Analyzing The Relationship Among The GDP - Current Account Deficit and Short Term Capital Flows: The Case of Emerging Markets

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ABSTRACT

In this study, it was analyzed if there was causal relationship among the current deficit, short term capital flows and economic growth in emerging markets. Before causality test was done, CD_{LM} tests were done in order to the fact that to be able to determine if there was cross section dependence in countries form the panel. At the end of CD_{LM} tests cross section dependence in emerging markets form the panel was determined. Then, panel causality test developed was done. According to the result of panel causality test bidirectional causality between current account deficit and GDP, unidirectional causality from short term capital flows to current deficit and GDP were determined.

Key Words: *GDP, current account deficit, short term capital flows, panel causality, emerging markets.*

JEL Classification: *C31, C33, F32*

GDP-Cari İşlem Açığı ve Kısa Vadeli Sermaye Akımları Arasındaki İlişkinin Analizi: Yükselen Piyasalar Örneği

ÖZET

Bu çalışmada, cari işlemler açığı, kısa vadeli sermaye akımları ve GDP arasında yükselen ekonomilerde nedensellik ilişkisinin olup olmadığı analiz edilmiştir. Nedensellik testi yapılmadan önce, paneli oluşturan ülkelerde yatay kesit bağımlılığı olup olmadığını tespit edebilmek için CD_{LM} testler yapılmıştır. CD_{LM} testlerinin sonuçunda, paneli oluşturan yükselen ekonomilerde yatay kesit bağımlılığı tespit edilmiştir. CD_{LM} testlerinden sonra panel nedensellik testi yapılmıştır. Panel nedensellik testleri sonucunda, cari işlem açığı ile GDP arasında çift yönlü, kısa vadeli sermaye akımlarından cari işlem açığına ve GDP'ye doğru tek yönlü nedensellik belirlenmiştir.

Anahtar Kelimeler: *GDP, cari işlemler açığı, kısa vadeli sermaye hareketleri, panel nedensellik, yükselen piyasalar.*

JEL Sınıflaması: *C31, C33, F32*

I. Introduction

Short-term capital flows and current account deficits are extremely important issues for every economy. A current account deficit is an adverse event, because of the damage it does to a country's economic balance, but it is observed in many developing economies. In this context, the problem is not having a current account deficit; rather, it is how to finance current account deficit or whether current account deficit makes economic growth unsustainable.

Capital balance is extremely important with regard to balance of payments in the economies that primarily have a high current account deficit. A deficit that has been occurred in the balance of payments on a current account could be wiped out with an increase of capital transactions.

Exchange rates are determined according to exchange supply and demand, and intervention of the central bank in the balance of payments makes the official reserve account trivial under a flexible exchange rate regime. Therefore, capital flow is extremely important for economies that want to avoid balance of payments problems and other macro-economic variables in a current account deficit situation.

One of the tools that can be used as a solution for current account deficit is short-term capital flow. Short-term flows, also referred as "hot money", usually tend to flow into markets with high interest and profitability rates. Moreover, short-term capital in-flows, which finance the current account deficit, have a positive effect on economic growth by strengthening the financial structure of companies in the stock market. Therefore, this effect remains a subject of discussion with regard to its sustainability. In addition, short-term capital flows may mean sudden economic input or output. Short-term capital flows suddenly may lead to another country because of interest rate differentials between countries and co-integrating the countries because of globalization. This could therefore have a negative effect on economies, so some measures should be taken to prevent short-term flows from making sudden market impacts.

The purpose of our study was to determine the relationship between economic growth and short-term capital flows, and the current budget deficit in G7 countries, in recent years. The results offer an innovative contribution to the existing literature.

The present study is described in separate sections as follows: the literature is reviewed in the first section; the second section introduces the data and methods; the third section details the empirical results we obtained via the use of econometric methods; and the results are discussed and evaluated in the final section.

II. Literature Review

No previous studies have investigated economic growth, current account deficit and short-term capital movements all together; rather, attempts have been made to study only one or two of these variables. Therefore, some studies have examined current deficit and short-term capital flows, others have assessed current account deficit and economic growth, and yet others have investigated short-term capital flows and economic growth.

After conducting a panel data analysis on 23 countries, including Latin America, East Asia, Africa and the Organization for Economic Co-Operation and Development (OECD), Fisher (1993) concluded that current account deficit has a negative effect on economic growth. Hepaktan and Cinar (2012) used the panel co-integration test to analyze whether any relationship existed between economic growth and current account deficit in 27 OECD countries, between 1975 and

2008. From their results, they concluded that there is indeed a relationship, and that it is one that is long-term. In their study in over 20 developed countries, covering the period between 1971 and 1993, and applying a vertical cross-section model, Debelle and Faruqee (1996) asserted that there is a causal relationship between economic growth and current account deficit. Bagnai and Manzochi (1999) identified the transformations in the current account deficit balance of 49 developing countries using structural fraction tests, and analyzed the relationships between economic growth and other macro-economic variables using panel data. The results show some discrepancies with those obtained by Debelle and Faruqee (1996), in that they indicated that the increases in growth rate lead to current processes deficit by giving way to current account deficit results on the negative side. Milesi-Ferreti and Razin (1999) studied the triggers of continuous and high-rate decreases in terms of current account deficit in over 105 middle- or low-income countries using the OLS and Probit models. The results showed that there was no systematic relationship between decrease in the growth rate and fluctuation in the current account deficit. Calderon et al. (1999) analyzed the relationship between basic macro-economic variables and current account deficit in 44 developing countries between 1966 and 1994, using panel data and generalized moment methods (GMM), and showed that there is a co-extensive and weak relationship between growth rate and current deficit.

Chin and Prasad (2000) studied the determiners of current deficit balance in 71 developing and developed countries between 1971 and 1995, using the OLS and panel data methods. The results were contrary to those obtained by Debelle and Faruqee (1996), in that they observed a weak relationship between growth rate and current account deficit in developing and developed countries. As a result of his analysis, based on time series' and panel data obtained from 25 developed countries, Freund (2000) noticed that there was a positive causality from economic growth to current account deficit, in a similar manner to Debelle and Faruqee (1996) and Bagnai and Manzochi (1999). Bussiere et al. (2004) studied the determiners of current deficit in developing and developed countries using the panel data constant effect, OLS with panel data puppet variables, and GMM, and determined that a weak statistical and co-extensive relationship exists between economic growth and current account deficit, in accordance with the results of a study conducted by Chin and Prasad (2000).

III. Data and Methodology

We analyzed the causality relationships between gross domestic product (GDP), current account deficit and short-term capital flows of 20 emerging markets selected according to data availability, namely, Brazil, Chile, China, Colombia, the Czech Republic, Egypt, Hungary, India, Indonesia, South Korea, Malaysia, Mexico, Morocco, Peru, The Philippines, Poland, Russia, South Africa, Thailand, and Turkey, over the long-term period of 1990-2011. The datasets were obtained from the electronic database of the World Bank, and the data used are shown in Table 1.

Table 1: Data Set

Variables	Explanations	Source
$EB_{i,t}$	Gross domestic product (%)	World Bank
$CA_{i,t}$	Current account deficit (% GDP)	World Bank
$KSA_{i,t}$	Short term capital flows (only portfolio investment, % GDP)	World Bank

A. Cross-Section Dependence

Cross-section dependency can be explained as a situation which a shock happen in units forming panels in terms of economics, then the other units of the panel are also affected by this shock. In terms of econometrics, as units forming panels are related to error terms in the panel data model, which is given in equation (1).

$$y_{it} = \alpha_i + \beta_i x_{it} + \varepsilon_{it} \qquad \textbf{(1)}$$
$$Cov(\varepsilon_{it}, \varepsilon_{ij}) \neq 0$$

A variety of tests may be used to analyze cross-section dependency in panel data. In this study, we used tests that were developed by Breusch-Pagan (1980) CD_{LM1}, Pesaran (2004) CD_{LM2}, Pesaran (2004) $CD_{LM,}$ and Pesaran-Yamagata (2008), CD_{LM1} adj.

The CD_{LM1} test is calculated as shown below:

$$CD_{LM1} = T\sum_{i=1}^{N-1}\sum_{j=i-1}^{N}\hat{\rho}_{ij}^2 \qquad \textbf{(2)}$$

This test is based on the sum of correlation coefficient squares among cross-section residuals, which are obtained from OLS. The test, which has N (N-1)/2 degrees of freedom, is used when N is constant and T→∞. The null hypothesis and alternate hypothesis are given below:

H_0: No relationships between cross-sections.

H_1: Relationships exist between cross-sections.

The CD_{LM2} test is calculated as shown below:

$$CD_{LM2} = \sqrt{\frac{1}{N(N-1)}}\left[\sum_{i=1}^{N-1}\sum_{j=i+1}^{N} T\hat{\rho}_{ij}\right] \sim N(0,1) \qquad \textbf{(3)}$$

In this equation, $\hat{p}_{ij}^2$ shows the estimation of the sum of cross-section residuals. The test that is used when N and T are great (T→∞ and N→∞) is asymptotically normal distribution.

The CD_{LM} test is calculated using the formula below:

$$CD_{LM} = \sqrt{\frac{2T}{N(N-1)}}\left[\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right] \sim N(0,1) \qquad \textbf{(4)}$$

This test, which is asymptotically standard normal distribution, is based on the sum of correlation coefficient squares among cross-section residuals, and is used when T>N and N>T. The null and alternative hypothesis of this test is similar to the CD_{LM1} and CD_{LM2} tests.

Finally, the CD_{LM1} adj test is a modified version of the CD_{LM1} test, and is formulated as shown below.

$$CD_{LM1adj} = \frac{1}{CD_{LM1}}\left[\frac{(T-k)\rho_{ij}^2 \mu T_{ij}}{\sqrt{v_{ij}^2}}\right] \sim N(0,1) \qquad \textbf{(5)}$$

B. Panel Causality Test

We used the panel causality test, developed by Emirtmahmutolgu and Kose (2011), which can be employed in both cross-section dependence and cross-section independence.

In order to perform the causality test, the heterogeneous panel VAR(ki) model is considered:

$$\begin{aligned} &Z_{it} = \mu_i + A_{i1}Z_{i,t-1} + ... + A_{ik_i}Z_{i,t-k_i} + u_{i,t} \\ &i = 1,2,.....N \qquad\qquad t = 1,2,...T \end{aligned} \qquad \textbf{(6)}$$

where μ_i stands for *p* dimensional vector of fixed effect; $A_{i1} \ldots A_{ik_i}$ stands for fixed (p*p) matrices of parameters. $u_{i,t}$ shows the column vector of error terms, $E(u_{it}) = 0$ and $V(u_{i,t}) = \sum_{u_i}$ are positive definite covariance matrices, and k_i is lag structure, which may differ across cross section units.

This test is based on the Toda-Yamamoto-Granger causality test. If variables in the VAR process are stationary, Wald statistics are valid. However, if variables contain unit roots, then Wald statistics have non-standard asymptotic distributions that may involve nuisance parameters (Sims et al., 1990: 113-115). Nonetheless, the Granger causality test is not valid for non-stationary variables. To avoid this problem, Toda and Yamamoto (1995) proposed a simple alternative approach for testing coefficient restrictions of a level VAR model.

The stability degrees of series, as described by Toda and Yamamoto (1995), are not important. Moreover, it is not necessary to ascertain whether or not the series' are co-integrated in order to perform this test. By adding lag length to maximum lag length, the VAR process is practiced.

We estimated the VAR $(k_i + d\max_i)$ model for testing the null hypothesis as follows:

$$\begin{aligned} Z_{i,t} &= \mu_i + A_{i1}Z_{i,t-1} + ... + A_{ik}Z_{i,t-ki} \\ &+ \sum_{l=ki+1}^{ki+d\max_i} A_{i1}Z_{i,t-1} + u_{i,t} \qquad i = 1,2...,N \qquad t = 1,2...T \end{aligned} \qquad \textbf{(7)}$$

If the lag length in equation (7) is $d\max_i$, it expresses the maximum stability ranks in the cross-section units.

In this test, Fisher test statistics (λ) were used in order to test Granger non-causality. λ is written as follows:

$$\lambda = -2\sum_{i=1}^{N} \ln(pi) \qquad i = 1, 2....N$$

pi is the p-value for Wald statistic of the i^{th} individual cross-section.

However, the Fisher test statistical limit distribution is not applied when there is cross-section dependency in the cross-sectional units. Therefore, bootstrap methodology is applied to the Granger causality test of cross-section dependency in this test.

We considered the VAR ($k_i + d\max_i$) model in the heterogeneous panel as follows:

$$x_{it} = \mu_i^* + \sum_{j=1}^{k_i + d\max_i} A_{11,ij} x_{i,t-j} + \sum_{j=1}^{k_i + d\max_i} A_{12,ij} x_{i,t-j} + u_{i,t}^* \qquad \textbf{(8)}$$

$$y_{it} = \mu_i^y + \sum_{j=1}^{k_i + d\max_i} A_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i + d\max_i} A_{22,ij} x_{i,t-j} + u_{i,t}^y \qquad \textbf{(9)}$$

So that d_{max} can be found and placed in equations (8) and (9), and estimates can be made again for each unit after the remainders are calculated.

IV. Empirical Findings

The results of the cross-section dependence tests are shown below.

Table 2: Test Results of Cross Section Dependence

Variables	CD_{LM1}		CD_{LM2}		CD_{LM}		Bias-adjusted CD Test	
	***t*-stat**	***p*-value**	***t*-stat**	***p*-value**	***t*-stat**	***p*-value**	***t*-stat**	***p*-value**
CA	260.506	0.001	3.617	0.000	2.512	0.006	44.298	0.000
EB	275.435	0.000	4.383	0.000	1.803	0.036	26.395	0.000
KSA	236.611	0.012	2.391	0.008	2.405	0.008	10.105	0.000
Model	291.893	0.000	5.227	0.000	1.361	0.087	20.790	0.000

The cross-section dependence tests showed that there were a cross-sectional dependence on both variables and model in emerging markets form the panel. So, Granger causality test cannot be used for it does not take into account cross section dependence in order to determine whether there is a causality relationship among the variables. Therefore, we used the panel causality test, developed by Emirmahmutoglu and Kose (2011). This test is based on the Toda-Yamamoto (1995) causality test, and order of stationary series, as well as adjustments of lag lengths of VAR which are necessary to estimate the VAR ($k_i + d\max_i$).

Table 3: The Results of ADF Test

Country	*KSA*		*EB*		*CA*		d_{max}
	Level	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**	
Brazil	0.001		0.000		0.014		1
Chile	0.012		0.050		0.248	0.000	1
China	0.383	0.021**	0.022		0.471	0.070	1
Colombia	0.469	0.000***	0.016		0.210	0.003	1
Czech Rep.	0.007		0.000		0.002		1
Egypt	0.001		0.335	0.000***	0.550	0.009	1
Hungary	0.003		0.029		0.204	0.004	1
India	0.092	0.000***	0.005		0.455	0.002	1
Indonesia	0.146	0.003***	0.038		0.349	0.004	1
Korea	0.001		0.003		0.004		1
Malaysia	0.180	0.006***	0.003		0.573	0.001	1
Mexico	0.002		0.001		0.310	0.000	1
Morocco	0.019		0.236	0.000***	0.809	0.003	1
Peru	0.006		0.017		0.454	0.000	1
Philippine	0.023		0.025		0.949	0.000	1
Poland	0.001		0.000		0.001		1
Russia	0.032		0.206	0.000***	0.080		1
South Africa	0.000		0.000		0.373	0.045	1
Thailand	0.032		0.009		0.274	0.003	1
Turkey	0.005		0.002		0.444	0.000	1

*Note: The values presented in table are MacKinnon (1996) one-sided p-values. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively*

Table 3 shows that the series' of current account deficit is stationary at level in whole emerging markets countries. Colombia, India, Indonesia, Malaysia and China are stationary at first difference in short-term capital flows series, while Egypt, Morocco and Russia are also stationary at first difference in GDP series. After the order of stationary and lag length of VAR were specified, a causality relationship among the variables was observed, as shown in Tables 4, 5 and 6.

We determined bidirectional causality between current account deficit and GDP, as shown in Table 4. Causality between current account deficit and GDP is statistically significant at a 1% confidence level. In the Czech Republic and India, causal relationship from current account deficit to GDP is significant at the 1%, in Colombia and Brazil at the 5%, and in Chile, Hungary and Korea at the 10% confidence level. Causality from GDP to current account deficit is significant at the 5% confidence level. Causality from GDP to current account deficit is significant at 1% in Hungary and China, at 5% in Brazil and Thailand and at 10% level in Egypt.

Table 4: The Result of Panel Causality Test

Country	k_i	CA→GDP		GDP→CA	
		W_i	P_i	W_i	P_i
Brazil	1	13.403	0.004**	8.570	0.036**
Chile	2	7.525	0.057*	0.949	0.814
China	2	0.296	0.961	11.815	0.008***
Colombia	1	7.905	0.048**	1.437	0.697
Czech Republic	1	11.431	0.009***	0.608	0.895
Egypt	3	1.522	0.677	7.418	0.060*
Hungary	2	7.595	0.055*	35.244	0.000***
India	1	11.625	0.009***	4.299	0.231
Indonesia	1	1.636	0.651	4.150	0.246
Korea	1	6.453	0.094*	3.177	0.365
Malaysia	1	1.468	0.690	1.620	0.655
Mexico	1	2.397	0.494	2.698	0.441
Morocco	1	2.590	0.459	3.742	0.291
Peru	1	2.003	0.572	1.989	0.575
Philippine	1	5.325	0.149	4.385	0.223
Poland	1	5.923	0.115	0.138	0.987
Russia	1	2.548	0.467	2.840	0.417
South Africa	2	0.540	0.910	3.525	0.318
Thailand	1	2.462	0.482	9.085	0.028**
Turkey	1	1.744	0.627	3.110	0.375
Fisher Test statistic (λ)		70.165		62.382	
p-value		0.002***		0.015**	

Note: Lag orders k_i are selected by minimizing the Schwarz Bayesian criteria.
*** *Indicate significance at the 1% level.*
** *Indicate significance at the 5% level.*
* *Indicate significance at the 10% level*

Unidirectional causality from short-term capital flows to current account deficit was also determined, as shown in Table 5. In China and Malaysia, significance was at 10% and 1% confidence levels, respectively, for a causality relationship between short-term capital flows and current account deficit.

Table 5: The Result of Panel Causality Test

Country	k_i	CA→KSA		KSA→CA	
		W_i	P_i	W_i	P_i
Brazil	1	1.067	0.785	1.607	0.658
Chile	1	1.149	0.765	4.386	0.222
China	2	6.544	0.087*	7.725	0.052*
Colombia	3	0.670	0.880	2.988	0.393
Czech Republic	1	1.390	0.707	0.252	0.968
Egypt	1	0.327	0.954	0.549	0.907
Hungary	1	0.710	0.870	3.310	0.346
India	1	0.529	0.912	2.141	0.543
Indonesia	1	2.539	0.468	0.609	0.894
Korea	1	0.037	0.998	0.161	0.983
Malaysia	1	4.583	0.204	21.922	0.002***
Mexico	2	2.832	0.418	0.970	0.808
Morocco	1	0.939	0.815	2.578	0.461
Peru	1	1.880	0.597	1.664	0.644
Philippine	1	0.759	0.859	5.008	0.171
Poland	1	0.507	0.917	6.731	0.080*
Russia	1	1.207	0.751	4.034	0.257
South Africa	1	5.369	0.146	5.549	0.135
Thailand	3	0.388	0.942	2.890	0.408
Turkey	1	0.537	0.910	1.099	0.777
Fisher Test statistic (λ)		20.447		55.077	
p-value		0.999		0.057*	

Note:Lag orders k_i are selected by minimizing the Schwarz Bayesian criteria
*** *Indicate significance at the 1% level.*
** *Indicate significance at the 5% level.*
* *Indicate significance at the 10% level.*

Table 6 shows unidirectional causality from short-term capital flows to GDP. In Brazil and Hungary, significance was 1%, in Russia and Peru significance was at 5% and 10% confidence level, respectively, for a causality relationship from short-term capital flows to GDP

Table 6: The Result of Panel Causality Test

Country	k_i	KSA→GDP		GDP→KSA	
		W_i	P_i	W_i	P_i
Brazil	1	15.433	0.001***	3.004	0.391
Chile	1	2.886	0.409	3.679	0.298
China	2	1.053	0.788	1.759	0.624
Colombia	1	0.930	0.818	5.009	0.171
Czech Republic	1	2.468	0.481	2.009	0.570
Egypt	2	1.629	0.652	2.542	0.468
Hungary	2	32.370	0.002***	0.909	0.823
India	1	2.950	0.399	0.746	0.862
Indonesia	1	0.136	0.987	2.032	0.566
Korea	1	0.776	0.855	0.657	0.883
Malaysia	1	4.902	0.179	3.517	0.318
Mexico	1	4.191	0.241	2.480	0.479

Morocco	1	3.498	0.320	3.887	0.274
Peru	2	7.040	0.070*	3.236	0.357
Philippine	1	3.395	0.334	1.466	0.690
Poland	1	4.695	0.195	1.152	0.765
Russia	2	9.427	0.024**	6.370	0.095*
South Africa	1	1.817	0.611	1.910	0.591
Thailand	1	0.950	0.813	0.046	0.997
Turkey	1	1.722	0.631	3.529	0.317
Fisher Test statistic (λ)		78.556		31.247	
p-value		0.000***		0.838	

Note: Lag orders k_i are selected by minimizing the Schwarz Bayesian criteria.
*** *Indicate significance at the 1% level.*
** *Indicate significance at the 5% level.*
* *Indicate significance at the 10% level*

V. Conclusion

In this study, we analyzed whether there was a causality relationship between current account deficit, short-term capital flows, and economic growth in emerging markets. Before performing the causality tests, we conducted CD_{LM} tests in order to determine if there was cross section dependence in countries from the panel. In this context, it has been understood that if a shock occurs to affect any of the current account deficit, short-term capital flows, and economic growth variables in a country with an emerging market, then other emerging markets will also be affected. We then performed the panel causality test, developed by Emirmahmutoglu and Kose (2011), to determine bidirectional causality between current account deficit and GDP, and unidirectional causality from short-term capital flows to current account deficit and GDP. We obtained the same result with Bagnai and Manzochi (1999) that a relationship exists between current deficit and GDP in emerging markets. However, there is no relationship between GDP and current deficit and short-term capital flows such as the studies of Chin and Prasad (2000) and Bussiere et al. (2004). In this context, current account deficit comes to the fore. Therefore, emerging markets should pay attention to the sustainability of their current account deficit.

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