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Article

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Causality between external balance and (some) fiscal variables: Preliminary results for the Eurozone

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Abstract

In this article, we present preliminary results, analyzing the causality between external balance and fiscal variables (primary public balance, interest paid on debt and overall public balance) within the so-called twin deficits hypothesis for a set of six Eurozone countries – three core countries (Austria, Finland and Germany) and three peripheral countries (Greece, Portugal and Spain) – in the period 1972–2011. We implement the Toda and Yamamoto (1995) approach to Granger non-causality testing (Granger, 1969). Results are not homogeneous for all the Eurozone countries included in the sample. Evidence of causality according to the twin deficits hypothesis is provided only for the case of Austria. In addition, evidence of a causal relationship from interest paid on debt to external balance is provided in the case of Portugal and from external balance to interest paid on debt for Austria and Germany.

Keywords: Eurozone external imbalances; twin deficits hypothesis; causality testing.
JEL Classification Codes: H62, F32, F41

1. Introduction

After the beginning of the global financial crisis, an increased attention has been paid to the external imbalances among Eurozone countries, due to its possible link with the outbreak of the crisis and their potential effects on the (in)stability of the Eurozone (Brissimis, et al., 2012; Campa and Gavilán, 2011; Chen et al., 2013; Gehringer, 2015). However, it was up to the burst of the European sovereign debt crisis, when research and policy articles have increased their focus on the relationship between the external imbalances and the fiscal position of government budgets (Brissimis et al., 2012; Hein et al., 2012) and the causality between them within the so-called twin deficits hypothesis (Algieri, 2013; Bluedorn and Leigh, 2011).

Twin deficits hypothesis refers to the positive macroeconomic relationship between current account balance and government budget balance, which was originally used to analyze the

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United States (U.S.) trade deficit during the 1980s and 1990s (Gordon, 1986). In twin deficits hypothesis, causality goes from government budget balance to external balance. In this regard, Salvatore (2006:701-702) clearly summarizes the transmission channel of the twin deficits hypothesis:

> *"[T]he theoretical [twin deficits hypothesis] relationship links casually an increase in the budget deficit to an increase in domestic interest rates, to an inflow of foreign capital, to the appreciation of the domestic currency, which then results in a current account deficit."*

Research on the relationship between external balance and fiscal balance for Eurozone member states has shown some interesting results. For instance, that the relationship between both balances is not homogeneous for all Eurozone countries, that is, for some countries, this relationship exists, while in the case of other countries, there is not supporting evidence of this relationship (Algieri, 2013; Brissimis et al., 2012; Hein et al., 2012). In addition, when this relationship exists, it is not one-to-one (Barnes et al., 2010; Bluedorn and Leigh, 2011). Moreover, in a context of interdependence, there is a need for fiscal coordination among Eurozone member states but not for a uniform fiscal policy (Kosteletou, 2013). Finally, external imbalances have been originated – at least in some countries, e.g., Spain – in private savings-investment decisions, where fiscal deficits were observed after the outbreak of the financial crisis in order to smooth the effects of private deleverage process (Hein et al., 2012).

In regard of the twin deficits hypothesis for Eurozone countries, results are not conclusive but contradictory. Two articles can exemplify this. On the one hand, Kosteletou (2013) shows evidence supporting twin deficits hypothesis in deficit and surplus countries within a panel data framework. On the other hand, Algieri (2013) points out that, at least for Southern Eurozone countries, there is not a clear nexus between fiscal balance and external balance. In this regard – and before going to the econometric analysis – we would like to highlight some points. First, in both cases, the focus of analysis is in Southern Eurozone countries. Second, both articles employ different techniques that would be a signal of the sensibility of results to the methodological strategy. Finally, it is necessary to know the role of public finance in the existence of external imbalance in order to implement policy actions to correct those imbalances in the medium and long term.

In what follows, we present preliminary results of the empirical analysis of the causal relationship between external imbalances and some fiscal variables for six Eurozone countries in the period 1972–2011. To this aim, we implement the Toda and Yamamoto (1995) approach to Granger causality testing (Granger, 1969), which allows including variables with different order of integration without the need to differentiate the series to reach stationarity. Some novelties of this article are the use of the Mauro et al. (2013) database – which decomposes the overall fiscal balance in primary balance and interest paid on public debt – in a longer span of time than the above-mentioned studies for a set of countries, including core and peripheral countries. We would like to reiterate that what we present here are preliminary results within a wider research project on the determinants of Eurozone external imbalances, in general, and the role of public finance, in particular.

2. Data and methodology

We focus on the analysis of twin deficits hypothesis in six Eurozone countries – three core countries (Austria, Finland and Germany) and three peripheral countries (Greece, Portugal and Spain) – for the period 1972–2011. As stated above, in twin deficits hypothesis, causality goes from fiscal variables to external balance. Thus, we aim to test this hypothesis of causality in the euro area.

We use data from the macro-economic database (AMECO) for the external balance (hereinafter EB) proxied by the balance on current transactions with the rest of the world, which

is the sum of net exports of goods and services, net primary income and net current transfers, the latter two from the rest of the world. In the case of fiscal variables, we use the series of the database from Mauro et al. (2013). Mauro et al. (2013) database contains historical data for government primary balance (hereinafter PB), interest paid on public debt (hereinafter IE) and overall government balance (hereinafter CB, difference between PB and IE).

Data is available for all the series with an annual frequency for the period 1960–2011. However, we shorten the sample in order to avoid biased results due to the shock of the end of Bretton Woods. Therefore, our analysis focuses on the period 1972-2011. In addition, we implement Bai-Perron breakpoint tests (Bai 1997; Bai and Perron 1998, and critical values from Bai and Perron 2003) to identify structural changes in the EB series (see Table 1). Those breakpoints for each country were introduced in the VAR estimations as exogenous dummy variables.

Table 1. Breakpoint tests for EB series.

Austria	1982, 1994, 2002
Finland	1989, 1995, 2003
Germany	1979, 1991, 2004
Greece	1982, 1998
Portugal	1978, 1984
Spain	2005

Note: *L+1 vs L sequentially determined breaks; auxiliary regression including a constant and a trend as regressors.

In our empirical analysis, we study causality[1] between fiscal variables (primary budget balance, interests paid on debt and overall budget balance) and external balances using the Toda and Yamamoto (1995) approach to Granger causality testing (Granger, 1969). In Toda-Yamamoto approach, VAR estimations are augmented with extra lags, depending on the maximum order of integration of the series within the group. An advantage of this approach is that it can be implemented in levels, even when variables are not stationary.

Following Toda-Yamamoto approach, we apply the usual lag selection, based on Schwartz and Akaike information criteria (we select the higher lag length of both tests). The order of integration is determined using augmented Dickey-Fuller (Dickey and Fuller 1979, 1981; hereinafter ADF) and Phillips-Perron (Phillips and Perron 1988; hereinafter PP) unit root tests. Let k be the lag length and d_{max} the maximum order of integration within the group. Before implementing Granger restrictions, we estimate a VAR model of order k, and if there is evidence of serial correlation, we increase the lag length until no evidence of serial correlation is found. Subsequently, a $(k + d_{max})th$ order VAR model is estimated. Granger-type restrictions are tested on the first k coefficients[2] while last d_{max} lagged vectors are ignored.

3. Results

We implement Granger non-causality testing in three groups of variables: Group 1 includes EB and PB, Group 2 includes EB and IE, and Group 3 includes EB and CB. Table 2 summarizes ADF and PP unit root tests applied to EB, PB, IE and CB. As shown in Table 2, the maximum order of integration d_{max} for all VAR groups is 1 with the only exception for the case of Portugal in Group 3. Thus, EB is I(1) for all countries excluding Portugal; PB is I(1) for all countries excluding Austria and Germany; IE is I(1) for all countries; and CB is I(1) for Finland, Greece and Spain, and I(0) for Austria, Germany and Portugal.

[1] In econometrics, Granger causality implies the ability to better predict another variable using the history of both variables.
[2] Or *k* plus the number of extra lags included until found no serial correlation.

Table 2. Unit Root Tests.

		External balance (eb)					Government primary balance (pb)			
Austria										
Level	ADF stat	-1.5828	PP stat	-1.4284	Integration	ADF stat	-3.7759	PP stat	-3.5697	Integration
	Prob.	0.4817	Prob.	0.5586	order	Prob.	0.0065	Prob.	0.0111	order
1st diff	ADF stat	-7.5147	PP stat	-7.7821	I(1)	ADF stat	-5.9504	PP stat	-10.8209	I(0)
	Prob.	0.0000	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	
Finland										
Level	ADF stat	-2.0131	PP stat	-1.4162	Integration	ADF stat	-3.0519	PP stat	-2.5707	Integration
	Prob.	0.2802	Prob.	0.5645	order	Prob.	0.0391	Prob.	0.1076	order
1st diff	ADF stat	-3.6899	PP stat	-5.0068	I(1)	ADF stat	-5.1128	PP stat	-5.4018	I(1)
	Prob.	0.0005	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	
Germany										
Level	ADF stat	-1.1629	PP stat	-1.4489	Integration	ADF stat	-4.3917	PP stat	-4.3358	Integration
	Prob.	0.6806	Prob.	0.5485	order	Prob.	0.0012	Prob.	0.0014	order
1st diff	ADF stat	-5.5272	PP stat	-5.5231	I(1)	ADF stat	-7.9390	PP stat	-13.4980	I(0)
	Prob.	0.0000	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	
Greece										
Level	ADF stat	-0.8923	PP stat	-0.8333	Integration	ADF stat	-2.1552	PP stat	-2.1552	Integration
	Prob.	0.7802	Prob.	0.7983	order	Prob.	0.2253	Prob.	0.2253	order
1st diff	ADF stat	-6.0443	PP stat	-6.0470	I(1)	ADF stat	-6.3692	PP stat	-6.4821	I(1)
	Prob.	0.0000	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	
Portugal										
Level	ADF stat	-3.4456	PP stat	-3.3022	Integration	ADF stat	-2.8363	PP stat	-2.7553	Integration
	Prob.	0.0152	Prob.	0.0216	order	Prob.	0.0625	Prob.	0.0741	order
1st diff	ADF stat	-5.4902	PP stat	-5.6699	I(0)	ADF stat	-7.5144	PP stat	-6.8517	I(1)
	Prob.	0.0000	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	
Spain										
Level	ADF stat	-2.7727	PP stat	-2.3737	Integration	ADF stat	-2.3099	PP stat	-1.3961	Integration
	Prob.	0.0717	Prob.	0.1555	order	Prob.	0.1742	Prob.	0.5743	order
1st diff	ADF stat	-4.7386	PP stat	-4.5943	I(1)	ADF stat	-4.9139	PP stat	-4.8210	I(1)
	Prob.	0.0000	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	

		Interest paid on public debt (ie)					Current government balance (cb=pb-ie)			
Austria										
Level	ADF stat	-2.4618	PP stat	-2.3620	Integration	ADF stat	-3.7723	PP stat	-3.9073	Integration
	Prob.	0.1324	Prob.	0.1588	order	Prob.	0.0066	Prob.	0.0046	order
1st diff	ADF stat	-4.6289	PP stat	-4.8131	I(1)	ADF stat	-5.5503	PP stat	-7.4874	I(0)
	Prob.	0.0000	Prob.	0.0000		Prob.	0.0000	Prob.	0.0000	
Finland										
Level	ADF stat	-0.9111	PP stat	-1.2501	Integration	ADF stat	-2.9051	PP stat	-2.4495	Integration
	Prob.	0.7741	Prob.	0.6427	order	Prob.	0.0541	Prob.	0.1355	order
1st diff	ADF stat	-3.5893	PP stat	-3.5805	I(1)	ADF stat	-4.8214	PP stat	-4.9973	I(1)
	Prob.	0.0007	Prob.	0.0007		Prob.	0.0000	Prob.	0.0000	
Germany										
Level	ADF stat	-1.6019	PP stat	-2.0208	Integration	ADF stat	-4.6192	PP stat	-4.4295	Integration
	Prob.	0.4718	Prob.	0.2771	order	Prob.	0.0006	Prob.	0.0011	order
1st diff	ADF stat	-2.2847	PP stat	-2.3516	I(1)	ADF stat	-7.8055	PP stat	-11.7531	I(0)
	Prob.	0.0234	Prob.	0.0199		Prob.	0.0000	Prob.	0.0000	
Greece										
Level	ADF stat	-1.9709	PP stat	-1.5279	Integration	ADF stat	-2.3108	PP stat	-2.3099	Integration
	Prob.	0.2978	Prob.	0.5092	order	Prob.	0.1738	Prob.	0.1740	order
1st diff	ADF stat	-1.8322	PP stat	-4.1370	I(1)	ADF stat	-6.7649	PP stat	-6.8959	I(1)
	Prob.	0.0642	Prob.	0.0001		Prob.	0.0000	Prob.	0.0000	
Portugal										
Level	ADF stat	-1.9399	PP stat	-1.6758	Integration	ADF stat	-4.2762	PP stat	-3.7618	Integration
	Prob.	0.3112	Prob.	0.4353	order	Prob.	0.0017	Prob.	0.0067	order
1st diff	ADF stat	-4.0961	PP stat	-4.0728	I(1)	ADF stat	-8.0914	PP stat	-8.7307	I(0)
	Prob.	0.0001	Prob.	0.0002		Prob.	0.0000	Prob.	0.0000	
Spain										
Level	ADF stat	-1.8393	PP stat	-1.4343	Integration	ADF stat	-2.5565	PP stat	-1.5728	Integration
	Prob.	0.3565	Prob.	0.5557	order	Prob.	0.1108	Prob.	0.4867	order
1st diff	ADF stat	-2.9655	PP stat	-3.0508	I(1)	ADF stat	-4.8337	PP stat	-4.7496	I(1)
	Prob.	0.0041	Prob.	0.0032		Prob.	0.0000	Prob.	0.0000	

Note: SIC was used for lag length selection for ADF. In the case of PP, spectral estimation method using Bartlett kernel and Newey-West for bandwidth. Estimated with constant in levels and without exogenous variables in 1st difference.

Table 3 summarizes results of Toda-Yamamoto approach to Granger non-causality.[3] The null of non-causality from fiscal variables to external balance is only rejected at 5% for the case of Austria in Group 1 and Group 3, and for Portugal in Group 2. According to the twin deficits hypothesis, direction goes from fiscal variables to external balance. However, with the only two exceptions of Austria and Portugal there is no evidence supporting this hypothesis.

In the case of reverse causality, rather than what is expressed in twin deficits hypothesis, that is, from external balance to fiscal variables, results are not homogeneous among Eurozone countries. For Austria and Germany, the null of non-causality is rejected for Group 2 (EB does not Granger cause IE).

Table 3. Toda-Yamamoto approach to Granger non-causality.

	Group 1: EB and PB	**Group 2: EB and IE**	**Group 3: EB and CB**
	H0: PB does not Granger cause EB	**H0: IE does not Granger cause EB**	**H0: CB does not Granger cause EB**
Austria	Null rejected	Null not rejected	Null rejected
Finland	Null not rejected	Null not rejected	Null not rejected
Germany	Null not rejected	Null not rejected	Null not rejected
Greece	Null not rejected		Null not rejected
Portugal	Null not rejected	Null rejected	Null not rejected
Spain	Null not rejected	Null not rejected	Null not rejected
	H0: EB does not Granger cause PB	**H0: EB does not Granger cause IE**	**H0: EB does not Granger cause CB**
Austria	Null not rejected	Null rejected	Null not rejected
Finland	Null not rejected	Null not rejected	Null not rejected
Germany	Null not rejected	Null rejected	Null not rejected
Greece	Null not rejected		Null not rejected
Portugal	Null not rejected	Null not rejected	Null not rejected
Spain	Null not rejected	Null not rejected	Null not rejected

Note: Details of estimations upon request to the authors.

Summarizing, results are not homogeneous for the six Eurozone countries, or when analyzing causality from fiscal variables to external balance or when inverse causality is tested. In addition, results support twin deficits hypothesis in the case of Austria and Portugal. In the case of reverse causality, evidence for the cases of Austria and Germany is provided.

4. Concluding remarks

In this article, we present preliminary results, analyzing the causality between external balance and fiscal variables (primary public balance, interest paid on debt and overall public balance) within the so-called twin deficits hypothesis for a set of six Eurozone countries – three core countries (Austria, Finland and Germany) and three peripheral countries (Greece, Portugal and Spain) – in the period 1972–2011, using the Toda and Yamamoto (1995) approach to Granger non-causality testing (Granger, 1969). The importance of studying the causal relationship between the external balance and fiscal balance lies in the possibility of implementing fiscal measures to permanently reduce external imbalances in the medium and long term.

Results are not homogeneous for all the Eurozone countries included in the sample. Evidence of causality, according to twin deficits hypothesis, is provided for the cases of Austria (Group 1 and 3) and Portugal (Group 2), while reverse causality was found in the case of Austria and Germany for Group 2.

In regard of our results, there are some points that should be highlighted. First, the relationship between external balance and fiscal balance is not homogeneous among our sample of countries. Second, with the only exception of Austria, all the analyzed countries do not present evidence on the causal relationship between external balance and fiscal deficits (primary

[3] In the case of Greece for Group 2 (EB and IE), results are not dynamically stable. For this reason, we exclude Group 2 for Greece from the analysis.

and overall deficit). Apart from the Austrian case, the causal relationships for Germany and Portugal are found in Group 2 (EB and IE). In the German case, there is evidence of a continuous (but moderate) increase in interests paid on public debt between 1972 and 1983. After 1983, interest paid on public debt is stabilized up to the German reunification when another increase in interest paid on public debt is presented. Those historical shocks require a detailed analysis focusing on short-term periods. However, given the number of observations, the analysis would require another statistical technique.

What factors could explain the results? Why the results show no supportive homogeneous evidence of the twin deficits hypothesis? The answer to both questions is related to the existence of multiple determinants of external imbalances in the euro countries. On the one hand, as stated by Hein et al. (2012), external imbalances have been (mainly) originated in private savings-investment decisions, where fiscal deficits were observed after the outbreak of the financial crisis in order to smooth the effects of private deleverage process. On the other hand, recent economic literature has highlighted some factors behind the European external imbalances: the expected catching-up process (Gehringer 2015; Belke and Dreger 2013), differences in price and non-price competitiveness (Belke and Dreger 2013, Arghyrou and Chortareas 2008) and the development of the financial system (Gehringer 2015; Schmitz and von Hagen 2011).

While the outcome presented here is preliminary, these results give us an idea of the complexity of the relationship between the external balance and the public balance in the case of Eurozone countries. In our ongoing works, we are aiming to deepen and strengthen the results presented here.

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