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Financial Integration, Euro and the Twin Deficits of Southern Eurozone Countries

Summary: The purpose of this study is the examination of the relationship between fiscal and Current Account balances for the countries of southern eurozone. The twin deficit hypothesis is tested within the context of a portfolio model involving variables from the financial sector. Empirical analysis is conducted with panel data, for the period 1991-2011. Evidence is provided to support the twin deficit hypothesis. Additionally, it is found that it is not only the fiscal policy of the southern eurozone coun-tries that affects their Current Account balances, but also the fiscal policy of the eurozone surplus countries of the north. Interdependence of euro-zone countries suggests that fiscal policy can be used for the elimination of external disequilibrium. Therefore, fiscal policy should be coordinated but not uniformly applied.

Key words: Current Account, Budget balance, Twin deficits, Financial integration, Fiscal coordination.

JEL: F32, F36, F41.

Analysis of the relationship between the Current Account (CA) and fiscal policy has attracted theoretical as well as empirical attention. There are two major competing theories: the positive association of CA deficit and the government budget deficit, known as the twin deficit hypothesis which derives from the Keynesian tradition. According to this view an expansionary fiscal policy stimulates output and demand which has a deteriorating influence on the CA. On the other hand, the two deficits are not related according to the Ricardian Equivalence approach. Any fiscal expansion, or contraction induces intertemporal reallocation of savings, leaving the CA balance unaltered. In line to this approach, an increase in the budget deficit increases private saving and has no effect on the CA. Whether or not, the two deficits are positively related has important policy implications. If the twin deficit hypothesis is valid, a government can improve the country's CA through a fiscal contraction and vice versa.

Empirical research for individual countries or group of countries has provided unclear results. Evidence in support of the twin deficit hypothesis primarily comes from the US experience in the 1980s and 2000s (John D. Abell 1990a, b; Abdulnasser Hatemi-J and Ghazi Shukur 2002; Jeffrey Frankel 2006). In Sebastian Edwards (2005) and Olivier Blanchard (2007a, b) it is claimed that CA deficits of the US and other rich countries have their origins in private saving and investment decisions and that fiscal deficits often play a marginal role. For the US there are other empirical studies verifying a negative relation between the two deficits. When fiscal account

worsens, the CA improves, as in Nouriel Roubini (2006), Soyoung Kim and Roubini (2008). There are numerous other studies that confirm the twin deficit hypothesis for other countries, such as Ahmad Zubaidi Baharumshah and Evan Lau (2007) for the case of Thailand. Also, Branko Urošević, Milan Nedeljković, and Emir Zildžović (2012) find a positive relation between fiscal balance and the Current Account for the case of Serbia, Romania, Hungary, Poland and the Czech Republic. Vince Daly and Jalal Siddiki (2010) test the hypothesis for OECD countries, with cointegration analysis. In 13 out of 23 OECD countries for the period 1960-2000, the twin deficit hypothesis is accepted. Empirical studies dealing with the impact of budget deficits on CA balances for eurozone countries are inconclusive. Evidence from George Vamvoukas (1999) and also from Panagiotis Pantelidis et al. (2009) for the period 1960-2007 confirm the twin deficit hypothesis for the case of Greece. On the other hand Theodore Papadogonas and Yiannis Stournaras (2006) provide support to the Ricardian equivalence hypothesis for the EU member states. According to them, CA developments are explained by factors related to financial and economic integration. Sylvia Kaufmann, Johann Scharler, and Georg Winckler (2002) reject the twin deficit hypothesis for Austria. Melina Vasarthani et al. (2010) estimate a model for the determination of the CA for the EU countries with panel data, over the period 1980-2008. Their results provide a weak support to the twin deficit hypothesis.

This study is structured as follows. Section 1 presents the evolution of the variables describing the fiscal situation, the CA balance and the main financial variables for the southern eurozone countries. Section 2 offers the theoretical background of the relation between the two deficits. In this section a portfolio model is used to explain developments in the CA and budget balances. Factors related to financial and economic integration such as interest rates and growth differentials are essential characteristics of this model. Section 3 provides empirical evidence based on panel data from southern eurozone countries, over the period 1991-2010. Finally, Section 4 concludes with a summary of our results.

1. The Data

This section starts by comparing the CA and fiscal balance situation. The year 1991 marks the beginning of the convergence period for the first group of the 11 EU countries that joined the EMU in 1999, and Greece that joined in 2001. The first stage of convergence as determined in the Delors report starts in mid-1990. The group of eurozone countries includes the southern European Union (EU) countries, that is, Spain, Portugal, Italy, France, and also Cyprus and Slovenia. A weak and deteriorating external sector is a common feature of these countries, with Greece and Portugal being in the worst position. This can be observed in Figure 1 that shows the course of the CA as a percentage of GDP. The CA surpluses of Italy and France have turned into deficits since 2004 and of Cyprus since 2001. We notice a temporary improvement in CA deficits lasting for two or three years after the introduction of the euro and also for the years 2009-2010, as a consequence of the economic crisis. CA deficits have piled up to a rising external debt over the years. With respect to the net external debt position, measured by the Net International Investment Position as a percentage of GDP, Greece Portugal and Spain are in the worst position, once again.

Figure 2 shows public debt and the Net International Investment Position as percentages of GDP of the countries of our group. By looking at the charts of Figure 2, it is concluded that some countries suffer from a dual problem: high public debt ratios matched with high or even higher external debt ratios. These countries are Greece, Portugal and Spain and to a much lesser extent Italy and Slovenia. Cyprus has a positive Net International Investment position, while France has started having an external debt since 2008. The question that arises is what have been the sources of financing the net external debt of Greece, Portugal, Spain and Italy since mid -1990s. The answer is related to the financial integration of EU and the creation of the euro that have eased borrowing conditions for both the public and private sector.

Interest rates fell rapidly during the convergence period in all countries of our sample. After the euro was introduced and before the advent of the economic crisis, long run interest rates of all countries of our sample almost coincided with the exception of Slovenia and Cyprus. However, after 2008, the difference between the long run interest rate of each individual country and that of Germany increased reflecting default risk that these countries were facing to a smaller or larger degree. Short run interest rates of all countries of south eurozone also followed a downward path, during the 1990s. Since early 2000, short run rates were kept at low levels an in accordance to the ECB base rate.

The countries of our group share a characteristic of their external sector that is worth noting: their trade balance with respect to other EU countries has been in deficit since 2000. The annual sum of the trade deficits has been increasing since then and is matched by a widening surplus of a different group of eurozone countries (Figure 3). This second group is comprised by surplus eurozone countries. These are Germany, Belgium, Ireland, Netherlands and Slovakia. The widening disequilibrium between the two groups reveals a severe loss in competitiveness for the deficit countries, after the introduction of the euro.[1] We are going to refer to the group of southern EU countries as the deficit group and to the other group as the surplus group.

Regarding the government budget balance, we observe in Figure 1 that it has been in deficit in all the countries of our group for all the years under consideration. Budget deficits as a percentage of GDP have improved during the 1990s. Loosening fiscal policies, after attaining the accession to EMU criteria have increased fiscal deficits in all countries of our group, with the exception of Spain. Public debt of the eurozone as a whole did not exceed 70% of GDP for the period covering the years 2000-2008. Figure 2 shows the stock of public debt as a percentage of GDP. We can observe the performance of the public debt/GDP, for the case of Italy and Spain. In Italy, the public debt as a percentage of GDP fell from a high of 121.84 in 1994 to 103.62 in 2007 and in Spain it fell from a high of 67.45 in 1996 to 36.13 in 2007. In 2010 as a consequence of the economic crisis, public debt climbed to unprecedented levels. It reached 142.75% of GDP in Greece, 119% in Italy, 93% in Portugal, 81.70% in France, 60.11% in Spain, 60.80% in Cyprus and 38.00% in Slovenia.

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[1] Slovenia joined EMU in 2007 and Cyprus in 2008 but for two years before their economies were functioning with fixed exchange rates, under the Exchange Rate Mechanism (ERM II).
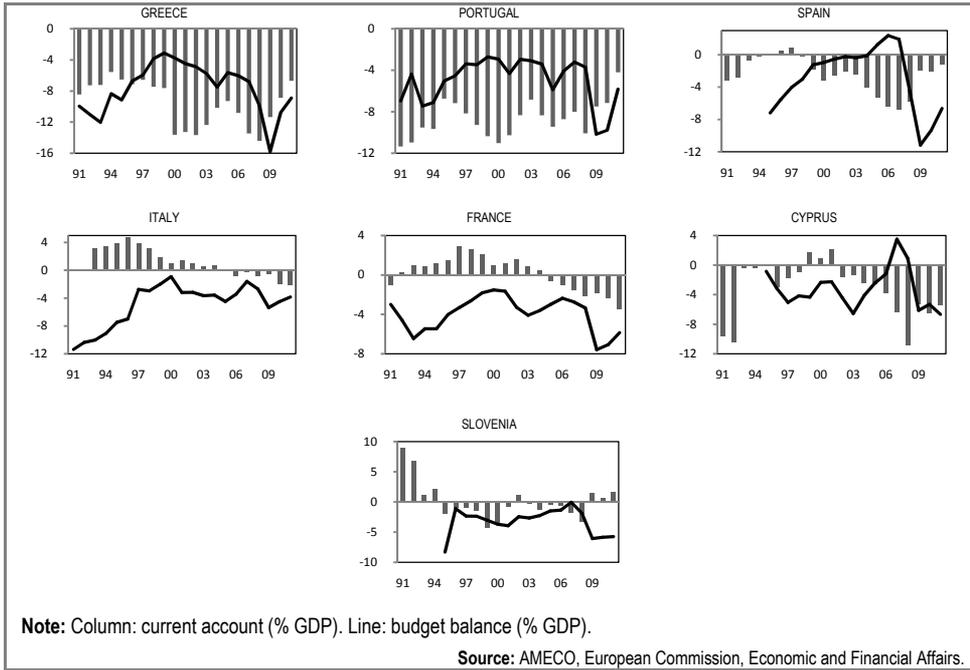
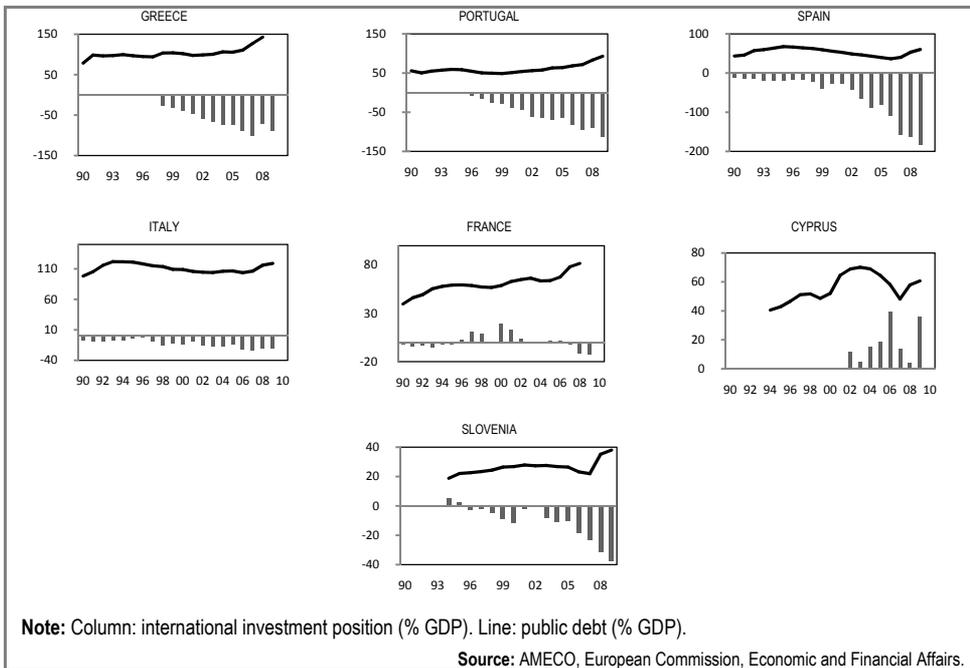**Figure 1** Current Account and Government Budget Balances, 1991-2011 (% GDP)

Figure 2 Public Debt and the International Investment Position (% GDP)

Note: Intra eurozone deficit includes: trade deficits of Austria, France, Italy, Spain, Portugal, Greece, Luxemburg, Cyprus, Malta and Slovenia. Intra eurozone surplus includes: trade surpluses of Germany, Belgium, Ireland, Holland and Slovakia, with other eurozone countries.

Source: AMECO, European Commission, Economic and Financial Affairs.
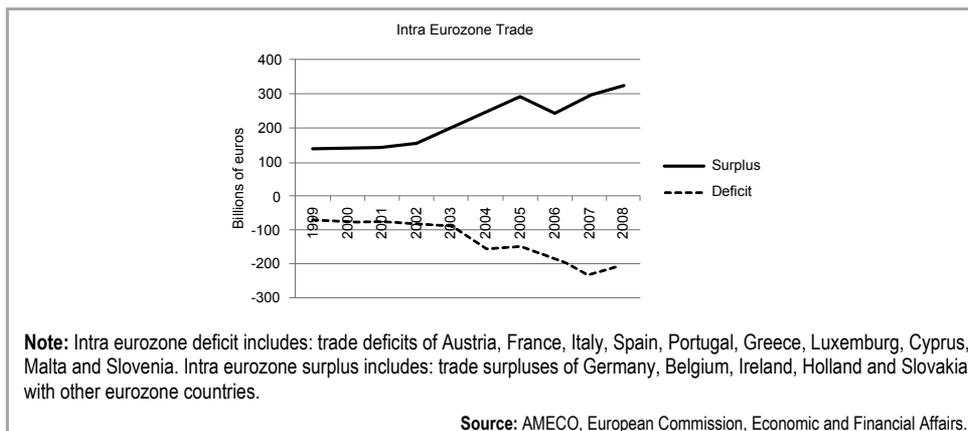
Figure 3 Intra Eurozone Trade

2. Theoretical Background

The relationship between the two balances derives from the basic macroeconomic identity, according to which the CA is equal to the difference between national saving, S and investment, I:

$$CA = S-I \qquad (1)$$

Breaking down S and I into their public and private sector components, (1) becomes:

$$CA = (Sp-Ip) + (Sg-Ig) \qquad (2)$$

where subscript p denotes private sector and subscript g denotes and public sector.

From (2), the CA is related to the excess public saving *(Sg-Ig)*, which corresponds to the budget balance. Hence equation (2) is used as a basis for discussing the twin deficit hypothesis. A positive relation between CA and excess government saving holds only under the condition that the difference between *Sp* and *Ip* remains constant. The course of *(Sp-Ip)* is crucial for the twin deficit hypothesis.

2.1 Channels through which the Budget Balance Influences the Current Account and vice versa

The two balances influence each other through various channels. Theoretical support to the twin deficit hypothesis and causality running from the public deficit to the external deficit derives mainly from the conventional Keynesian and Mundell-Fleming approach.

First, according to the Keynesian tradition, an expansionary fiscal policy stimulates income and deteriorates the CA. This is true irrespective of exchange rate regime, capital mobility situation or phase of the business cycle of the economy. *Secondly*, in a Mundell-Fleming framework (John M. Fleming 1967; Robert Mundell 1968), with perfect capital mobility and negligible transaction costs, fiscal expansion

increases real interest rates that in turn trigger capital inflows. As a result, real exchange rate appreciates, deteriorating the CA.

Causality running from the CA balance to the budget balance is supported by other views. Financial integration and easier access to borrowing for member countries causes deterioration of their CA balances, raising questions of sustainability by financial markets. Pierre-Olivier Gourinchas (2002), among others, argue that governments should protect their economies from such a potential by lowering public deficits. If such a policy is implemented, the two deficits are inversely related and the twin deficit hypothesis does not apply.

An inverse relation between the two deficits was found in the US, for the period 1973-2004, by Kim and Roubini (2008). The observed "twin divergence" as they call it is in effect when the main driver of the two balances is an output shock. They claim that because during economic recessions unemployment is high and output falls, fiscal policy is expansionary thus stimulating economic activity. Therefore, the budget balance worsens. At the same time, as spending falls, the CA improves. On the contrary during the booms, when the economic activity is high, the fiscal balance improves implying coexistence of deteriorating CA balances and improving budget balances. Consequently, according to them there is no causal effect between the two deficits but there exists an inverse association.

Joseph E. Stiglitz (2010) supports the twin deficit hypothesis, with causality running from the CA to the budget balance. He argues that countries with persistent or expanding CA deficits are often obliged to run fiscal deficits to maintain aggregate demand. "Without the fiscal deficit, they will have high unemployment." (Stiglitz 2010, p. 235).

The synchronized variation in private sector's saving and investment, known as the Feldstein-Horioka puzzle (Martin Feldstein and Charles Horioka 2008), supports the twin deficit hypothesis, as can be inferred from equation (2) (Blanchard and Francesco Giavazzi 2002; Carlos Foncesa Marinheiro 2008). More recent empirical work has proved that the Feldstein-Horioka puzzle is no longer valid. Neither is the twin deficit hypothesis.

João Sousa Andrade and Adelaide Duarte (2011) indicates a different source of connection between the two deficits. According to him the twin deficit phenomenon in Portugal is the result of monetary integration and poor policies. Falling interest rates created a kind of Dutch disease that produced high budget and CA deficits as well as external debt.

An alternative approach known as the Ricardian Equivalence Hypothesis suggests no relation between the two deficits (Robert Barro 1974, 1989). The Ricardian Equivalence predicts that a fiscal expansion has a positive effect of the same size on private saving, while real interest rates, investment and CA balance remain unaffected. Papadogonas and Stournaras (2006) empirical findings support this view.

2.2 A Portfolio Model

Whatever the underlying forces of the two deficits are, widening imbalances in the euro area countries cannot be explained without considering the effect of financial and economic integration and the common currency. Below we construct a portfolio model in the context of which the relation between CA and budget balances can be discussed. Under the condition of financial integration and a single currency, it is assumed that short run interest rates are common for all countries, while long run interest rates may differ. Therefore, financial assets bearing different rates of return are not perfect substitutes in the portfolios of investors. Let us assume, for simplicity, that prices are constant and that the Union we are referring to is comprised of two countries representing two groups with distinct characteristics. The first is the surplus countries group comprised by countries of the core of the currency union. Deficit countries make up the second group. The difference between the two groups is that all indicators of real variables, such as income per capita, distribution of income, competitiveness of the economy, as well as the structure of production and institutional framework, are superior in the surplus group to those of the deficit group. Also, the financial sector of the surplus group is more developed and efficient. Deficit countries benefit from the formation of the currency union with the surplus group, in terms of lower nominal and real interest rates and easier access to borrowing, in general. This situation induces widening deficits in both fiscal and CA balances.

It is also assumed that the external sector of the union as a whole is in balance. Thus, the CA surplus of the first group equals the deficit of the second. At this stage, for simplicity of analysis, the two country groups will be referred to as countries: the deficit countries group will be the "home" country while the surplus group will be the "foreign" country. The CA balance is equal to the change in the net holdings of foreign assets held by domestic residents. If it is positive it corresponds to the country's net lending abroad, if negative, to net borrowing from abroad:

$$CA = \Delta(F\text{-}B) \tag{3}$$

where, Δ, denotes first difference. F is the holdings of foreign assets by domestic residents and B is the holdings of domestic assets by foreign residents. It is assumed that foreign assets, F, are comprised by bonds issued by the government or the private sector of the foreign country, with an average rate of return Rf, whereas, B, domestic assets are bonds issued by the government or the private sector of the home country, with an average rate of return Rb. Residents of the union can hold their financial wealth in the form of money, M, or bonds F, or B. Money, M, has also a rate of return equal to Rm. The rate of return of each form of asset is its interest rate. Hence demand for each asset[2] depends positively on its own interest rate, negatively on the other assets' interest rates and it also depends on income, Y. Subsequently, demand for foreign assets Fd, by domestic residents, is a function of Rf, Rb, Rm and Y, the income of the home country:

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[2] Demand for F corresponds to the (supply of) lending by domestic residents to foreigners. Similarly, demand for B corresponds to the (supply of) lending to domestic residents by foreigners.

$$Fd = f_d(\overset{(+)}{R_f}, \overset{(-)}{R_b}, \overset{(-)}{R_m}, \overset{(+)}{Y}) \tag{4}$$

Signs of (+) or (-) denote the sign of partial derivative of the demand for F with respect to corresponding variables in (4). Similarly, demand for domestic bonds Bd, is described in equation (5):

$$Bd = b_d(\overset{(-)}{R_f}, \overset{(+)}{R_b}, \overset{(-)}{R_m}, \overset{(+)}{Y*}) \tag{5}$$

The star (*) refers to foreign country variables.

To determine the factors affecting the assets supply side we argue that B and F are issued by the corresponding country's government or private sector, to finance their borrowing requirements. The higher the stock of public debt *(PDebt)* is, the higher the stock of bonds that have been issued is. Also, the lower the interest rate is the higher the supply of bonds is. Therefore, supply of foreign bonds,[3] *Fs*, depends positively on the foreign country' stock of public debt, *PDebt** and negatively on *Rf*. Supply of domestic bonds, depends positively on *PDebt* and negatively on *Rb*.

$$Fs = f_s(\overset{(+)}{PDebt*}, \overset{(-)}{R_f}) \tag{6}$$

$$Bs = b_s(\overset{(+)}{PDebt}, \overset{(-)}{R_b}) \tag{7}$$

Consequently, when demand of each asset is equal to its supply, the actual stock of F and B depends on all forces included in corresponding demand and supply functions:

$$F = f(\overset{(?)}{R_f}, \overset{(-)}{R_b}, \overset{(-)}{R_m}, \overset{(+)}{Y}, \overset{(+)}{PDebt*}) \tag{8}$$

$$B = b(\overset{(-)}{R_f}, \overset{(?)}{R_b}, \overset{(-)}{R_m}, \overset{(+)}{Y*}, \overset{(+)}{PDebt*}) \tag{9}$$

In (8) the direction of influence of R_f on F depends on whether the effect originates from the demand for foreign bonds, F (supply of lending) or the effect originating from the supply of F (demand for borrowing). The same holds for the ambiguous effect of R_b on the stock of bonds, B, in (9). By substituting the equilibrium equations (8) and (9) in (3) we end up with the CA balance as a function of variables coming from the asset market:

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[3] Supply of F corresponds to the demand for borrowing by foreigners, while supply of B corresponds to the demand for borrowing by domestic residents.

$$F - B = \phi(\overset{(?)}{R_f}, \overset{(?)}{R_b}, \overset{(-)}{R_m}, \overset{(+)}{Y}, \overset{(-)}{Y^*}, \overset{(-)}{PDebt}, \overset{(+)}{PDebt^*}) \qquad \text{and}$$

(10)

$$CA = \Delta(F - B) = \Delta(\phi(\overset{(?)}{R_f}, \overset{(?)}{R_b}, \overset{(?)}{R_m}, \overset{(+)}{Y}, \overset{(-)}{Y^*}, \overset{(-)}{PDebt}, \overset{(+)}{PDebt^*}))$$

If additionally we assume that a change in the stock of public debt corresponds to that year's budget balance, BB, with the opposite sign, we can rewrite (10) as:

$$CA = \zeta(\overset{(?)}{\Delta R_f}, \overset{(?)}{\Delta R_b}, \overset{(-)}{\Delta R_m}, \overset{(+)}{\Delta Y}, \overset{(-)}{\Delta Y^*}, \overset{(+)}{BB}, \overset{(-)}{BB^*})$$

(11)

Again, the effect of a change in Rf or Rb on the CA balance is subject to the dominance of the effect from the demand or the supply side of the relevant bonds market. It is noted that the CA is influenced by the change in interest rates and not by their levels.

Next we shall discuss the effect of financial integration on the CA balance and its relation with the budget balance. Within our framework of analysis, financial integration causes stronger adjustments in the home country representing weaker economies, than in the foreign country. The government of the home country takes the opportunity to increase its borrowing to finance its requirements by increasing the supply of government bonds, B. In turn, this inflates public debt, as well as the budget deficit by the same amount, ceteris paribus. The increase in the supply of B, given the fact that there exists sufficient demand for domestic bonds, increases the stock of bonds, B, in the home country. From (3) *CA=Δ(F-B),* it is implied that the CA balance deteriorates. Moreover, unless other adjustments are made, the deterioration of the CA is matched by a deterioration of the budget balance. Therefore, the twin deficit hypothesis holds under the hypothesis of the government and private sector unlimited capacity to borrow from financial markets. In fact, what we will estimate is a linear specification of (11) that has the following form:

$$CA_{ti} = a_0 + a_1\Delta R_{fti} + a_2\Delta R_{bti} + a_3\Delta R_{mti} + a_4\Delta Y_{ti} + a_5\Delta Y_{ti}^* + a_6 BB_{ti} + a_7 BB_{ti}^* + u_{ti} \qquad (12)$$

Coefficients α_1, α_2, α_3 can be either positive or negative: *$\alpha_1>0$,* if the effect coming from the demand side prevails over the effect coming from the supply side of the market for F. It implies that as *ΔRf* increases, CA improves. In other words, the higher the increase in foreign interest rates is, the greater the demand for foreign bonds by domestic residents is. As *F* increases, our country's CA improves. *$\alpha_1<0$,* if the effect of the supply side of the F market prevails. Similarly, *$\alpha_2>0$, or $\alpha_2<0$, $\alpha_4>0$, $\alpha_5<0$, $\alpha_6>0$, $\alpha_7<0$. u_{ti}* is the disturbance term.

3. Results of the Empirical Research

Our intention has been to test empirically the twin deficit hypothesis for southern eurozone countries, over the period 1991-2010 that covers the convergence process, the introduction of the euro as well as the economic crisis. For this reason we have used panel data from Greece, Portugal, Spain, Italy, France, Cyprus and Slovenia.

3.1 Saving – Investment

Before proceeding with the empirical examination of the two deficits it is important to examine the saving-investment behavior. The reason is that financial integration that led to the reduction in nominal and real interest rates, as well as the optimism about the future of the EMU, influenced savings as well as investment interfering in the relation of the two deficits. The identity $CA=(Sg-Ig)+(Sp-Ip)$ suggests that our preliminary investigation should involve the following relations:

(i) private savings Sp and private investment Ip. If these two variables are positively correlated with correlation coefficient equal to one then the Feldstein-Horioka puzzle is verified, as well as the twin deficit hypothesis. For any other value of the correlation coefficient, the twin deficit hypothesis should be further investigated. So, we should test:

$$Sp=\beta_o + \beta_1 Ip \qquad (13)$$

$$\text{If } \beta_0=0 \text{ and } \beta_1=1 \qquad (13)'$$

then the Horioka Puzzle is valid and the twin deficit hypothesis is accepted.

(ii) if the Feldstein-Horioka puzzle doesn't hold, the relation between net public savings, $(Sg-Ig)$, and net private savings, $(Sp-Ip)$, should be investigated. In case net public and private savings are positively correlated, the twin deficit hypothesis is verified. In case of negative correlation, or, of no correlation at all, the twin deficit hypothesis should be further examined. We should test:

$$(Sg-Ig)= \gamma_0+\gamma_1(Sp-Ig) \qquad (14)$$

$$\text{If } \gamma_o>0 \text{ and } \gamma_1>0 \qquad (14)'$$

then, the twin deficit hypothesis holds, otherwise it should be further checked.

In the special case where:

$$\gamma_o= 0 \text{ and } \gamma_1= -1 \qquad (14)''$$

the Ricardian Equivalence hypothesis is valid and the twin deficit hypothesis is rejected.

Testing the above relations involves the following steps.

First, we check for unit roots, with the standard tests. Secondly, if all or some of these variables are not stationary, we test for cointegration and finally we examine whether the long run coefficients satisfy conditions (13)′ or (14)′. Tables 1, 2 and 3 summarize the estimated results. Table 1 shows the results for the standard panel unit

root tests. These tests are the Kaddour Hadri (2000) z statistic, the Andrew Levin, Chien-Fu Lin, and Shang Chu (2002) t* test, the Kyungso Im, Hashem M. Pesaran, and Yougcheol Shin (2003) W statistic and the ADF-Fisher Chi square statistic based on Gandadharrao Soundabarao Maddala and Shaowen Wu (1999). From Table 1 it is inferred that whereas the variable *Sp* can be considered as stationary, *Ip, (Sg-Ig)* and *(Sp-Ip)* cannot. Therefore we proceed by testing for cointegration. Table 2 displays a list of four cointegration tests. These are the Chihwa Kao (1999) residual ADF cointegration test and the Pedroni Panel pp statistic, the Pedroni Panel ADF t statistic and the Pedroni Group ADF t statistic, as described in Peter Pedroni (1999, 2004). These tests except for the last one assume cross section independence. Most of the performed tests for the existence of cointegrating vector suggest that private investment and private savings are cointegrated. The same is true for net government savings *(Sg-Ig)* and net private savings *,(Sp-Ip)*.Table 3 demonstrates the estimated coefficients for the long run relationships. The method of estimation is the Panel Least Square with cross section weights performed with EViews 7.0. As can be observed, conditions (13)´and (14)´ are not satisfied. Their rejection does not imply the rejection of the twin deficit hypothesis, which should be further investigated.

Table 1   Unit Root Tests (Panel Data for Deficit Eurozone Countries, 1991-2010)

Variables	Hadri z statistic	Levin, Lin and Chu t*	Im, Pesaran and Shin W-statistic	ADF-Fisher Chi-square
Sp	5.66*	-2.26*	-1.57**	22.89***
Ip	2.62*	-0.76	-1.21	18.18
(Sg-Ig)		0.91*	1.35	9.72
(Sp-Ip)		2.31	-0.67	18.65

Note: The asterisks *, **, *** correspond to statistics according to which, the Ho hypothesis of a unit root, cannot be rejected at the 1%, 5% and 10% level of significance.

Source: Author's calculations.

Table 2   Cointegration Tests (Panel Data for Deficit Eurozone Countries, 1991-2010)

Variables	Kao test	Pedroni Panel pp statistic	Pedroni Panel ADF statistic	Pedroni Group ADF statistic
Ip, Sp	4.55	-3.56 *	-3.39*	-1.68**
(Sg-Ig), (Sp-Ip)	-1.61**	-1.14	-2.06**	-1.23***

Note: The asterisks *, **, *** correspond to statistic according to which, the Ho hypothesis of no cointegration cannot be rejected at the 1%, 5% and 10% level of significance.

Source: Author's calculations.

Table 3   Estimated Coefficients of Cointegration Equation
   (Panel Data for Deficit Eurozone Countries, 1991-2010)

Equation	β_0	β_1	γ_0	γ_1
$Sp = \beta_0 + \beta_1 Ip$	27.72*	-0.49*		
$(Sg\text{-}Ig) = \gamma_0 + \gamma_1 (Sp\text{-}Ig)$			-3.72*	-0.40*

Note: The asterisk, *, denotes statistical significance of relevant coefficients at the 1% level of significance.

Source: Author's calculations.

It should be noted that *Ip* and *Sp* are inversely related. In addition, the excess government savings*,(Sg-Ig)* and the excess private savings, *(Sp-Ip)* are inversely related. This could support a weak Ricardian Equivalence Hypothesis. This inverse association suggests that the expansion of the government excess savings in the euro-

zone deficit countries have led to the crowding out of the private sector excess savings. Therefore, as there is no certainty about whether the twin deficit hypothesis is rejected, we proceed by estimating the portfolio model.

3.2 Estimation of the Portfolio Model

The purpose of this section is to estimate equation (12) with panel data from the deficit eurozone countries and from Germany, representing the "foreign" surplus country of our theoretical framework. With the intention to make data from different countries more comparable and also correct for inflation, data on the CA and budget balances are expressed as percentages of GDP. We have replaced ΔY with GDP growth, y, and for Germany ΔY^* is replaced with Germany's GDP growth, yg. Initially, we have tested for data stationarity. Table 7 reports the Hadri (2000) z statistic, the ADF-Fisher Chi square statistic, which are the most commonly used tests based on individual processes. According to these tests, stationarity of the variables cannot be rejected at the 1% or 5% level of significance, with the exception of the *BB/GDP* ratio and the relative growth of output *y/yg*. For these two cases stationarity can be rejected, on the basis of Hadri z statistic. In addition, the Pesaran (2007) test has been performed. This assumes heterogeneity in the autoregressive coefficient of the Dickey Fuller regression and allows for the presence of a single unobserved common factor. According to the Pesaran (2007) test, stationariy can be rejected for the difference in long run and short run interest rates.

The stationarity of the CA as a share of GDP for the southern eurozone countries, as well as for Germany has important implications for the Current Account deficit sustainability. Similar implications can be drawn from the stationarity of the budget balance with respect to GDP. Current Account deficit stationarity for EU and non-EU countries has been investigated with an AR-based boot strap approach to the Hadri (2000) test by Mark J. Holmes, Jesus Otero, and Theodore Panagiotidis (2010a). Also Holmes, Otero, and Panagiotidis (2010b) have performed an AR bootstrap approach to Hadri and Yao Rao (2008) test that supports stationarity and sustainability for thirteen EU countries. Concerning our test results, the fact that CA/GDP stationarity is rejected by the Hadri z test, suggests that stationariy should by further investigated.

Next we proceed with the estimation of (12), although there could be doubts about the stationarity of some variables. Empirical results obtained with EViews are reported in Table 5 that contains three alternative estimations of (12). The additional explanatory variable included in the estimation of (12) is competitiveness. In column (1) competitiveness is represented by the relative price expressed as the Harmonized Consumer Price Index of the southern eurozone countries with respect to Germany's. Column (2) includes the real effective exchange rate and column (3), the terms of trade measured as the price of exports with respect to the price of imports. Data on alternative measures of competitiveness and all other variables are taken from the AMECO data base of the European Commission.

Table 4 Unit Root Tests (Panel Data for Deficit Eurozone Countries, 1991-2010)

Variable	Panel data for deficit eurozone countries, 1991-2010			Single variable unit root tests	
	Test statistic			ADF	Phillips-Peron
	Hadri z statistic	ADF-Fisher Chi-square	Pesaran (2007) Chi-square		
CA/Y (CA balance/GDP)	2.35*	19.12	-2.7*		
ΔRb (Annual change in the long run interest rate of southern eurozone countries)	5.54*	26.06*	1.2		
ΔRf (Annual change in the long run interest rate of Germany)	7.79*	10.13		-5.52*	-5.79*
ΔRm (Short run interest rate)	5.52*	16.53	0.1		
BB/GDP (Budget balance of southern countries as a share of GDP)	0.97	23.11**	-4.9*		
BBg/GDPg (Germany's budget balance /GDP)	0.28*	29.88*		6.54*	-5.54*
y/yg Relative real output growth	1.20	82.61*	-2.9*		
Relative prices (Based on Harmonized Consumer Price Index)	7.66*	41.43*	44.01*		
REER (Real Effective Exchange Rate)	6.67*	54.68*	-6.1*		
TOT (Terms of Trade)	5.60*	25.03*	-2.9*		

Note: The asterisks *, **, *** correspond to statistics according to which, the Ho hypothesis of a unit root cannot be rejected at the 1%, 5% and 10% level of significance.

Source: Author's calculations.

Table 5   Estimation of the Portfolio Model for the Southern Eurozone Countries with Current Account Deficits, 1991-2010

Method of Estimation: Panel Two-Stage EGLS (cross section weights)
Dependent Variable: CA/GDP

Independent variables	(1)	(2)	(3)
ΔRb (Annual change in the long run interest rate of southern euro-zone countries)	-0.611*	-0.908*	-1.407**
ΔRm (Short run interest rate)	-0.040	-0.154	-0.198
BB/GDP (Budget balance of southern countries as a share of GDP)	0.171***	0.390*	0.247**
BBg/GDPg (Germany's budget balance as share of Germany's GDP)	-0.243*	-0.610*	-0.413*
y/yg Relative real output growth	-0.004*	-0.008*	-0.004*

Relative prices (Harmonized Consumer Price Index)	-0.108*		
REER (Real Effective Exchange Rate)		-12.270**	
TOT (Terms of Trade)			-0.348**
Constant	6.415***	7.378	31.041*
Adjusted R-squared	0.871	0.887	0.752
Standard error of regression	2.560	2.078	
F-statistic (probability)	62.346 (0.00)	84.248(0.00)	
Total panel observations (unbalanced)	106	110	107
Instruments used	REER(-1), y(-1), CA/GDP(-1)	REER(-1), y(-1), CA/GDP(-1)	TOT(-1), y(-1), CA/GDP(-1)

Note: The asterisks *, **, *** denote statistical significance of relevant coefficients at the 1%, 5% level and 10% level of significance, respectively.

Source: Author's calculations.

The method of estimation is the Two Stages Least Square with cross section weights. Subsequently, in Table 5, we observe the following.

First, concerning the effect of fiscal policies: the budget balance and the CA as percentages of GDP are positively related as implied by the positive and significant coefficients of *BB/GDP* in columns (1)-(3).This is consistent with the prediction of our model, as α_6 coefficient is expected to be positive, verifying the twin deficit hypothesis. It is reminded that the channel of influence from the budget balance to the Current Account balance is through the bonds market: an expansionary fiscal policy is financed through the issue of government bonds. If increased supply of bonds is met by higher demand, then the change in B, ΔB is positive and exerts a deteriorating effect on the CA balance, through equation (3), which is $CA=\Delta(F-B)$. If $\Delta B>0$ and $\Delta F=0$, then the CA is negative.

Germany's budget balance as a percentage of its GDP is inversely related to the CA/GDP of the deficit southern eurozone countries as expected from our model which predicts a negative value for α_7. This suggests that domestic as well as foreign fiscal policies are equally important in affecting external imbalances in the eurozone. So, an expansionary fiscal policy in Germany reduces the CA deficits of southern eurozone countries. And of course the opposite is true, that is, a tightening fiscal policy in Germany widens the deficits of the southern eurozone countries. If this is true, an underlying hypothesis with regard to twin deficits for Germany must hold. Nevertheless, this must be empirically investigated.

Secondly, about the effect of interest rates: in columns (1) and (2) of Table 5, specific coefficients are estimated for the variation in the long run interest rates, ΔRb and ΔRf.

The negative sign on ΔRb can be explained as follows. Increasing reductions in Rb causes the deterioration in the CA balance (as a percentage of GDP). According to our theoretical approach, the worsening of the CA is the outcome of a positive effect on the supply of B, which deteriorates the CA. Hence, for periods of declining interest rates, increasing negative changes in the long run interest rate is matched

with wider CA deficits. This happens because governments as well as the private sector can benefit by increasing their borrowing (issuing bonds) under the condition of fast falling interest rates. Therefore, widening CA deficits of the southern euro-zone countries over the period of 1991-2000 have been, to a certain extent, the result of sharp reductions in long run interest rates (Figure 4). We could, therefore, claim that the deteriorating CA balances of the deficit eurozone countries have been, to a certain degree, the result of financial integration and deregulation of the capital markets. The opposite effect is true. That is decreasing variations in the interest rates – as in the period after 2000 - are related with improving CA balances as a percentage of GDP. Convergence of interest rates among the EMU countries should, in part, explain an improvement in CA balances after the introduction of the Euro.

Thirdly, regarding the GDP growth y and y*: their coefficient is equal but of opposite sign. Contrary to what our model predicts an increase in the difference of output growth in the South has a deteriorating effect on the CA balance. This outcome is in line to the Keynesian tradition.

Fourthly, estimated coefficients of alternative measures of competitiveness in columns (1)-(3) are negative supporting the view that a loss in competitiveness leads to a deteriorations of the CA balance.

3.3 Implications for the Greek Economy

The results of our empirical investigation for the deficit eurozone countries hold for Greece as well. Hence, the deterioration of the Greek CA during the last two decades can be attributed to some extent to the financial integration and the introduction of the euro. The sharp decline in the interest rates in the 1990s made borrowing easier for the public as well as for the private sector. Also, we found that fiscal policies are of importance. Most surprisingly, German fiscal policy, representing the policies of the EU core euro countries, is of importance for the Greek Current Account. The twin deficit hypothesis therefore holds for the case of Greece. The Greek CA can improve through policies promoting the improvement of the country's competitiveness, that is, the Greek relative unit cost must decline. This cannot be achieved only by introducing horizontal cuts in incomes of public and private sector wage earners[4]. There are alternative policies that can be put into effect, such as promoting investment, technologies and innovations in exporting sectors and cutting taxes on selected products or industries. Unfortunately, the economic and political developments that have brought the country to the brink of default have created insecurity about the future and adverse expectations. These, together with severe and repeated wage cuts, have led domestic spending and investment to a nadir level. Given the economic environment of insecurity and instability, the country's competitiveness has declined, despite the decrease in the relative unit labour cost. The importance of the German Budget Balance in affecting the Greek CA indicates the crucial role that policy factors in the core countries of the EU can play. Unlimited lending to the Greek government to pay its debts will not help the country to recover from recession. On the contrary, a better synchronization of fiscal and monetary policy program for the eu-

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[4] As the 2010, 2011 and 2012 adjustment programs of the EU and IMF dictate.

rozone as a whole could be more successful if adjusted according to the needs of each country individually. It must be noted that the criteria of the Stability Growth Pact were repeatedly violated in the past by many countries for various reasons.

4. Conclusion

In this study we have examined the effect of the government deficit on the CA balance. Initially, we studied descriptive information about the fiscal developments, the financial situation and the CA of the southern eurozone countries. During the post Maastricht period, the CA balances of these countries have been in deficit. This contrasts with northern or core eurozone countries that have CA surpluses. Then we constructed a portfolio model incorporating the effect from financial integration and the creation of the euro. According to this the channel of influence from fiscal policy to the CA balance is the bond market, from where governments and the private sector can borrow. Finally we have tested our portfolio model with panel data from the countries of the southern euro area and Germany, representing the surplus countries of northern eurozone for the period 1991-2010. The conclusions we have drawn can be summarized as follows.

First, the twin deficit hypothesis is confirmed. An expansionary fiscal policy worsens the CA and the opposite of course, holds. This is true for the eurozone countries with CA deficits. The sample of deficit countries includes Greece, Portugal, Spain, Italy, France, Cyprus and Slovenia.

Secondly, fiscal policy of the surplus eurozone countries represented in our empirical examination by Germany influences the CA balances of the countries of southern eurozone. We found that expansionary (contractionary) fiscal policy of the German government improves (deteriorates) the CA deficits of the countries of the south.

Thirdly, fluctuations in the long run as well in short run interest rates affect the CA. A sharp decline in long run and short run interest rates, as during the 1991-1999 period has a deteriorating effect on the CA. Variations in the German long run interest rates also influence the CA deficits of the South with an opposite sign.

Fourthly, competitiveness, measured as the relative unit labour cost, is important. An improvement in competitiveness reduces the CA deficit.

In brief, the interdependence between south eurozone and core eurozone countries is crucial in determining CA imbalances within the EMU. For the elimination of these imbalances fiscal coordination, but not uniformity is important. Unilateral decisions such as reductions in the government budget balance are inadequate for the elimination of external distortions. Additionally, fiscal rules followed by all eurozone countries uniformly would be incapable of eliminating CA imbalances in the euro area.

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