Causality Relationships in the Structure of Portugal's Balance of International Payments

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Abstract

This paper provides an empirical investigation of the causal relationship between the current account and foreign capital inflows in the case of the Portuguese economy, during the period 1980-2009. We utilize unit root and cointegration analysis to test for the existence of a long run relationship. Furthermore, we examine the type of Granger-causality among the two variables on the basis of an augmented VAR model. Our findings suggest that there exists a long run relationship between foreign capital inflows and current account position that is based upon a unidirectional causal long-run relationship, running from foreign capital inflows to current account position. In the short-run we find a bidirectional relationship between the two variables. The results indicate that policies design for attracting foreign capital should take into account their current account deficit inducing implications and that policies aiming to improve the management of foreign capital inflows have a role in addressing indebtedness and external imbalances concerns.

JEL classification: F32, F21

Keywords: Current Account; Financial Account, Granger Causality, Portugal

1.Introduction

Foreign capital flows to the Portuguese economy have increased significantly since 1992. Exhibiting a significant upward trend, foreign capital inflows reached an average size of 15.2 percent of GDP during the 1992-2009 period; while during 1980-1991 their average size was 4.2 percent of GDP on average. Similar –although reverse- behavior can be noticed in the external position of the Portuguese economy. During the 1980-1992 period, the average current account position was -2.66 percent of GDP; after 1992, it widens significantly reaching -7.4 percent of GDP on average. The purpose of this paper is to examine the causal relationship between foreign capital inflows and current account deficits of the Portuguese economy, during the period from 1980 to 2009.
Theoretically, the direction of influence between foreign capital inflows and current account positions -if any- can go either way; foreign capital inflows can either drive or be driven by current account imbalances. By inducing real exchange appreciation, foreign capital inflows can be the driving force of current account worsening. On the other hand, financing requirements of a current account deficit can induce foreign capital inflows. The issue has important economic policy implications.

In the case that current account imbalances induce foreign capital inflows, concerns regarding the external balance of the economy should be dealt with policies focusing on managing domestic expenditure. On the other hand, if foreign capital inflows are the cause of current account deficits, then sustainability concerns regarding external debt should be dealt with policies focusing in managing capital inflows.

The growing empirical literature addressing the relationship between capital flows and current account balance provides mixed findings. Forogue and Veloce (1990) finds bidirectional causality between financial and current accounts for the case of Canada. Fry et al. (1995) examining 46 developing economies find no predominant tendencies on the causality between foreign direct investment and current account deficits. Bosworth and Collins (1999) -studying 58 developing countries- found that current account deficits drive foreign capital flows.

Wong et all. (1999) –studying the economies of Argentina, Thailand, Mexico and Philippines- find that financial account changes induce current account changes as the degree of their integration to international capital markets increased. Calderon et al. (2002) findings –on the basis of a data set of 44 developing countries for the period 1966-95- indicate –among others- that reductions in international real interest rates can induce downward shifts in the current account balance. Chinn and Prasad (2000) –examining eighty nine developed and developing countries for the period 1971-1995- find that "financial deepening does have a significant and robustly positive effect on the current account in developing countries but not in industrial countries". More recently, Sarisoy-Guerin (2003), Yan (2005), and Yan and Yang (2007) find that while for industrial countries current account changes induce foreign capital inflows, the direction of causality is reversed for developing countries. Ersoy (2011) -examining the Turkish economy- finds a unidirectional relationship running from financial inflows to current account deficits. Similarly, Mastroyiannis (2011) –examining the Greek economy- finds that capital inflows induce current account changes.

The pertinent empirical studies can be classified into two groups on the basis of the type of econometric analysis utilized. While some researchers use cross section analysis, others prefer a "country by country" approach. As noted by Maddala (1999), country differences -in terms of their development, their institutional structures, their capacity to manage change, data compilation techniques, among others- result to parameter heterogeneity and cross-correlated errors in a cross section analysis that may produce bias estimates. On the other hand, a "country by country" approach allows for a more in-depth analysis of the economy under examination. By taking into account the particular characteristics of the economy under examination directly into the empirical analysis can improve significantly the reliability of policy conclusions.

In this paper we examine the intertemporal links between current account positions and foreign capital inflows to the Portuguese economy in order to test for various causal relationships between them. We test for the existence of a long run relationship, as well as, the direction of influence between foreign capital inflows and external imbalances of the Portuguese economy, for the period from 1980 to 2009. Our findings suggest that there exists a unidirectional long run relationship, running from foreign capital inflows to current account position, during the period 1980-2009.

The rest of the paper is organized as follows. The next section presents our methodological approach. Section 3 provides a short description of the evolution of the institutional framework governing transactions in the current and financial accounts and presents that data and their statistical properties. Section 4 provides the empirical analysis and interpretation of the results. In the final section we summarize the main findings and provide our conclusions.

2.Methodological Issues

Our methodology for examining the relationship between foreign capital flows and the current account position of the Portuguese economy is based upon: a) the accounting framework that governs the Portuguese Balance of International Payments and b) theoretical considerations regarding their causality.

As a result of the double entry bookkeeping system employed in balance of payments accounting, the sum of current account balance (CAB), net capital flows (NT), net Financial Flows (NFF) , errors and omissions (EO) and reserve asset transactions (RT) equals –by definition-to zero. That is:

1. $CAB + NCF + NFF + EO + RT \equiv 0$

Equation 1 implies that a deficit in CAB will be matched necessarily by either a net surplus in NCF, or a net surplus in NFF, or the use of reserve assets, or by some combination of them (assuming there are no errors or omissions). In other words, a deficit in the current account will necessarily be matched by an increase of the liabilities to foreigners or by a decline in reserves. Equation 1 is an identity and, thus, it does not indicate a particular causal relationship among the variables involved; however, it suggests an indicative negative relationship between current account changes and changes in the financial account.

Economic theory provides contrasting hypotheses regarding the direction of influence between current account and financial account inflows. Foreign capital inflows can be induced by changes in current account balance. In this case, capital inflows accommodate a current account deficit by facilitating its finance.

On the other hand, capital inflows can induce current account deficits. In this case, foreign capital inflows result to real exchange appreciation, which -in turn- leads to current account worsening. Furthermore, a bidirectional causal relationship between capital inflows and current account positions may exist, as a result of the contemporaneous effect of changes in other economic variables to current account transactions and foreign capital inflows.

The elucidation of the direction of influence between current and financial accounts has important economic policy implications. In the case that a current account deficit is a "home grown" phenomenon that initiates capital inflows, economic policy addressing external imbalances should focus on the domestic conditions of the economy, implementing appropriate expenditure reducing and/or expenditure switching policies. On the other hand, if external conditions result in "pushing"[1] foreign capital to flow into the domestic economy, economic policies should focus in managing capital inflows and address their consequences.[2] Investigating the causality relationship between current account transactions and capital flows some researchers conduct their empirical analysis on the basis of net capital flows, while others use gross flows. We follow the second strand of literature and examine the relationship between foreign capital inflows and current account balance in order to shed light on the direct implications of foreign capital in current account patterns.[3]

3.Evolution of Institutional Framework and Data

Examination of the time profile of the institutional framework governing current account and capital account transactions reveals that steps towards international financial liberalization started in 1986; by1990, most of the existing capital controls were gradually dismantled. All remaining restrictions on short term capital flows were removed -in accordance with a European Union deadline- by 1992; the year that the Portugal became a member of European Exchange Rate Mechanism.[4]

Our empirical analysis is based on annual data on current account balance and gross foreign capital inflows, both expressed as a share of GDP, for the period 1980-2009. Current account balance (CA) is the sum of the trade balance on goods and services, net income from abroad and net current transfers. The source of our data on current account balance is the World Economic Outlook Database (International Monetary Fund 2011). Our data on gross foreign capital inflows (FC) consist of the sum of the domestic economy's foreign liabilities associated with direct and portfolio investment as well as other investment. The source of our data on these three categories of foreign capital inflows to the Portuguese economy is the International Financial Statistics (International Monetary Fund, 2011).[5]

The evolution of current account balance and foreign capital inflows is presented in Figure 1. With the 1981 and 1982, the current account balance is oscillating around zero up to 1996. After 1996, the current account position exhibits a persistent growing negative trend. As is indicated in Table 1, the average current account position expressed as a percent of GDP for the period 1980-1996 equals to -2.65, while after 1996 the averaged current account deficit rise to -7.4.

Similarly, the pattern of foreign capital inflows during 1980-1996 is different compared with their pattern after 1996. Foreign capital inflows as a percentage of GDP averaged to 4.19 before 1996. After 1996, foreign capital inflows exhibit a persistent growing trend, averaging to 12.46 percent of GDP. The inverse relationship between current account and foreign capital inflows presented in Figure 1 is validated by the negative correlation (-.497) between the two variables (see Table 1). Furthermore, visual inspection of Figure 1 indicates the presence of deterministic and/or stochastic trends in the data.

4.Empirical Analysis

Our empirical analysis consists of a three step procedure. First, we examine the time series properties of the data.

[1] See Calvo et. *al*. (1993) for an analysis of "push" and "pull" factors that induce capital mobility.
[2] For an analysis see Atish Ghosh et. *al*. (2008), Gilpin (2001), Yang (2007) and Calvo et. *al*. (1993).
[3] This approach is followed by Yan (2005), Yang, (2007), Ersoy, (2011) Mastroyiannis, (2011), among others.
[4] See Gibson et. al. (2005), OECD, (2002).
[5] See International Monetary Fund (1993) for description of the variables.

Next we investigate whether the series are cointegrated and, last, we examine for causal relationships between the two variables on the basis of a vector error correction model.

With regard to the statistical properties of the data, our findings suggest that FC and CA are non-stationary time series. We examine the order integration using four tests: the Dickey-Fuller (DF) test (Dickey and Fuller 1979), the Augmented Dickey Fuller (ADF) test (Said and Dickey 1984), the Philips-Perron's Z (PP) test (Phillips and Perron 1988) and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) (1992) test. The results are presented in Table 2. The DF, ADF and the PP tests examine the validity of the null hypothesis that a variable is a realization of a stochastic series containing a unit root. All three tests could not reject the null hypothesis that FC and CAB are non-stationary at their levels. In contrast, the null hypothesis of non-stationarity is rejected at 1% level of significance for the first difference of both variables. The KPSS test examines the null hypothesis that a variable is stationary. As with the first three tests, the null hypothesis is rejected for the levels of FC and CA; while, it cannot be rejected for their first differences at 1% and 5% level of significance respectively.

Assuming that both series are integrated of order one, in the next step of our analysis we examine whether they are cointegrated. We employ two cointegration test procedures proposed by Engle and Granger (1987) and Johansen and Juselius (1990). The Eagle-Granger procedure involves the OLS estimation of the presumed cointegrating equation and examination of the residual's order of integration. Statistically significant evidence that the residuals are I(0) indicates the existence of a long run equilibrium relationship between CA and FC. The time series properties of the residuals are examined using the Engle-Granger and the Phillips and Peron test. Both tests reject the null hypothesis of no cointegration.[6] The results are presented in Table 3.
Alternatively, we investigate whether FC and CAB are cointegrated using the Johansen and Juselius (1990) test procedure.

Assuming that FC and CA are cointegrated, the Granger representation theorem suggest that some type of causal relationship exists between the two variables. There are three possible directions of influence between the variables: two unidirectional causality relationships (CA→FC, FC→CA)[7] and one bidirectional relationship among the two variables (CA↔FC)[8]. We investigate which one of these causal relationships holds in our data on the basis of the following vector error correction model[9]:

2. $\Delta CA_t = a_0 + \sigma_1 (CA_{t-1} - \gamma FC_{t-1}) + \sum_{i=1}^{3} \alpha_{1i} \Delta CA_{t-i} + \sum_{i=1}^{3} a_{2i} \Delta FC_{t-i} + u_t$
3. $\Delta FC_t = \beta_0 + \sigma_2 (CA_{t-1} - \gamma FC_{t-1}) + \sum_{i=1}^{3} \beta_{1i} \Delta FC_{t-i} + \sum_{i=1}^{3} \beta_{2i} \Delta CA_{t-i} + e_t$

where Δ is the difference operator, $\alpha_{2\iota}$ and $\beta_{2\iota}$ represent parameters capturing short-run dynamics; σ_1 and σ_2 capture long-run dynamics; u_t and e_t are white noise. Estimation of equations 2 and 3 is free of spurious regression problems since CA and FC are stationary at their differences (see Table 2) and the term in parenthesis (the error correction term (EC)) is also stationary since CA and FC are cointegrated. Long run and short run causal relationships between CA and FC can be tested for on the basis of the estimates of the parameters of equations 1 and 2. Parameters σ_1 and σ_2 provide information about long run causal relationship(s). If $\sigma_1 \neq 0$ and $\sigma_2 = 0$, one long run causal relationship exists, running from FC to CA; if $\sigma_1 = 0$ and $\sigma_2 \neq 0$, the causal relationship runs the opposite direction. Estimates indicating that $\sigma_1 \neq 0$ and $\sigma_2 \neq 0$ suggest a bidirectional long run between FC and CA. Information regarding short run causality between the two variables can also be inferred on the basis of estimation of equations 2 and 3. If α_{21}, α_{22} α_{23} are jointly significantly different than zero, FC causes CA in the short run. In the case that β_{21}, β_{22} β_{23} are jointly significantly different than zero, CA causes FC in the short run.

[6] We include a quadratic trend in both tests on the basis of visual inspection of the presumed cointegrating vector that suggests it includes a quadratic trend.

[7] The shorthand notation → means direction of causation

[8] Since the two variables are cointegrated, the fourth possibility that the variables are independent is excluded. If the results of our causality tests indicate independency, they will be in direct contrast with the evidence that the variables are cointegrated.

[9] Traditional Granger causality test between two variables involves the estimation of a vector autoregressive (VAR) model on levels and testing parameter restrictions. Valid statistical inferences rely on the assumption that tests such χ^2 and F have standard asymptotic properties. Since in our case both variables are I(1) on the levels, the asymptotic properties of standard tests are nonstandard and estimation is subject to spurious regressions/causality problems. Therefore the traditional Granger causality test is inappropriate for examining the direction of causation in our data.

Estimates of equations 2 and 3 are presented in Table 4, along with diagnostic and specification tests. Structural breaks are not captured in the data by the Chow's F test. The lag length of the right hand variables of equations 2 and 3 are set equal to three on the basis of a sequential LR statistic, and the Akaike, Schwarz and Final Prediction Error information criteria. The Ramsey's regression specification test suggests that that omitted variables do not cause a specification problem. No significant serial correlation is captured by the Lagrange Multiplier test[10]. The Lutkepohl(2005) and Urzua (1997) multivariate tests can not reject the null hypothesis of multivariate normality with p-value equal 0,11(the low p-value is due to skewness in the FC variable). Last, no simultaneity bias is suggested by White's F statistic.

The coefficient of the error correction term in the equation 1 is significantly different than zero, but not in equation 2. With respect to short run dynamics, a Wald test on the significance of the coefficients α_{21}, α_{22} α_{23} rejects the null hypothesis that they are equal to zero as a group at a significance level of ?. Similarly the null hypothesis that β_{11} β_{12} β_{13} equal zero as a group cannot be rejected.

Our analysis indicates that in the long run there is a unidirectional causal relationship between CA and FC, running from FC to CA. In the short run the evidence suggest that a bidirectional causality between the two variables.

5.Conclusions

In this paper we examine the relationship between foreign capital inflows and the external position of the Portuguese economy, for the period 1980 to 2009. Our results indicate that although the series are individually non stationary, together they form a long run relationship. This long run equilibrium relationship is based upon a unidirectional causal relationship, running from foreign capital inflows to current account position. Our results are similar to those found for the case of Turkey (Ersoy (2011)) and Greece ((Mastroyiannis (2011)).

Our findings are in contrast with evidence of previous research indicating that current account deficits are a "home grown" phenomenon for developed economies; that is, foreign capital inflows are induced by current account deficits as an extra source of finance. On academics grounds, the results indicate that in the long run foreign capital flows are "pushed" into the economy of Portugal due to external factors, instead of being "pulled" into the economy due to internal economic conditions. In terms of economic policy implications, our results suggests that sustainability concerns regarding the growing current account deficit are best dealt with not only with switching/reduction expenditure policies, but also with policies addressing the management of foreign capital inflows.

Our results are subject to two qualifications. First the test results may be fragile due to the low number of observations and, second, specifications problems arising due to omitted variables problems should be further examined. An important question arises regarding the causal relationships among the variables that compose foreign capital inflows and current account position. Further study is warranted.

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[10] Serial correlation is depicted in the 8th lag

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7.Graphs and Tables

Table 1: Descriptive Statistics		
Portugal: 1980 2009		
Observations: 30		
	CA	FC
Mean	-0,054	0,105
Mean before 1996	-2,656	4,197
Mean after 1996	-7,429	15,257
Median	-0,058	0,083
Maximum	0,031	0,269
Minimum	-0,147	-0,009
Std. Dev.	0,050	0,076
Correlation (CA FC)	-0,497	

Figure 1

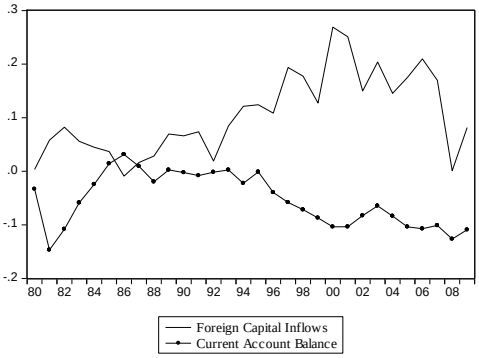

Table 2: Unit Root Tests				
	FC	ΔFC	CA	ΔCA
DF	-2.15 (0)	-5.80* (0)	-1.57 (0)	-1.52 (0)
ADF[a]	-2,47 (0)	-5.998* (1)	-1.55 (0)	-6.70* (1)
PP	-2.40	-6.838*	-1.547	-6.207*
KPSS[b]	0.1243*(3)	0.9625 (3)	0.1519** (3)	0.0985 (5)

[a]MacKinnon (1996) one-sided critical values for rejection of the null of unit root are used. The numbers in parenthesis represent the lag lengh used. The choice of the number of lags is chosen on the basis of the formula reported in Schwert (1989).
[b] Number in parenthesis indicate Newey-West Bandwith. *, **, *** denote rejection of the null hypothesis at 1%, 5%, 10% significance levels respectively.

TABLE 3: Engle-Granger and Phillips-Quliaris Cointegration Tests				
Cointegrating regression: CA = a + b*(FC)				
Eagle-Granger Cointegration Test				
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
FC	-2.93	0.157	-13.27	0.137
CA	-2,095	0.489	-8.84	0.375
Phillips-Quliaris Cointegration Test				
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
FC	-2,835	0.1848	-11.91	0.191
CA	-2,074	0.499	-8,659	0.3894

*MacKinnon (1996) p-values. Sample: 1980-2009. Included observations: 30. Automatic lags specification based on Schwarz criterion (maxlag=6).Null hypothesis: Series are not cointegrated. A quadratic time trend is included in the equation.

TABLE 4

Estimation of Equation 2

	Lagged Variables (parameter)								
Dependent Variable	c	EC σ_1	ΔCA_{t-1} (α_{11})	ΔCA_{t-2} (α_{12})	ΔCA_{t-3} (α_{13})	ΔFC_{t-1} (α_{21})	ΔFC_{t-2} (α_{22})	ΔFC_{t-3} (α_{23})	Wald test (χ^2): $\alpha_{21} = \alpha_{22} = \alpha_{22} = 0$
CA	-0.002	-0.60***	0.383	0.29	0.22	0.28	0.28	0.1	6.76* p-value: 0.0797 df.: 3
	-0.003	(-0.19)	(-0.20)	(-0.21)	(-0.16)	(-0.13)	(-0.12)	(-0.11)	

R2: 0.437, Adj. R2: 0.219, S.E. of regression: 0.018, Sum squared resid: 0.006126, Log likelihood: 71.69983, F-statistic: 2.001081, Prob(F-statistic): 0.111648, Ramsey RESET Test (LM df.:1): 0.29 (p-value:0.59), Jarque-Bera: 0.423 (p-value:0.80), Breusch-Godfrey Serial Correlation LM Test (χ2:(df5): 4.43 (p-value:0.49), ARCH Heteroskedasticity Test (χ2:(df1): 1.01 (p-value:0.31)

Numbers in parenthesis are standard errors. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively.

Estimation of Equation 3

	Lagged Variables (parameter)								
Dependent Variable	c	EC σ_2	ΔFC_{t-1} (β_{11})	ΔFC_{t-2} (β_{12})	ΔFC_{t-3} (β_{13})	ΔCA_{t-1} (β_{21})	ΔCA_{t-2} (β_{22})	ΔCA_{t-3} (β_{23})	Wald test (χ^2)
FC	-0.001	0.68	-0.67	-0.688	0.08	-1.51	0.08	-0.44	7.088 p-value: 0.0691 df.: 3
	(-0.003)	(-0.57)	(-0.38)	(-0.377)	(-0.33)	(-0.60)	(-0.63)	-0.47	

R2: 0.456513 Adj. R2: 0.245157 S.E. of regression: 0.054766 Sum squared resid: 0.053988 Log likelihood: 43.40989 F-statistic: 2.159921 Prob(F-statistic): 0.089123 Ramsey RESET Test (LM df.:1): 0.16 (p-value:0.67) Jarque-Bera: 18.68 (p-value:0.00) Breusch-Godfrey Serial Correlation LM Test (χ2:(df5): 11.06 (p-value:0.07) ARCH Heteroskedasticity Test (χ2:(df1): 0.45 (p-value:0.50)

Numbers in parenthesis are standard errors. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively.