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ON THE CAUSALITY BETWEEN IMF CREDITS AND MACROECONOMIC INDICATORS: EVIDENCE FROM DEVELOPING COUNTRIES, 1975-2004

Abstract

Using panel data for 88 developing countries over the period 1975-2004, this paper analyzes the way of causality between selected ten macroeconomic variables and IMF credits. The causality has been found between IMF credits and macroeconomic indicators in eight out of ten cases in the study. Consequently, overall, it can be said that IMF credits (or IMF stabilization programs) are worsening the macroeconomic performance of developing countries rather than improving their economic problems.

JEL Classification: *E63, F33, F34, N1, O19, C33*

Keywords: *IMF, Developing countries, Panel Unit Roots, Granger Causality*

1. INTRODUCTION

The primary role of the International Monetary Fund (IMF) is to provide credits to member countries in balance-of-payments difficulties. The basic conception of the IMF's role, as envisioned at Bretton Woods in 1944, was to promote exchange rate stability and provide short-term finance to deal with temporary current account deficits in advanced countries. Thus, with the breakdown of the "par adjustable peg system" in 1973, the IMF lost its major role as the "guarantor of fixed exchange rates" among advanced countries. Nevertheless, the IMF did not disappear, and its role expanded instead into many new areas. The IMF has now evolved into the "crisis manager" and "development financier" for developing countries (See Krueger 1998; Bordo and James, 2000; for discussions of the changing role of the IMF). In its 64 years of existence, the IMF has been criticized because of its institutional structure and lending practices. Some argue that the IMF is a bureaucratic and nontransparent institution with no accountability for its actions. It has also been suggested that Fund-supported stabilization programs are ineffective and may create moral hazard (Dreher and Vaubel, 2001).

As a result of the IMF supported economic reform programs, many crisis-hit countries in the 1990s have temporarily succeeded in achieving macroeconomic stabilization and

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the existing studies suggest that IMF programs provide a short-run balance of payments relief to crisis-hit countries (See Donovan 1982; Doroodian 1993; Conway 1994; Przeworski and Vreeland 2000; and Evrensel 2002). This effort however has been accompanied by temporary deceleration of real growth and prolonged recession in some countries.

Therefore, the IMF-supported macroeconomic stabilization programs have been criticized substantially in terms of their philosophy, approach, analytical framework, program, conditionality and especially, in terms of their impact on the main macroeconomic indicators; such as, inflation, balance of payments, current account and growth.

There is a huge literature about the macroeconomic effects of IMF programs on the macroeconomic performance of developing countries (See Ozturk 2008; Bird 2007; Steinwand and Stone 2007; Atoyan and Conway 2006; Barro and Lee 2005; Easterly 2005; and Przeworski and Vreeland 2000 for the effects of IMF programs on macroeconomic variables). Therefore, we will not give any information about the effects of IMF programs on macroeconomic variables in this study. Moreover, we will study the way of causality between the credits given by IMF and the macroeconomic indicators. In other words, we will investigate about whether the macroeconomic problems in developing countries are calling for the assistance of IMF or the IMF credits create the macroeconomic problems and then call for the assistance of IMF, or there is no any relationship between these variables. To our knowledge, no study has focused on the causality between IMF credits and macroeconomic indicators in the literature.

This paper focuses on the way of causality between IMF credits and selected ten macroeconomic aggregates of 88 developing countries by using panel data for the period of 1975-2004. The organization of the paper is as follows. Section 2 describes methodology and data. Section 3 briefs the empirical results and the last section concludes the paper.

2. METHODOLOGY AND DATA

The choice of the period rests on the availability of data. Data on macroeconomic variables are annually obtained from the World Development Indicators (WDI Online, World Bank), IMF's International Financial Statistics (IFS) and Penn World Data. The analysis covers the time period 1975-2004 for 88 developing countries. Countries studied in this paper are listed in Table 1. Since some of the data are not available for all countries or periods, the panel data are unbalanced and the number of observations depends on the choice of explanatory variables. The macroeconomic variables used in the study are: balance of payments (BOP), IMF credits, budget deficit (BD), current account balance (CA), per capita GDP (growth), consumption (C), domestic credits (DC), foreign direct investment (FDI), inflation (INF), investment (I) and real exchange rate (RER).

Table 1

Countries included in the analysis

Algeria	Egypt	Lao	Rwanda
Argentina	El Salvador	Lesotho	Samoa
Azerbaijan	Ethiopia	Liberia	Senegal
Bangladesh	Fiji	Madagascar	Sierra Leone
Belize	Gabon	Malawi	Slovakya
Benin	Gambia	Malaysia	South Africa
Bolivia	Georgia	Mali	Sri Lanka
Brazil	Ghana	Mauritania	Sudan
Bulgaria	Guatemala	Mauritius	Swaziland
Burkina Faso	Guinea	Mexico	Tanzania
Burundi	Guinea Bissau	Moldova	Thailand
Cameroon	Guyana	Morocco	Togo
Chad	Haiti	Mozambique	Trinidad and Tobago
Chile	Honduras	Nepal	Tunisia
China	Hungary	Nicaragua	Turkey
Comoros	India	Niger	Uganda
Costa Rica	Indonesia	Pakistan	Ukraine
Cote d'lvoire	Jamaica	Papua New Guinea	Uruguay
Croatia	Jordan	Peru	Venezuela
Dominic	Kenya	Poland	Yemen
Dominic Rep.	Kongo Dem. Rep.	Romania	Zambia
Ecuador	Kongo Rep.	Russian Federation	Zimbabwe

The relationship between IMF credits and selected economic aggregates will be performed in two steps. First, we define the order of integration in series by using panel unit root tests. Second, we test causality using the Granger causality test.

2.1. PANEL UNIT ROOT TESTS

For the developing countries, heterogeneity arises because of differences in economic conditions in each country. Therefore, we employed a homogeneous panel unit root test and two heterogeneous panel unit root tests to check whether the variables in our model are stationary or non-stationary. These tests are the LLC (Levin *et al.*, 2002), Fisher ADF (Choi, 2001) and IPS (Im *et al.*, 2003). While the first one assumes that all countries have a common unit root process, the last two tests take heterogeneity into account using individual effects and individual linear trends.

Levin *et al.* (2002) propose a more powerful panel root test than a separate unit root tests for each individual time series. The null hypothesis is that all individuals have unit root ($H_0 : \alpha = 0$) against the alternative that all individuals have stationary process ($H_0 : \alpha < 0$). For this hypothesis, we can consider the following form of the ADF regression:

$$\Delta y_{it} = \mu_i + \alpha y_{i,t-1} + \sum_{j=1}^{k_i} c_{ij} \Delta y_{i,t-j} + \varepsilon_{it}, \quad i=1,...N;\ t=1,...T \qquad (1)$$

However since k_i is unknown Levin *et al.* therefore suggest a three-step procedure to implement LLC test. In step 1, Levin *et al.* carry out separate ADF regressions for each individual in the panel, and generate two orthogalized residuals. Step 2 requires estimating the ratio of long–run to short-run innovation standard deviation for each individual. In the final step, Levin *et al.* compute the pooled t-statistics.

Choi (2001) considers the following model:

$$y_{it} = d_{it} + x_{it} \qquad (2)$$

Where $d_{it} = \beta_{i0} + \beta_{i1} + ... + \beta_{im_i} t^{m_i}$, $x_{it} = \alpha_i x_{i(t-1)} + u_{it}$ and u_{it} is integrated of order zero. Choi allows each time series y_{it} to have a different sample size and a different specification of nonstochastic and stochastic compenents depending on *i*. The null hypothesis is that all the individual series in the panel are nonstationary ($H_0 : \alpha_i = 0$ for all *i*) and against the alternative of some time series stationary ($H_0 : \alpha_i = 0$ for some *i*'s). Choi proposed a Fisher-type test:

$$Z = \frac{1}{\sqrt{N}} \sum_1^N \Phi^{-1}(p_i) \qquad (3)$$

Where Φ is the standard normal cumulative distribution function. Im *et al.* (2003) (IPS) also developed a unit root test for dynamic heterogeneous panels based on the mean of individual unit root statistics. Im *et al.* propose a standardized t-bar test based on the ADF statistics averaged across the groups. The stochastic process, y_{it}, is generated by the first-order autoregressive process:

$$y_{it} = (1-\phi_i)\mu_i + \phi_i y_{i,t-1} + \varepsilon_{it} \quad i=1,...N;\ \ t=1,...T \qquad (4)$$

Where initial values, y_{i0}, are given. In the testing the null hypothesis of unit roots, $\phi_i = 1$ for all *i*. Equation (4) can be expressed:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \varepsilon_{it}, \qquad (5)$$

The null hypothesis is that each individual series in the panel has a unit root and alternative hypothesis allows for α_i to differ across groups:

$$H_0 : \beta_i = 0 \text{ for all i} \qquad (6)$$
$$H_1 : \beta_i < 0, \quad i = 1,2,..., N_1, \quad \beta_i = 0, \quad i = N_1 + 1, N_1 + 2,...., N \qquad (7)$$

The modified standardized t_{IPS} statistic below is distributed as N(0,1) when $T \to \infty$ followed $N \to \infty$ sequentially:

$$t_{IPS} = \frac{\sqrt{N}\left(\bar{t} - \frac{1}{N}\sum_{i=1}^{N} E[t_{iT} \mid \beta_i = 0])\right)}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} \mathrm{var}[t_{iT} \mid \beta_i = 0])}} \tag{8}$$

2.2. PANEL GRANGER CAUSALITY TEST

To test for panel causality, a time-stationary VAR model may be employed in the following form:

$$Y_{it} = \alpha_0 + \sum_{j=1}^{m} \alpha_j \, Y_{it-j} + \sum_{j=1}^{m} \beta_j \, X_{it-j} + \varepsilon_{it} \tag{9}$$

$$X_{it} = \delta_0 + \sum_{j=1}^{m} \delta_j \, Y_{it-j} + \sum_{j=1}^{m} \gamma_j \, X_{it-j} + v_{it} \tag{10}$$

where ε_{it} and v_{it} are error terms. There are three possible cases of causality testing: If the $\beta_j = 0$ is not rejected then X does not cause Y in the long run; similarly if the null $\delta_j = 0$ is not rejected Y does not cause X in the long run. Likewise rejection of the null $\beta_j = 0$ and $\delta_j = 0$ means there is a bidirectional causal relationship between the two variables.

3. EMPIRICAL RESULTS

Table 2 presents the results derived from one homogeneous and two heterogeneous panel unit root tests for the order of panel integration. Maximum lags based on Akaike information criterion (AIC) for these tests and both panel unit root tests have the same results: The null hypothesis of unit roots can be rejected for all series at levels.

Table 2

Panel Unit Root Test Results

Variables	LLC	Fisher ADF	IPS
	Levels	**Levels**	**Levels**
IMF	-53.358 (6)***	290.203 (6)***	-6.157 (6)***
Budget deficit	-26.692 (5)***	328.951 (5)***	-8.232 (5)***
Per capita GDP	-12.296 (6) ***	219.557 (6)**	-1.508 (6) *
Current Account	-9.514 (6)***	458.076 (6)***	-9.794 (6)***
Balance of Payments	-11.480 (6)***	491.948 (6)***	-10.880 (6)***
Foreign Direct Investment	-7.652 (6)***	447..913 (6)***	-7.236 (6)***
Consumption	-5.967 (6)***	473.980 (6)***	-6.048 (6)***
Inflation	-601.432 (6)***	583.285 (6)***	-77.152 (6)***
Investment	-7.835 (6)***	358.081 (6)***	-7.626 (6)***
Real Exchange Rate	-14.734 (6)***	450.231 (6)***	-9.103 (6)***
Domestic Credits	-8.868 (6)***	306.640 (6)***	-6.880 (6)***

Note: Maximum lags in ( ).
***, **, and * denote the rejection of the null hypothesis at 1%, 5% and 10% levels, respectively.

Table 3 shows the Granger causality (1969) test results that analyze the relationship between IMF credits and selected macroeconomic indicators of developing countries. To determine the optimal interval lag, there are some methods like Akaike's and Schwartz's in the econometric literature. However, in the study of Pindyck and Rubinfeld (1991), instead of selecting the optimal lag, they found that the results will be better and more accurate if you try for few optimal lags to see whether they are sensitive to lag length or not. Thus, the Granger F-values are calculated with three different lag length in this study.

Table 3

Granger Causality Test Results

	Obs.	F–Statistic	F–Statistic	F-Statistic	
Null Hypothesis		Lag 1	Lag 2	Lag 3	**Conclusion**
1- IMF and Balance of Payments (BOP)	2054				
IMF does not Granger cause BOP		0.36	0.48	0.59	**BOP ⇒ IMF**
BOP does not Granger cause IMF		3.40*	0.17	0.39	
2- IMF and Budget Deficit (BD)	1498				
IMF does not Granger cause BD		3.0*	1.47	1.86	**IMF ⇒ BD**
BD does not Granger cause IMF		30.92	10.46	7.97	
3- IMF and Current Account Balance (CA)	2017				
IMF does not Granger cause CA		5.11**	3.43**	2.24*	**IMF ⇔ CA**
CA does not Granger cause IMF		9.13***	4.6***	2.83**	
4- IMF and Per Capita GDP (Capita)	2291				
IMF does not Granger cause CAPITA		0.04	0.008	0.11	
CAPITA does not Granger cause IMF		1.33	2.35*	1.60	**CAPITA ⇒ IMF**
5- IMF and Consumption (C)	2150				
IMF does not Granger cause C		6.01**	1.64	0.74	**IMF ⇒ C**
C does not Granger cause IMF		0.46	0.18	0.28	
6- IMF and Domestic Credits (DC)	2207				
IMF does not Granger cause DC		35.81	419.00	239.7	**DC ⇒ IMF**
DC does not Granger cause IMF		22.72	5.27***	3.27**	
7- IMF and Foreign Direct Investment (FDI)	1904				
IMF does not Granger cause FDI		0.95	0.83	2.12*	**IMF ⇔ FDI**
FDI does not Granger cause IMF		8.88***	1.94	3.05**	
8- IMF and Inflation (INF)	2034				
IMF does not Granger cause INF		0.08	1.57	1.13	**IMF ….. INF**
INF does not Granger cause IMF		0.64	0.10	0.33	
9- IMF and Investment (I)	2174				
IMF does not Granger cause I		3.06*	0.70	0.60	**IMF ⇔ I**
I does not Granger cause IMF		3.45*	2.14	3.46**	
10- IMF and Real Exchange Rate (RER)	987				
IMF does not Granger cause RER		0.49	0.23	0.14	**IMF ….. RER**
RER does not Granger cause IMF		0.02	0.02	0.01	
Note: ***, **, and * denote the rejection of the null hypothesis at 1%, 5% and 10% levels, respectively.					

As it can be seen in Table 3, the test results are concluded with arrow signs. One-way arrows show one-way causality, two-ways arrows show two-way causality and dots show no causality between the variables. In case of balance of payments (BOP) and IMF, there is a causality running from BOP to IMF. In other words, the developments or changes in BOP of developing countries will call for IMF assistance. Therefore, when there is a BOP deficit, the IMF credits will be used by these countries. On the other hand, in case of IMF and budget deficits (BD), the causality runs from IMF to BD. This shows that IMF credits create some changes (or problems) in the budget balance of related countries. However, there is bidirectional (two-way) causality between IMF credits and current account balance (CA). In case of IMF and inflation (INF), and IMF and real exchange rate (RER), no causality is found. It means there is no relationship between these variables. The causality between IMF and selected ten variables are concluded in Table 3.

4. CONCLUSION

This paper analyzes the causality between selected macroeconomic variables and IMF credits using panel data for 88 developing countries over the period of 1975-2004. We investigated about whether the macroeconomic problems in developing countries are calling for the assistance of IMF or it is the IMF credits that create the macroeconomic problems which then call for the assistance of IMF, or there is no relationship between these variables.

The findings of this paper can be summarized as follows: i) the causality runs from IMF to budget deficit and consumption, ii) the causality runs from per capita income, domestic credits and balance of payments to IMF, iii) there is two-way (bidirectional) causality between IMF and foreign direct investment, IMF and investment, and IMF and current account balance, and iv) no causality is found between IMF and inflation, and IMF and real exchange rate. Consequently, overall, it can be said that IMF credits (or IMF stabilization programs) are worsening the macroeconomic performance of developing countries rather than improving their economic problems. In other words, macroeconomic indicators of countries are deteriorating after the use of IMF credits.

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KAUZALNOST IZMEĐU MMF-ovih KREDITA I MAKROEKONOMSKIH INDIKATORA: PRIMJERI ZEMALJA U RAZVOJU, 1975-2004

SAŽETAK

Koristeći panel podatke 88 zemalja u razvoju u periodu od 1975. do 2004., rad analizira kauzalnost između deset odabranih makroekonomskih varijabli i kredita MMF-a. Kauzalnost MMF-ovih kredita i makroekonomskih indikatora je pronađena u osam od deset slučajeva obuhvaćenih istraživanjem. Stoga se može zaključiti da krediti MMF-a (ili MMF-ovi stabilizacijski programi) više pogoršavaju makroekonomske performanse zemalja u razvoju nego što umanjuju njihove ekonomske probleme.

JEL: *E63, F33, F34, N1, O19, C33*

Ključne riječi*: MMF, zemlje u razvoju, jedinični korijeni vremenskih presjeka, Grangerov test kauzalnosti*