5% and 10% error levels (meaning that there is a unit root) is rejected.

When the values in Table 4 are to be interpreted in terms of CD and GDP, it can be seen the test statistic for all variables is greater than the critical value determined by Mackinnon as absolute values when the constant and trend-constant values of the ADF and PP test statistics are separately analyzed, and the fact that the probability values are 0 or quite close to 0 causes the hypothesis Ho to be rejected. Therefore, it can be concluded when the initial differences of the series are taken, they reach the steady state assumption.

Determination of Brazil's Length of Delay

The series which have been made stationary by taking the difference; Before a Granger causality analysis can be performed and interpreted, the appropriate lag length must be determined. In determining the number of delays; LR (Likelihood ratio test statistic), FPE (Final Estimation Error Criteria), AIC (Akaike information criterion), SC (Schwarz information criterion), HQ (Hannan-Quinn information criterion) criteria are used.

Table 5: Determining Lag Length for Brazil

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3.171	NA	5.14e-05	1.695	2.472	1.895
1	-15.082	23.665*	4.28e-05*	1.562*	1.525	1.125*
2	4.731	13.253	9.83e-05	2.152	3.965*	2.965
3	15.122	11.455	0.001	2.956	4.879	3.965

NOTE: * Shows the length of delay selected by the criterion. LR: Likelihood ratio test statistic (on 5% level)FPE: Final Prediction Error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Based on the test results given in Table 5, the length of delay is 2 as per the SC, and 1 as per the AIC and HQ. The length of delay was taken as 1 as it was seen that there was no problem of autocorrelation and changing variance in the model, where the length of delay is 1.

Brazil's Co-integration Test

The results of Brazil's Cointegration Test are presented in Table 6.

Table 6: The Johansen Co-integration Test Results of Brazil

Hypothesis Ho	Eigenvalue Statistic	Trace Statistic	10% Critical Value	Prob**	Max-Eigenvalue Statistic	10% Critical Value	Prob**
r=0*	0.482	44.862	36.123	0.021	21.125	20.785	0.090
$r \leq 1$*	0.417	24.634	22.456	0.070	17.253	16.452	0.062
$r \leq 2$	0.168	6.541	10.412	0.250	6.045	9.474	0.356
$r \leq 3$	0.015	0.547	3.120	0.740	0.547	3.120	0.565

Not: As per the maximum eigenvalue and trace statistic, it is shown that 2 co-integration equation is present on the α=0.10 significance level. * Shows that the hypothesis is rejected on the 0.10 significance level. **MacKinnon- Haug-Michelis (1999) are p values.

When the Co-integration Analysis results in Table 6 were examined, a long-term relation was found between the CD and GDP series. The hypothesis H_0 stating that there is no co-integrated relation between the variables was rejected. The max-Eigenvalue and trace statistics show that there is 2 c-integration equation between these variables. The hypothesis H_0 is rejected if the test statistics calculated are higher than the 1%, 5% and 10% critical value on a specific level of significance. As per the maximum eigenvalue and trace statistics, there is a co-integration and the number of vector is 2.

Causality Test Results of Brazil

The "Granger Causality Test" is utilized to test whether one of the variables in a model, which is formed to make estimations on one variable, causes changes in other variables.

Tablo 7: Granger Test Results of Brazil

	Chi Square	sd	Prob
GDP is not the cause of the current deficit.	10.001	1	0.002**
Current deficit is not the cause of GDP.	5.129	1	0.021***

Not: ***p<0.01, **p<0.05

As a result, it can be seen that the current deficit is the cause of the growth, while the growth is the cause of the current deficit. Thus, there is a bilateral relation between the current deficit and growth.

CONCLUSION

Current balance consists of the combination of the foreign trade, services, investment incomes and current transfer balances of the balance of payments. If the incomes obtained by a country from the current accounts are higher than the expenditures it makes on the current accounts, then there is a current surplus, or a current deficit if it is fewer. Today, many countries face the problem of current deficit. Being another important concept for the economies of the countries, the economic growth means the increase of the production capacity, or the constant escalations in the real output per capita. This long-term fact is a concept on which the economists from past to present have put emphasis and made researches.

Brazil started to implement a more outward-oriented economy strategy, but was able to reach a noteworthy success in its foreign investments as of the second half of the 1990s, following the "Real Plan" it implemented to struggle against inflation in 1994.

The annual data of the 1980-2020 period were taken into consideration in the application. The variables are current deficit and economic growth. In the econometric application, the variables were initially subjected to the ADF and PP Unit Root tests, and variables became steady in their first differences. Then, through the application of the Co-integration Analysis to the variables, it was revealed that there was a long-term relation. Subsequently, Granger Causality Test was implemented to determine the causality and relation between the variables in the model. As a result, it was found that there was a reciprocal relation between current the deficit and economic growth.

It is not possible to fully eliminate the problem of current deficit in the developing countries such as Brazil. However, some measures can be taken. For example, it is important to encourage the inflow of portfolio and direct foreign investments, and to provide economic, political, social and administrative stability in the country. As the developing countries grow based on import, deteriorations occur in the current balance.

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