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Working Paper

Current account determinants and external sustainability in periods of structural change

ECB Working Paper, No. 1243

Provided in Cooperation with:
European Central Bank (ECB)

Suggested Citation: Brissimis, Sophocles N.; Hondroyiannis, George; Papazoglou, Christos; Tsaveas, Nicholas T.; Vasardani, Melina A. (2010) : Current account determinants and external sustainability in periods of structural change, ECB Working Paper, No. 1243, European Central Bank (ECB), Frankfurt a. M.

This Version is available at:
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EUROPEAN CENTRAL BANK

EUROSYSTEM

WORKING PAPER SERIES

NO 1243 / SEPTEMBER 2010

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by Sophocles N. Brissimis,
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by Sophocles N. Brissimis[2], George Hondroyiannis[3], Christos Papazoglou[4], Nicholas T. Tsaveas[5] and Melina A. Vasardani[6]

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1 *Paper presented at the Eurosystem Seminar "Detecting Macroeconomic Imbalances in the Euro Area Countries" on 11-12 May 2009 in Frankfurt am Main. We are grateful to Eurosystem's Seminar participants, as well as George Oikonomou, George Demopoulos, Heather Gibson, Stephen Hall, Petros Migiakis, Angelos Kanas, other staff members of the Bank of Greece and, in particular, an anonymous referee for their comments and useful discussions. The views expressed in this paper do not necessarily reflect those of the Bank of Greece or the Eurosystem.*

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ISSN 1725-2806 (online)

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Abstract

The aim of this paper is to study the main macroeconomic, financial and structural factors that shaped current account developments in Greece over the period from 1960 to 2007 and discuss these developments in relation to the issue of external sustainability. Concerns over Greece's external sustainability have emerged since 1999 when the current account deficit widened substantially and exhibited high persistence. The empirical model used, which theoretically rests on the intertemporal approach, treats the current account as the gap between domestic saving and investment. We examine the behaviour of the current account in the long run and the short run using co-integration analysis and a variety of econometric tests to account for the effect of significant structural changes in the period under review. We find that a stable equilibrium current account model can be derived if the ratio of private sector financing to GDP, as a proxy for financial liberalisation, is included in the specification. Policy options to restore the country's external sustainability are explored based on the estimated equilibrium model.

JEL classification: F30; F32

Keywords: Current account model; external sustainability

Non-technical summary

Large and persistent current account deficits constitute a cause for concern, particularly when sustainability issues are raised and thus the economic prospects of a country are put at risk. Against this background, identifying the determinants of the current account is of considerable importance, as also documented by the development of a number of theoretical intertemporal models in the literature over the past decade. Several empirical applications of these models have drawn on the national accounting identity, which treats the current account balance as the difference between national saving and investment, emphasising the important role of the factors that influence consumption (saving) and investment decisions in explaining current account positions.

This paper attempts to ascertain empirically the determinants of the current account balance in Greece. The analysis extends over a period of almost 50 years (1960- 2007) and aims at revealing the main macroeconomic, financial and structural factors that influenced net national saving and thus shaped the course of current account developments. It should be noted that during most of the period under consideration, Greece experienced medium to small current account deficits, which were the result of diverse circumstances and policies in different sub-periods. In the last sub-period from 1999-2007, however, substantial widening and high persistence of the current account deficit were observed. This, in turn, has raised the issue of Greece's external sustainability in the context of the economy's ability to service its accumulated external debt obligations in the long run.

Our empirical analysis starts off by examining the current account from a long-run (equilibrium) perspective. We apply standard econometric techniques to establish whether there is a stable (co-integrating) relationship between the current account and several "fundamental" determinants of net national saving. Then, at a second stage, we explore the short-run dynamics of the current account in periods of small and large current account imbalances.

One of the main findings is that the financial liberalisation that took place in the 1990s and the process of monetary integration that led to the adoption of the euro in 2001 resulted in considerable credit expansion and fall in private savings, contributing to a substantial deterioration of the current account deficit. In the subsequent period of euro area membership, credit expansion and the current account deficit were maintained at high levels.

From a policy perspective, widening domestic saving and investment imbalances could lead to potentially disruptive adjustments, with implications for financial market stability and economic activity. Even though in principle large imbalances can be unwound in a gradual and orderly fashion, there are important downside risks. A slowdown in economic activity, perhaps larger than anticipated, along with heightened concerns over fiscal sustainability, could trigger a change in foreign investors' behaviour that could lead to very high risk premia or even abrupt disruptions in financial flows. This is particularly relevant in the context of the recent global financial and economic crisis which, although inducing some current account adjustment, seems to have exacerbated these risks.

Therefore, policy actions are needed to contain the current account deficit within limits. Indeed, while reverting to external sustainability is feasible, wide-ranging and bold policy adjustments that address both domestic demand excesses and unfavourable relative price differentials are needed for this purpose. The policy options that could be considered to restore current account equilibrium are fiscal consolidation, improvement of external competitiveness and implementation of structural reforms. Action on only one front is not sufficient to restore external sustainability within a reasonable time frame.

1. Introduction

Large and persistent current account deficits constitute a cause for concern, particularly when sustainability issues are raised and thus the economic prospects of a country are put at risk. In the case of small open economies that heavily rely on external financing, an adverse change in foreign investors' behaviour may trigger a process of sharp and disorderly adjustment of external imbalances with serious consequences for the economy. This is highly relevant in the recent global financial and economic crisis, which seems to have exacerbated these risks, partly on account of the fact that the correction of the current account imbalances in the aftermath of the crisis was considered to be mostly cyclical and short-lived.

Against this background, identifying the determinants of the current account is an issue of utmost importance, as also evident from the development of a number of theoretical intertemporal models in the literature over the last decade. Several empirical applications of these models have drawn on the national accounting identity, which treats the current account balance as the difference between national saving and investment and have suggested a number of "fundamental" factors as determinants of current account positions.

The main purpose of the paper is to construct an empirical model suitable for explaining the evolution of the current account balance in Greece. The analysis extends over a period of almost 50 years (1960- 2007) and aims at revealing the main macroeconomic, financial and structural parameters that affected net national saving and thus shaped the course of current account developments. Given the exceptional and crisis-related circumstances that characterised the global economy in 2008 and 2009, the analysis does not cover the very recent years.

In most of the period under consideration, Greece experienced medium to small current account deficits, which were the result of diverse conditions in different sub-periods. The last sub-period from 1999-2007, however, appears of particular interest as it is characterised by a substantial widening of the current account deficit that raises the issue of external sustainability. Our empirical analysis suggests that the financial liberalisation in the 1990s and the process of monetary integration that led to the adoption of the euro in 2001 resulted in considerable credit expansion and fall in the private saving ratio that contributed to much larger current account deficits, making the economy more vulnerable to external shocks.

In parallel, the paper introduces in the discussion of the current account the policy-related question of external sustainability, particularly relevant for the period since 1999. We define external sustainability, independently of our empirical model, as the current account to GDP ratio that stabilises the net foreign asset position (or alternatively, external debt for simplicity) to GDP ratio. A novelty of the paper, in this respect, is that it relates the policy measures needed to restore external sustainability to the specific variables of the equilibrium current account model that is developed. A further contribution of the paper is the use of a variety of econometric tests for both the long-run analysis and the short-run dynamics in order to account for shifts in behaviour during times of significant structural change. This is particularly true in the case of Greece, which in the period under review went through a process of financial liberalisation and policy regime changes that substantially altered the country's macroeconomic conditions. The paper concludes by exploring possible policy options for reverting to external sustainability, while illustrating with an example of comparative static analysis how the estimated equilibrium model could be applied to simulate different adjustment paths.

The rest of the paper is organised as follows. Section 2 discusses the stylised facts concerning current account developments and sectoral saving-investment gaps in Greece. A description of the empirical model and the determinants of the current account appear in Section 3. Section 4 examines the methodological issues and presents the data sources. The empirical results are analysed in Section 5, while the policy implications are addressed in Section 6. Finally, Section 7 concludes.

2. Stylised facts

Historically, Greece's current account balance has been characterised by medium to small deficits (1.7 percent of GDP in the period from 1960 to 1973 and 2.2 percent of GDP in the period from 1982 to 1998) or small surpluses (0.9 percent of GDP in the period from 1974 to 1981). Since 1999, however, a dramatic deterioration of the Greek current account balance has been observed, with the external deficit reaching on average 11.2 percent of GDP.

The sectoral breakdown of the national saving-investment gap between private sector and general government provides some insights into the possible origins of Greece's current

account problems (see Figure 1). In the earlier period from 1960 to 1973, current account deficits were the result of rising private investment, in excess of also rising private saving, which overall offset moderate fiscal surpluses. This was a period of high output growth at an average rate of 8.6 percent. Given the stable long-run financial inflows, particularly foreign direct investment that included investment in real estate, the current account deficit of that period did not raise any particular concerns.

In the post-1974 period, a number of changes occurred in the saving and investment behaviour of both the private and the public sector that seem to relate to the gradual worsening of the current account position. First, private investment steadily weakened, broadly in line with the stages of economic development, where higher capital stock building is required in the earlier phases of the catching-up process.[1] However, its muted evolution since, might also indicate a certain degree of misallocation of the increased inflows of EU cohesion funds towards consumption rather than investment in the 1980s and the 1990s. As a result, the net private saving-investment gap was positive until mid- to late-1990s, when a strong decrease in private saving turned it back into negative. The large deterioration of private saving coincided with the years of financial liberalisation in Greece, the completion of the Single Market and the process of monetary integration in the EU. Second, significant fiscal expansion took place, mostly as a result of increased government consumption rather than government investment; the latter remained relatively stable throughout the respective period, with a slight pick-up due to public infrastructure projects in the late 1980s and the 1990s (cohesion policy packages) and in 2004 (Olympic Games; see Figure 2). Fiscal consolidation appeared to be the case only in the sub-period from 1995 to 1999, in the context of the convergence efforts undertaken by the Greek authorities to meet the euro area entry criteria. Finally, in the most recent sub-period, since 1999, the negative net saving positions of both the public and the private sectors further widened, again largely as a result of falling saving rather than booming investment.

The impact of these developments on the current account seems to partly depend on the interaction between the private and the public sectors. In the earlier sub-period from 1974 to 1995, private saving fully or largely counteracted the high and sometimes double-digit

[1] See Debelle and Faruqee (1996), Faruqee and Debelle (1998) and Chinn and Prasad (2003). A less developed country has a larger deficit, as the marked need for investment is accompanied by relatively low domestic saving. At an early stage of development, the external financing requirement initially rises with the increasing development of a country, but then goes down when a higher level of development has been achieved.

fiscal deficits, keeping thus current account imbalances under control. This Ricardian effect however has become less evident since 1996 and was consequently reversed after 1999, having significant implications for current account developments.

Thus, it was the private sector's behaviour that seems to have played a far more crucial role in the widening of Greece's current account imbalances in the post-1999 period. Table 1 shows that the fall in private saving accounted for essentially all (and more) of the deterioration in the external balance, with the other items having a small and mostly countervailing impact. The saving ratio fell from 25 percent or higher in the pre-1995 period to slightly above 10 percent in the period after 2001, with most of the deterioration predating Greece's euro area entry. One can thus venture the hypothesis that *prima facie* financial liberalisation and the process to EMU accession, with falling inflation and interest rates among other factors, were responsible for the sharp fall in the national saving ratio[2] and the subsequent large worsening of Greece's current account balance. The experience of other peripheral EU countries, which liberalised their financial systems around the same time as Greece, was similar. In effect, some widening of the current account deficit was to be expected, but not necessarily of that magnitude and speed.

3. Determinants of the current account

The economic theory underpinning this paper stems from the *intertemporal approach to the current account*, which was initially proposed by Sachs (1981) and Buiter (1981) and later extended by Obstfeld and Rogoff (1995). Empirical applications of the model have followed two directions (see Bussière *et al*., 2004; Ca' Zorzi and Rubaszek, 2008). On the one hand, several studies have tried to establish evidence in favour of the baseline model using different testing strategies (e.g. see Bergin and Sheffrin, 2000; Nason and Rogers, 2006). On the other hand, a number of papers have examined the long-run relationship between the current account and its fundamental macroeconomic determinants by applying standard econometric techniques (e.g. see Debelle and Faruquee, 1996; Blanchard and Giavazzi, 2002; Chinn and Prasad, 2003; Bussière *et al*., 2004; Hermann and Jochem, 2005; Gruber and Kamin, 2007; Ca'Zorzi *et al*., 2009). The present paper draws upon the second

[2] About one fifth of the decline of the ratio of private saving to GDP can be attributed to the fall in the disposable income to GDP ratio, reflecting increased taxation of the private sector.

line of research and attempts to empirically test some of the implications for the current account as suggested by the intertemporal model. Since the literature on current account modelling is vast and numerous specifications are available, we proceeded by selecting standard variables that are typically included in current account regressions, including credit to the private sector, which is of particular interest for Greece in the period under review.

The starting point of the empirical analysis is the accounting identity of the current account (*CA*) being equal to the difference between domestic saving (*S*) and investment (*I*). We are particularly interested in investigating the determining factors of private saving, since *prima facie* evidence suggests that private saving plays a pivotal role in explaining current account developments in Greece. For normalisation purposes, all variables are expressed as ratios of GDP. We specify the private saving to GDP ratio (S_P / Y) as a function of different economic variables, including domestic real GDP per capita (Y / N) relative to the real GDP per capita of a reference country (Y^* / N^*), the real effective exchange rate *(REER)*, the ratio of the general government fiscal balance to GDP $((S_G - I_G)/Y)$ and the ratio of private investment to GDP (I_P / Y). It is obvious that domestic investment plans by private agents will affect private saving ratios to the extent that these are financed domestically.

Our basic private saving specification is the following:

$$\frac{S_P}{Y} = f\left(\frac{Y}{N} / \frac{Y^*}{N^*}, REER, \frac{S_G - I_G}{Y}, \frac{I_P}{Y}\right) \tag{1a}$$

In addition to the basic specification, the following financial and demographic factors are considered to explain the private saving rate: (i) credit to the private sector as a percent of GDP *(CRP)*, (ii) the real interest rate *(RIR)* and (iii) the dependency ratio (or alternatively the fertility rate) *(DEM)*. Finally, the effect of macroeconomic uncertainty, proxied by inflation volatility *(VOL)*, is taken into account. The extended private saving specification reads as:

$$\frac{S_P}{Y} = f\left(\frac{Y}{N} / \frac{Y^*}{N^*}, REER, \frac{S_G - I_G}{Y}, \frac{I_P}{Y}, CRP, RIR, DEM, VOL\right) \tag{1b}$$

Relative real GDP per capita represents an important factor in explaining current account developments (e.g. see Freund, 2000), linking the intertemporal approach to the

current account and the stages of development hypothesis. A small open economy that starts from relatively low domestic income is expected to have low saving, as the optimal consumption levels are high relative to current income. This implies increased external borrowing against future income, which coupled with substantial initial investment needs, would translate into larger current account deficits at an early stage of development. As the economy catches up and a higher level of development is achieved, external financing needs tend to moderate. Thus, we expect relative real GDP per capita to be positively related to private saving and the current account.

An appreciation of the *REER* increases the purchasing power in terms of imported goods of current and future income, as well as the value of the accumulated monetary and property assets of domestic agents. This effect tends to raise consumption and reduce the propensity to save**.** Thus, an increase in *REER* is expected to decrease private saving and the current account.

The relationship between fiscal policy, on one hand, and private saving and current account, on the other, depends on the extent to which consumers react in a Keynesian or Ricardian manner.[3] The Keynesian model assumes that a higher fiscal deficit (or lower fiscal surplus), as a result of lower taxes or higher government spending, increases disposable income and thereby consumption and decreases private saving, leading to a higher current account deficit (or lower current account surplus). The economic reaction of private agents under the Keynesian model supports the twin-deficit hypothesis, according to which wider fiscal deficits should usually be accompanied by wider current account deficits. However, the twin-deficit hypothesis does not necessarily hold when consumers act in a Ricardian manner. If the fiscal situation is perceived by agents as increasingly unsustainable, then tax increases or reduction in government spending (i.e. fiscal consolidation) are expected in the future,

[3] For a literature review, see Debelle and Faruquee (1996), Bussière *et al.* (2005) and Briotti (2005). The empirical work by Nickel and Vansteenkiste (2008) shows that the government debt to GDP ratio can partly explain the Ricardian or Keynesian behaviour of private agents. In countries with debt to GDP ratios up to 90 percent, the relationship between the government balance and the current account balance is positive, i.e. an increase in the fiscal deficit leads to a higher current account deficit. In very high debt countries, however, this relationship turns negative but insignificant, implying that a rise in the fiscal deficit does not result in a rise in the current account deficit. Implicitly, this result suggests that households in very high debt countries tend to become Ricardian. The composition of government spending may also be important (see Bayoumi and Masson, 1998). For example, public investment, to the extent that it is viewed as productive, is not expected to require further taxes and should not generate a private saving response. By contrast, investment that does not generate revenues for the government (and is considered equivalent to government consumption) would involve future taxes and might induce a larger private saving offset.

which will affect agents' future net wealth. In this case, a higher fiscal deficit (or lower fiscal surplus) in the present decreases consumption and increases precautionary saving, so that agents maintain their long-run rate of consumption, in an environment of reduced future disposable income. This would lead to a lower current account deficit (or higher current account surplus). Thus, to the extent that private agents do not adjust their saving more than the change in the fiscal balance, we expect the current account to respond positively to the fiscal balance.

In the extended specification a demographic variable is added, since the age profile of the population is likely to be a structural determinant of domestic saving. An increase in the dependency ratio or the fertility rate will decrease the saving ratio because, according to the life-cycle hypothesis, the young and the old are net consumers. However, other factors like the desire of the elderly to leave bequests, the uncertainties about the lifespan after retirement and the financial support that will be required, as well as the public-pension portion of their incomes, may urge them to save rather than spend. Consequently, the effect of the demographic variable on private saving and the current account may be positive or negative.

In addition to these standard determinants, the variables of credit to the private sector, real interest rate and inflation volatility are also included in the specification.

A potentially important determinant of saving that appears in the empirical literature is financial liberalisation, hereby proxied by credit to the private sector as percent of GDP. The process of deregulation in financial markets is usually associated with lower levels of private saving, as the borrowing constraint faced by households is relaxed. Meanwhile, financial liberalisation and capital market integration allow banks to lend at a lower cost to individuals, for instance for house purchases or consumption. This may lead to significant declines in saving, as empirical evidence based on countries that have liberalised access to consumer credit has shown (see Jappelli and Pagano, 1989; Bayoumi, 1993; Lehmussaari, 1990 and Ostry and Levy, 1995).[4] The variable of private credit as percent of GDP is also likely to capture similar effects, i.e. on credit conditions and private agents' borrowing behaviour, brought about by the process of monetary integration, as well as wealth effects associated with the sharp increase in asset prices, particularly house prices. For example,

[4] For further evidence showing that financial liberalisation increases consumption, and significantly decreases saving, while it does not substantially increase investment, see Melitz (1990), Englund (1990) and Osugi (1990).

evidence has shown that the increase in house prices in a number of industrial countries over the last decade has reinforced household mortgage borrowing, while at the same time its positive wealth effect has resulted in a reduction in household saving (see Faulkner-MacDonagh and Mühleisen, 2004). Thus, private credit is expected to influence negatively private saving and the current account.

As far as the real interest rate is concerned, its rise increases the rate of return on saving and, thus, the saving ratio.[5] In the same vein, the reduction in interest rate spreads and currency risk, due for example to financial liberalisation and nominal convergence in the EU, is expected to reduce private saving (as well as increase private investment) for countries like Greece that are net borrowers. Therefore, the real interest rate is expected to be positively related to private saving and the current account.

Finally, macroeconomic uncertainty is captured by the inflation volatility variable. The predominant finding in the literature is that agents in economies that are characterised by more volatile inflation tend to save more for precautionary reasons, in order to smooth their consumption streams in the face of volatile future income flows**.** However, there is some empirical evidence that high inflation volatility might lead to less saving, as it advances expenditure in time by creating a climate of insecurity that works in the opposite direction, that is favouring present (relative to future) consumption.[6] As a result, the sign of the volatility of inflation variable is inconclusive and can only be determined empirically.

Substituting equation (1b) into the accounting identity of the current account yields:

$$\frac{CA}{Y} = f\left(\frac{Y}{N}/\frac{Y^*}{N^*}, REER, \frac{S_G - I_G}{Y}, \frac{I_P}{Y}, CRP, RIR, DEM, VOL\right) + \frac{S_G - I_G}{Y} - \frac{I_P}{Y} \qquad (2)$$

Private investment as a percent of GDP is considered both as a determining factor of private saving, as well as an autonomous variable influencing directly the current account balance. Similarly, the fiscal balance is taken into the equation as the determining factor of S_P and autonomously without any further breakdown, as it is difficult to comprehensibly

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[5] The income effect of interest rate changes on saving is not taken into account, as most empirical studies have found a positive, although often insignificant, interest rate elasticity of saving.

[6] See for example, Dayal-Gulati and Thimann (1997) and recent work by Nocetti and Smith (2010).

distinguish the factors that influence public consumption (saving) and public investment, since government decisions do not always follow purely economic considerations.

A linear representation of equation (2) can be written as[7]:

$$\left(\frac{CA}{Y}\right)_t = \beta_0 + \overset{+}{\beta_1}\left(\frac{Y}{N}/\frac{Y^*}{N^*}\right)_t + \overset{-}{\beta_2}\, REER_t + (1+\overset{+}{\beta_3})\left(\frac{S_G - I_G}{Y}\right)_t + (\overset{-}{\beta_4} - 1)\left(\frac{I_P}{Y}\right)_t + \\ + \overset{-}{\beta_5}\, CRP_t + \overset{+}{\beta_6}\, RIR_t + \overset{+/-}{\beta_7}\, DEM_t + \overset{+/-}{\beta_8}\, VOL_t + \varepsilon_t \qquad (3)$$

If $(1+\beta_3)=0$, the Ricardian equivalence holds. If $(\beta_4 - 1)=0$, domestic saving fully finances domestic investment (Feldstein-Horioka hypothesis[8]). According to the arguments above, a positive sign is expected for β_1, $(1+\beta_3)$ and β_6, a negative sign for β_2, $(\beta_4 - 1)$ and β_5, while the signs of β_7 and β_8 cannot be determined a priori.

4. Methodological issues and data

As discussed, the main purpose of the empirical analysis is to identify the current account determinants in Greece over the period from 1960 to 2007. At the first stage, a co-integration vector is estimated and tested for stability. At the second stage, two alternative non-linear models of the dynamics of the current account, in addition to the linear model, are selected, a regime-switching model (RS-R) and a threshold model (TA-R), and estimated conditional on the stable co-integrating equation obtained at the first stage. These types of models are employed to analyse the short-run behaviour of the current account when the latter is subject to regime shifts or changes above or below a threshold value. Under this assumption, the estimated model can accurately capture nonlinearities and/or asymmetries resulting from regime shifts.

Before estimating the long-run relationship, we test for the order of integration of the variables. Standard tests for the presence of a unit root based on the work of Dickey and Fuller (1979, 1981), Perron (1988), Phillips (1987), Phillips and Perron (1988), Kwiatkowski *et al*. (1992) and Lee and Strazicich (2004) are used to investigate the order of integration of the variables employed in the empirical analysis. In particular, we test for a unit root in the presence of a structural break by using the Lee and Strazicich (2004) minimum LM unit root

[7] See also Herrmann and Jochem (2005).
[8] For a discussion see Coakley *et al.* (1996).

test that endogenously determines a structural break in intercept and trend. The one-break minimum LM unit root test, unlike the Zivot and Andrews (1992) test, does not exhibit size distortions in the presence of a break under the null.

The order of integration of the ratio of the current account balance to GDP (CA/Y) is important for the additional reason that it is related to the notion of external sustainability (see Trehan and Walsh, 1991). The latter is defined in the paper independently of the empirical current account model that is developed and on the basis of the ratio of net foreign asset position to GDP, which must be a stationary process in the steady state (see also discussion in Section 6), implying, among others, that the economy satisfies its intertemporal long-run budget constraint (see Taylor, 2002). The external debt sustainability condition holds if the $CA\ /\ Y$ ratio is stationary. However, non-stationarity of the ratio does not necessarily indicate external debt non-sustainability, unless a number of conditions hold. A more informative way of examining this issue is to look at the following long-run regression equation (see Holmes, 2006):

$$\left(\frac{X}{Y}\right)_t = \beta_0 + \beta_1\left(\frac{M^*}{Y}\right)_t + \varepsilon_t \tag{4}$$

where X is exports of goods and services, M^* is imports of goods and services minus net factor incomes and net unilateral transfers[9] and $X - M^* = CA$. Given that X/Y and M^*/Y are non-stationary variables, failure to detect co-integration between them would indicate that the economy fails to satisfy its long-run budget constraint and, therefore, is expected to default on its external debt (see Hakkio and Rush, 1991). If, however, exports and imports are co-integrated, i.e. ε_t is an I(0) process, and moreover (β_0, β_1) is $(0,1)$, then this would imply external debt sustainability, because in this case the current account would be balanced. If exports and imports are co-integrated, but $\beta_1 \langle 1$ or $\beta_0 \neq 0$ and $\beta_1 = 1$, then the current account is out of balance and the external debt as percent of GDP is unsustainable and can increase without bound.[10]

[9] Net payments of interest and net receipts from shipping largely account for the net factor income component of the Greek current account.

[10] In order to test for co-integration between the two variables, the Engle-Granger approach is used. Since over longer periods, shifts in industrial structure, productivity, etc may have occurred which altered the long-run relationship, the Gregory and Hansen (1996) co-integration tests that account for an endogenously determined break are applied. This is a two-step procedure (as is also the Engle-Granger procedure), in which dummy variables are included in the co-integrating equation to account for possible shifts.

Once the order of integration of the variables has been determined, the long-run relationship, equation (3), which is our final current account specification, is estimated. Co-integration testing is performed using the fully modified OLS (FM-OLS) regression technique of Phillips and Hansen (1990), which modifies least squares to account for the endogeneity in the regressors resulting from the existence of a co-integrating relationship. The fact that since 1999 a considerable worsening of the current account deficit has taken place might conceivably create instability in the estimated long-run relationship towards the end of the sample. As long-run stability implies that the estimated parameters of the co-integrating relationship are invariant over time, to allow for valid inference, we carry out stability tests taking into account: (i) the non-stationarity of the variables and (ii) that a break in the estimated long-run relationship may have occurred towards the end of the sample period. Andrews and Kim (2003) proposed a co-integration breakdown test appropriate for testing the end-of-sample stability of a co-integrating relationship. The co-integration breakdown test is a generalisation of the Chow test for stability and can be applied to the FM-OLS procedure. For this purpose, two statistics from Andrews and Kim (2003) are reported, the P_c and R_c statistics, which detect whether the breakdown of the co-integrating relationship is due to a shift in the estimated parameters or a change in the distribution of the co-integration residuals, which in that case will no longer be stationary.

Finally, an error correction model is estimated for the CA/Y using OLS and, alternatively, RS-R or TA-R models. Engle and Granger (1987) show that in the presence of co-integration, there always exists a corresponding error-correction representation, which implies that changes in the dependent variable are a function of the lagged error of the co-integrating relationship (error-correction term), as well as changes in the explanatory variables. However, if there is a structural change in the short-run dynamics of the error correction model, the resulting estimate of the coefficient of the error correction term is not consistent. An underlying assumption of OLS is that the coefficients are constant, so in order to capture possible regime shifts two different methods of estimation of the error correction model are employed, the RS-R and the TA-R models. In the RS-R model the regime shift is exogenously determined, while in the TA-R model the regime-generating process is not

assumed to be exogenous, but directly linked to the endogenous variable. Both models are estimated with two regimes. [11,12]

The empirical analysis was carried out using annual data for the period from 1960 to 2007. The current account variable (CA/Y) is the ratio of the current account balance to nominal GDP, the fiscal balance $((S_G - I_G)/Y)$ is equal to general government saving minus investment as percent of GDP and the private investment rate (I_P/Y) is private investment as percent of GDP. The data above, as well as the exports *(X)* and adjusted imports (M^*) as percent of GDP are obtained from the Greek National Accounts. $REER$ index is the CPI-deflated real effective exchange rate obtained from Eurostat. An increase in $REER$ implies appreciation of the currency. The ratio $(\frac{Y}{N}/\frac{Y^*}{N^*})$ is calculated (in logs) as the difference between real GDP per capita in Greece and Germany. Real GDP and the population of Germany are taken from the IMF's *International Financial Statistics* (IFS), while the source for the population of Greece is the National Statistical Service of Greece. Credit to private sector (CRP) is (the log of) the ratio of claims of banks on resident sectors other than the government sector (IFS) to GDP. The source for the demographic variables of the dependency ratio and the fertility rate *(DEM)* is the OECD Health Database. The real interest rate *(RIR)* is the deposit rate or Treasury bill rate (IFS) adjusted for CPI inflation (National Statistical Service of Greece). Finally, inflation volatility (VOL) is the variance of the annual inflation rate based on quarterly CPI data.

We constructed a GARCH measure of volatility as follows:

Mean equation: $$\pi_t = \alpha_0 + \alpha_1 \pi_{t-1} + \alpha_1 \pi_{t-2} + \varepsilon_t \quad (5)$$

Variance equation: $$\sigma_t^2 = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 \sigma_{t-1}^2 + \beta_3 \pi_{t-1} \quad (6)$$

where π_t is the annual CPI inflation rate and ε_t is a random error. The conditional variance in equation (6) is a function of four terms: (i) the mean, β_0, (ii) news about inflation volatility in the previous period, measured as the lag of the squared residuals from the mean equation,

[11] Following Krolzig (1997) and Krolzig *et al.* (2002), the RS-R and the TA-R models are estimated with shifts in the coefficients (including the constant) and the error variance Σ.
[12] The RS-R and the TA-R models are estimated by means of the EM algorithm proposed by Dempsteir *et al.* (1977), using the MSVAR software developed by Krolzig. For more details, see Krolzig (1997).

ε_{t-1}^2 (the ARCH term), (iii) last period's error variance, σ_{t-1}^2 (the GARCH term) and (iv) inflation in the previous period.

5. Empirical results

The ADF, PP, KPSS and Lee-Strazicich tests for stationarity were applied to all the variables in levels and first differences.[13] Table 2 presents the results for the ADF and the Lee-Strazicich tests. All variables except *VOL* were tested for stationarity assuming a shift in the mean. The *VOL* variable was tested assuming a shift in the mean and in the trend. The ADF statistic suggests that all variables are integrated of order one, I(1). The Lee-Strazicich test confirmed the stationarity properties of the first difference for all variables and moreover suggested that *VOL* is I(0).[14] Hence we concluded that the current account ratio was non-stationary, which in turn indicated that some further testing was needed for the external sustainability issue.

Thus, we tested for the existence of co-integration between X/Y and M^*/Y, both of which can be shown to be I(1) series (see Table 2 and Figure 3). The co-integrating relationship between these two variables was estimated by employing the Engle-Granger method. The ADF test was applied to test for the stationarity of the residuals of this relationship. This test could not reject the null hypothesis of no co-integration between the two variables at the 5 percent level of significance (ADF= -1.72).[15] Two dummy variables were included in the co-integrating relationship to account for a potential break in 1999, a year in which the current account deficit widened substantially. The first dummy affects the intercept and takes the value of 1 for all the years since 1999 and the other one is a slope dummy, which affects M^*/Y. The co-integrating relationship between X/Y and M^*/Y was estimated by employing again the Engle-Granger method. The ADF test rejected the null hypothesis of no

[13] The results do not include variables that were found insignificant in the co-integration analysis (see also footnote 16).

[14] The results of the PP and the KPSS unit root tests are available from the authors upon request.

[15] Since this result might be biased in favour of accepting the null hypothesis of no co-integration, due to the existence of structural breaks, the Gregory-Hansen test which accounts endogenously for possible changes in the co-integration vector over the estimation period was applied. The various tests (level shift: -4.02, level shift with trend: -4.25 and regime shift with potential break point: -4.55) suggested that the data support the hypothesis of no co-integration between the two variables.

co-integration among the variables at the 5 percent level of significance (ADF= -3.48). The results indicated that for the period from 1960 to 1998 the estimated coefficient of $M*/Y$ is equal to 0.99, which is not different from one (t= -0.02) and the constant term is not different from zero (t= -0.03), while for the period from 1999 to 2007 the coefficient of $M*/Y$ is equal to 0.19, which is smaller than one (t= -12.27). This implied that Greece's external position was sustainable in the period from 1960 to 1998, but not in the later period from 1999 to 2007.

As a next step, the model for the current account with the basic specification for the private saving rate (equation 1a) was estimated using FM-OLS (see Table 3). All the estimated coefficients have the right sign and are statistically significant except that of the *REER* (see Table 3, basic specification). The Andrews and Kim (2003) breakdown tests were applied to test for the stability of the parameters of the co-integrating relationship. One break was considered towards the end of the estimation period in 1999. The results reported in Table 3 (see panel 2) clearly show that the stability of this specification is rejected at 1 percent level of significance, indicating the existence of a break. Next, an extended specification was estimated where two more variables, the credit (*CRM*) and the inflation volatility (*VOL*) variables, were included into the model.[16] All the estimated coefficients have the expected sign and are statistically significant. Moreover, the stability of the estimated co-integrating equation cannot be rejected.

A number of interesting results emerge from the above extended specification (see Table 3, last column). First, the stage of development matters. The positive estimated coefficient of relative real GDP per capita implies that the current account deficit will narrow as real GDP per capita in Greece converges to that of Germany. Second, the negative coefficient of the *REER* indicates that an appreciation of this rate influences adversely the current account not only through worsened international competitiveness and reduced net exports (trade channel) but also through reduced saving due to higher purchasing power in terms of imported goods and increased value of the accumulated financial and real assets. Third, the estimated coefficient of the fiscal balance is greater than zero and less than one. This implies that an increase in the fiscal deficit is only partially offset by an increase in private saving, thus widening the current account deficit. Therefore, evidence points against

[16] Preliminary estimations of the model showed that the real interest rate (*RIR*) and the demographic variables (*DEM*) were not significant and therefore these variables were omitted. All the regressions are available from the authors upon request.

complete Ricardian equivalence, supporting the twin-deficit hypothesis. Fourth, the estimated coefficient of private investment is statistically significant indicating that domestic saving only partially finances private investment and thus the Feldstein-Horioka hypothesis is rejected. Consequently, a rise in private investment would tend to increase the current account deficit. Fifth, the highly significant negative effect of credit on the current account indicates that the relaxation of the borrowing constraints for the private sector following financial liberalisation and the falling interest rates, also partly due to the process of monetary integration, have led to a sizeable deterioration of the current account balance during the last decade, as consumption increased and saving fell. Finally, inflation volatility, which is a proxy for macroeconomic uncertainty, surprisingly affects negatively the current account by reducing saving.

At a second stage, the error correction model was estimated for the current account, initially for the entire period [17] (see Table 4, last column). Only the coefficient of *REER* was statistically significant and had a negative sign, implying that an appreciation of the currency resulted in a deterioration of the current account position. All the other coefficients including that of the error correction term were not statistically significant. The non-significance of the error correction term indicated that the current account balance was weakly exogenous, implying that deviations from equilibrium were not corrected in the short run, as there was no tendency for the current account to return to equilibrium. Instead, it was through real exchange rate changes that the current account adjusted.

However, the linear error correction model may not be appropriate to capture differences in the short-run dynamics due to regime shifts. For this purpose we employed in addition the RS-R and the TA-R models.[18] In the RS-R model two regimes were selected. Regime 1 is the period before 1991 and regime 2 is the period since 1991. The year 1991 marks the beginning of a period characterised by the transition from high inflation (around 20 percent) to single-digit inflation (see Garganas and Tavlas, 2001). The estimation results in Table 4 suggest that during the first regime, i.e. before 1991, all the estimated coefficients except that of

[17] A one year lag for all the variables of the error correction model was adopted.

[18] All the linearity tests strongly reject the null hypothesis of linear relationship for both models (LR= 24.32 and LR= 42.95 respectively). Moreover, the AIC and SC criteria are smaller in value in the case of non-linear models indicating a better fit. In addition, standard errors are different among regimes in both models, but considerably smaller compared with that of the linear model. This last finding suggests that the correlation among the variables is different across regimes.

REER were not statistically significant. The non-significance of the error correction term means that before 1991 the current account was a weakly exogenous variable, adjusting through changes in the exchange rate policy. On the contrary, during the second regime, i.e. after 1991, all the estimated coefficients except those of *REER* and fiscal balance were statistically significant. This finding suggests that after 1991 credit to the private sector and relative real GDP per capita were the drivers of the short-run current account developments. Also, the current account was a weakly endogenous variable in this period suggesting that it tended to adjust in the short run to restore equilibrium as determined by the long-run relationship.

The analysis of the short-run dynamics with the TA-R model also used two regimes and showed similar results. The regimes were determined by the position of the current account as percent of GDP in the previous year. The threshold value of the current account determined endogenously by the model was estimated at -1.3 percent of GDP. The results (see Table 4) suggest that for high current account deficits (greater than 1.3 percent of GDP), credit to the private sector is significant, confirming the importance of financial liberalisation for the short-run deterioration of the current account since 1999. In addition, the statistical significance of the error correction term in this regime implies that in periods that are characterised by high external deficits, the current account reacts to correct deviations from equilibrium. During the second regime, i.e. a current account position in surplus or in deficit smaller than 1.3 percent of GDP, the variables that significantly affected the current account were the *REER*, the fiscal balance and the private investment rate. However, the current account was weakly exogenous, since the coefficient of the error correction term was not statistically significant.

6. Policy implications

Our empirical analysis has shown that current account developments in Greece are determined in the medium term by macroeconomic factors, such as the fiscal balance, competitiveness, real convergence and private investment, working through the saving-investment channel. Demographic factors, on the contrary, captured by the dependency ratio or the fertility rate, do not seem to play a role in explaining the evolution of the current account.

From a policy perspective, this implies that higher fiscal deficits and persistent price competitiveness losses tend to worsen current account positions, increasing the economy's external vulnerability. The same is true for higher and non-domestically financed private

investment, particularly when this investment is not associated with improvements in the potential growth or the productive and export capacity of the economy. By contrast, real economic convergence induces lower current account deficits, as the initially elevated need for capital investment gradually subsides, while higher income allows for higher saving.

A determinant, however, that turned out to be of critical importance was financial liberalisation, as proxied by private sector credit to GDP. We found that it is the inclusion of that variable in the model that actually produces a stable relationship between the current account and its determinants. Credit to the private sector increased rapidly following the changes brought about by financial liberalisation and the process of Greece's monetary integration in the EU. Private agents, and in particular households, borrowed at an increasing rate in order to reach a higher desired level of indebtedness. In effect, private agents moved from an initial position of very low indebtedness towards the steady state level, defined as the level at which the rate of growth of credit is equal to the nominal GDP growth rate. Faced with a permanent move to a new regime with easy access to funding due to relaxed credit constraints, and low-cost financing due to lower inflation and interest rates, households opted to adjust their consumption and investment (mainly housing) through increased borrowing and reduced saving. This decline in private saving spurred by favourable credit conditions was identified in our model as the predominant factor contributing to the strong deterioration of the current account balance in Greece since 1999.

Meanwhile, our empirical analysis has shown that from 1999 to the end of our sample, which more or less coincides with the outbreak of the crisis, Greece's current account balance was on an unsustainable path. We defined external sustainability as the current account to GDP ratio that stabilises the net foreign asset position to GDP ratio[19] and suggested that a non-stationary current account did not necessarily imply external debt non-sustainability, but only under certain conditions. These conditions were tested empirically using the relationship between exports *(X)* and adjusted imports *(M*)*, confirming that Greece's current account was unsustainable after 1999.

[19] We deemed this approach more appropriate, because a current account "norm" estimated using a long-term (equilibrium) relationship may not necessarily be identical to the notion of a "sustainable" current account; in practice, such norm could also be derived from values of the current account determinants that imply external debt non-sustainability. Thus, this norm should not be adopted as a current account benchmark for adjustment.

Having identified the current account determinants and defined external sustainability, a policy-relevant question that arises is what can be done to bring the current account back on track, once it is found to be unsustainable.

Starting from the most important determinant of the current account balance, the private sector's indebtedness, one can expect that as this indebtedness approaches the steady state, the rate of accumulation of private debt will slow down, either because banks will not lend as much as in the past, or because the private sector will avoid an excessive burden of debt that will strain its ability to service it. It is interesting to note that this trend has intensified since the summer of 2007 as a result of the global financial crisis. Thus, in the long run, we can expect that private sector's debt will stabilise as a proportion of GDP.[20] This slowdown in credit growth will imply: (i) reduced consumption capacity and thus lower domestic demand and demand for imports and (ii) increased saving in order for private agents to be able to service in the future the accumulated debt (assuming intertemporal consumption-smoothing behaviour). While the above described adjustment path of credit to the private sector towards its steady state is a market-driven process, it could be reinforced by strengthened bank lending prudential standards and tighter supervision.

The reduced consumption capacity and the continuous balance sheet restructuring through increased saving on the part of households are likely to contribute to a reduction in the current account deficit to GDP. As credit growth slows down towards nominal GDP growth, the current account ratio will also reach a plateau. Still, a note of caution is required. The stabilisation of the credit ratio at some higher level (possibly close to the EU average) does not necessarily mean, however, that the country's external position will become sustainable. This implies that additional policy measures, suggested by the findings of this study, can help the current account to revert to sustainability. These include eliminating fiscal deficits, improving competitiveness and implementing structural reforms.

The potential impact that some of these policies have on the current account can be illustrated with a comparative static exercise (simulation) based on the estimated equilibrium model. It should be emphasised that the simulation presented below serves as an indicative example, and not a baseline scenario, of an adjustment process using our long-run

[20] A recent study by Brissimis and Vlassopoulos (2009) shows that mortgage loans have a unitary long-run elasticity with respect to GDP.

relationship and making some ex-ante assumptions about: (i) the external sustainability and the current account benchmark level and (ii) the medium-term values of the determinants. The assumptions are based on the economic conditions that prevailed in the pre-crisis period.

As discussed, the necessary condition for external sustainability is that the country's net foreign asset position (*NFA*), expressed as a ratio to GDP, is stable at some level, such that $NFA_t / GDP_t = NFA_{t-1} / GDP_{t-1} = k$. Since the country's net foreign asset position evolves according to the following rule (ignoring, for simplicity, valuation effects), $NFA_t = NFA_{t-1} + CA_t$, where *CA* is the current account, the sustainability condition can be written as $CA_t / GDP_t = gk$, where g is the economy's nominal growth rate and k is the constant level at which the economy's net external indebtedness is stabilised.

For simplicity we can assume that k is equal to Greece's current net external position, where net external obligations are close to but below the country's GDP. This implies that we set the target that there will be no further worsening of the country's external position. Let's also assume that the long-run nominal growth rate is about 5 percent, consisting of a 3 percent real growth rate (more or less in line with the potential growth rate of the last fifteen years) and an inflation rate of just below 2 percent (which is consistent with the ECB's inflation target). Under these assumptions, sustainability would require a current account deficit below 5 percent.

On the basis of the co-integrating relationship estimated earlier, we also assume that private investment remains at its pre-crisis average level of about 20 percent of GDP and the fiscal deficit falls rapidly, reaching zero by 2012, as assumed in Greece's pre-crisis Stability Programme. At the same time, the *REER* reverts to the levels seen before Greece joined the euro area. The *REER* adjustment could be achieved through a combination of structural and other reforms that would induce price and cost restraint. For example, policies such as the deregulation of closed professions would increase market competition, thus reducing prices and costs and improving external and internal competitiveness. Finally, it is also assumed that the real GDP per capita convergence continues along the pre-crisis trend, supported by structural reforms. In this extremely optimistic scenario, based on favourable and loose underlying assumptions and the rather modest target of no further worsening of the country's external position beyond the pre-crisis level, Greece's current account deficit would fall to 4.7 percent of GDP only in 2015.

These indicative calculations make obvious and even more imperative the need for further substantial policy action under the current, particularly demanding, economic circumstances in Greece, as the risks to any future current account adjustment path are on the downside. The task of correcting external imbalances may prove challenging given the austerity measures adopted by the Greek government in the context of the EC/IMF/ECB economic adjustment programme, which is likely to weigh on nominal GDP growth. In this respect, a more ambitious target to reduce external debt may turn out to be even more difficult. In addition, while the financial and economic crisis is likely to impair the potential growth rates of most economies, including Greece's, population ageing and slowdown of immigration can be expected to further reduce potential growth of Greece below its earlier performance.

Against this background, it seems that a return of the current account to sustainable levels will take a relatively long period of time and call for decisive, comprehensive and multi-level action to correct domestic demand excesses – particularly in terms of consumption – as well as unfavourable relative price differentials. Policy measures in the direction of fiscal consolidation, improvement of competitiveness and implementation of structural reforms are necessary. However, a single policy measure alone will be ineffective in correcting the domestic imbalances that have caused the significant deterioration of the current account balance of Greece since 1999.

In sum, despite the fact that the ongoing financial and economic crisis seems to have speeded up adjustment of current account imbalances in Greece, as it has forced the correction of some underlying domestic imbalances, bold and co-ordinated policy measures are needed to restore the economy's external equilibrium.

7. Conclusions

This paper analysed the determinants of the current account in Greece over the period from 1960 to 2007 by focusing on the main macroeconomic, financial and structural factors that influenced saving and investment patterns. The current account deficit has widened substantially since 1999 showing high persistence and signs of non-sustainability as the relevant tests have confirmed. The worsened current account deficit was mainly the result of significantly decreasing private saving rates and not exceptionally strong investment activity.

From the co-integration analysis of the specified current account model, we found that credit growth was pivotal in explaining the fall of the private saving rate and concluded that the end of rapid credit expansion, reinforced by strengthened bank lending prudential standards and tighter supervision, will help arrest the sizeable deterioration of the current account. On the other hand, there is a clear risk that, even if this rapid credit expansion comes to an end, the current account deficit will be stabilised, but at a level inconsistent with long-term external sustainability.

Further policy actions are therefore needed to contain the deficit within limits. We argue that the return of the current account to sustainable levels is feasible. However, wide-ranging and bold policy measures that address domestic demand excesses and unfavourable relative price differentials are needed to ensure successful adjustment. Based on the estimated equilibrium relationship, additional policy options that can be considered are fiscal consolidation, improvement in external competitiveness and implementation of structural reforms. Action on only one front is not sufficient to restore sustainability within a reasonable time frame.

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TABLE 1					
Saving and investment as percent of GDP					
	Private sector saving	**General government saving**	**Private sector investment**	**General government investment**	**Current account balance**
1994	25.6	-6.5	16.2	2.7	0.2
2007	10.5	-2.0	19.6	3.0	-14.0
Δ(2007-1994)	-15.1	4.5	3.4	0.3	-14.3

Sources: National Statistical Service of Greece and authors' calculations.

TABLE 2				
Augmented Dickey-Fuller and Lee-Strazicich unit root tests				
Variables	ADF unit root test		Lee-Strazicich unit root test	
	Level	First difference	Level	First difference
CA/Y	-0.359	-6.260***	-2.395	-6.059***
$\frac{Y}{N}/\frac{Y^*}{N^*}$	-2.599	-1.913	-0.708	-6.060***
$REER$	-1.900	-6.515***	-1.401	-7.889***
$(S_G - I_G)/Y$	-1.393	-6.598***	-1.68	-7.151***
I_p/Y	-2.489	-7.365***	-1.54	-7.420***
CRP	0.051	-5.803***	-1.471	-6.266***
VOL	-2.388	-8.607***	-4.609**	-
X/Y	-2.114	-8.943***	-2.422	-6.178***
M^*/Y	-1.467	-8.671***	-2.115	-4.968***

Notes: The LM Lee-Strazicich unit root test endogenously determines the structural break in intercept for all variables except for *VOL*, and in both intercept and trend for *VOL*. The critical values for the former case are: -4.24, -3.57 and -3.21 at the 1, 5 and 10 percent level of significance and for the later case are -5.11, -4.50 and -4.21 respectively (see Lee and Strazicich, 2004). ** and *** indicate significance at the 5 and 1 percent level.

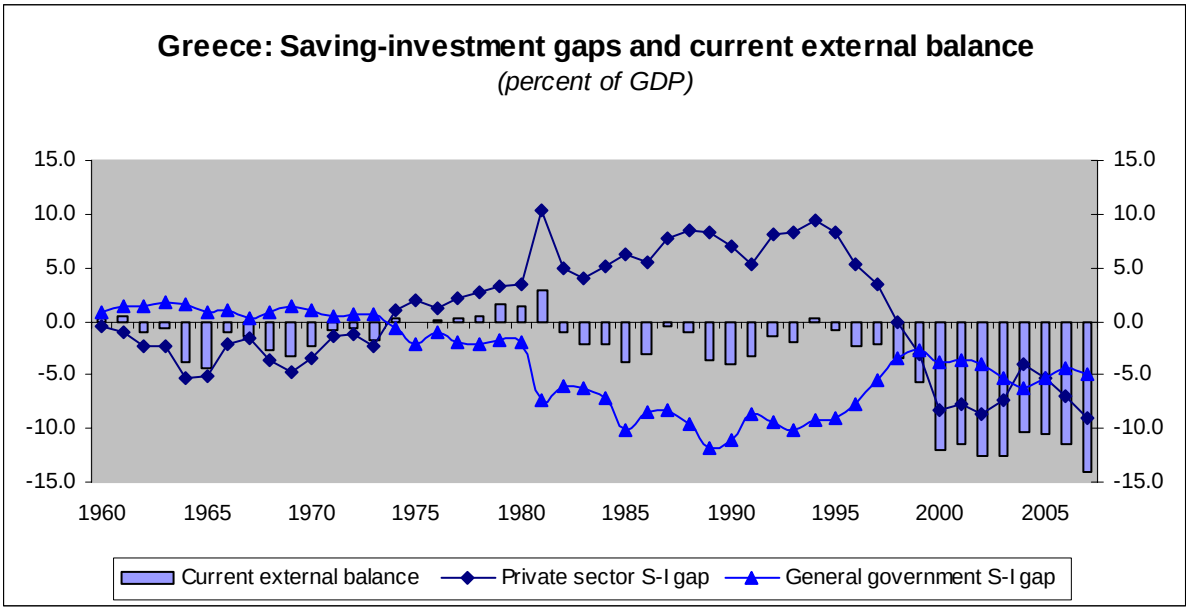
TABLE 3		
FM –OLS estimation of the long-run current account specification		
Variables	Basic specification	Extended specification
Constant	0.275 (1.06)	1.667*** (6.66)
$\frac{Y}{N} / \frac{Y^*}{N^*}$	0.099** (2.04)	0.274*** (4.56)
REER	-0.027 (-0.46)	-0.189*** (-3.60)
$(S_G - I_G)/Y$	0.407** (2.48)	0.467** (2.70)
I_P / Y	-0.394*** (-3.56)	-0.928*** (-6.01)
CRP		-0.119*** (-9.65)
VOL		-0.015** (-2.12)
Co-integration breakdown tests of the long-run specification		
Year of break / test	p-value	p-value
1999 / P_c	0.000	0.74
1999 / R_c	0.000	0.77

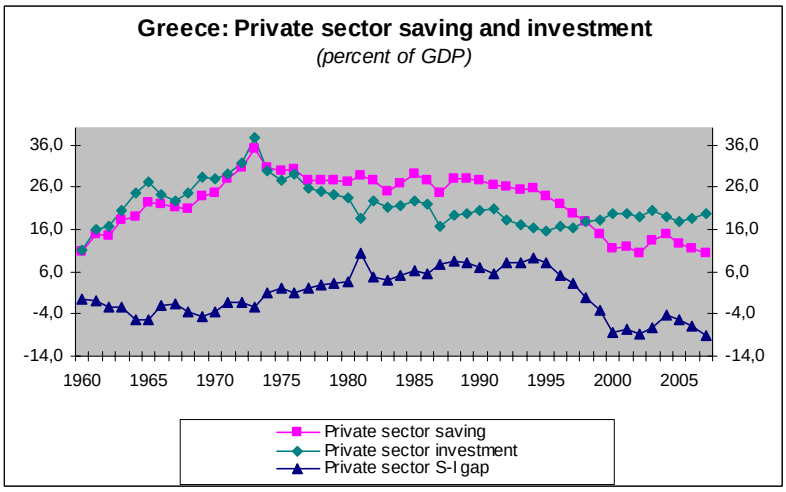
Notes: The numbers in parenthesis are the t-statistics. ** and *** indicate significance at the 5 and 1 percent level. P_c and R_c are the co-integration breakdown tests proposed by Andrews and Kim (2003). Reported values are simulated p values.

TABLE 4					
Estimation of the short-run current account specification					
	RS-R		TA-R		Linear specification
Variables	Regime 1	Regime 2	Regime 1	Regime 2	Model
Constant	-0.002 (-0.53)	0.004 (0.77)	-0.007 (-1.08)	-0.007** (-3.34)	-0.002 (-0.65)
$\Delta\left(\frac{Y}{N}/\frac{Y^*}{N^*}\right)_{t-1}$	-0.096 (-1.43)	0.287** (1.93)			-0.082 (-0.89)
$\Delta REER_{t-1}$	-0.168*** (-2.87)	0.090 (0.52)	-0.167 (-1.64)	-0.117** (-2.63)	-0.167** (-2.45)
$\Delta\left(\frac{S_G - I_G}{Y}\right)_{t-1}$	0.245 (1.28)	-0.29 (-1.10)	-0.288 (-1.39)	0.618*** (3.97)	-0.022 (-0.11)
$\Delta\left(\frac{I_P}{Y}\right)_{t-1}$			0.100 (0.63)	-0.272*** (-4.00)	0.028 (0.23)
ΔCRP_{t-1}	-0.008 (-0.36)	-0.235*** (-5.11)	-0.215*** (-5.66)	0.019 (1.24)	-0.037 (-1.52)
D1991			0.016* (1.86)	-0.007 (-1.29)	0.001 (0.22)
ECT_{t-1}	0.020 (0.15)	-0.57** (-1.89)	-0.702** (-2.94)	0.045 (0.46)	-0.080 (-0.50)
Standard error	0.013	0.011	0.012	0.008	0.016
Log Likelihood	137.71		146.68		125.60
AIC	-5.38		-5.64		-5.07
SC	-4.82		-4.96		-4.71
LR linearity test	24.32***		42.95***		

Notes: The numbers in parenthesis are the t-statistics. ** and *** indicate significance at the 5 and 1 percent level.

FIGURE 1


Greece: Saving-investment gaps and current external balance
(percent of GDP)
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Current external balance
Private sector S-I gap
General government S-I gap


Greece: Private sector saving and investment
(percent of GDP)
36,0
26,0
16,0
6,0
-4,0
-14,0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Private sector saving
Private sector investment
Private sector S-I gap

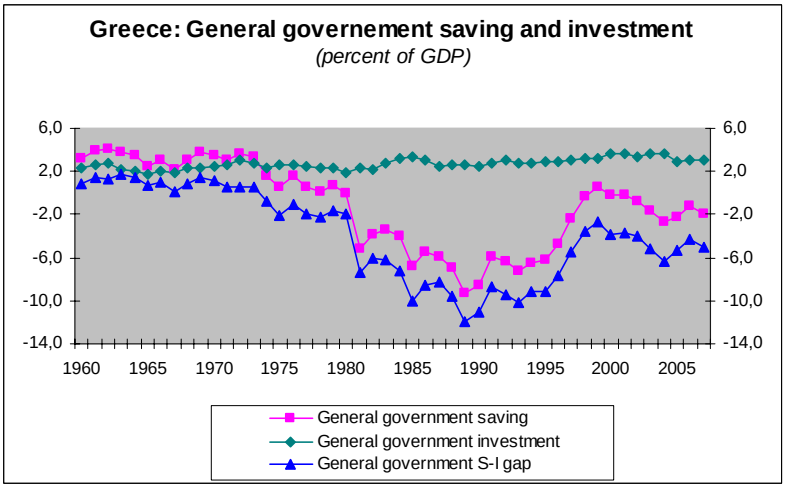
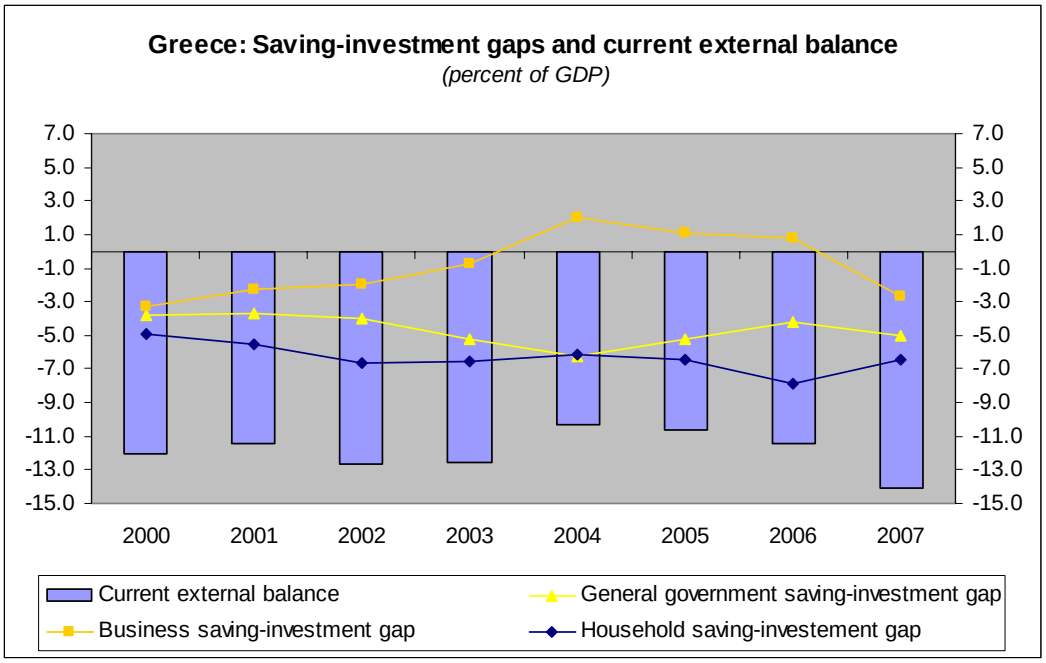
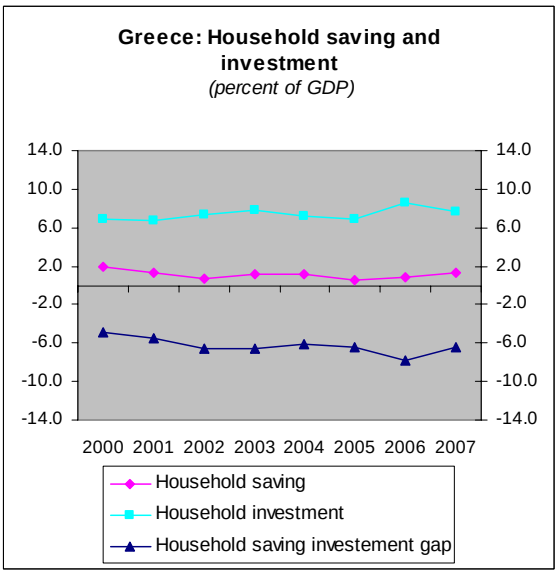
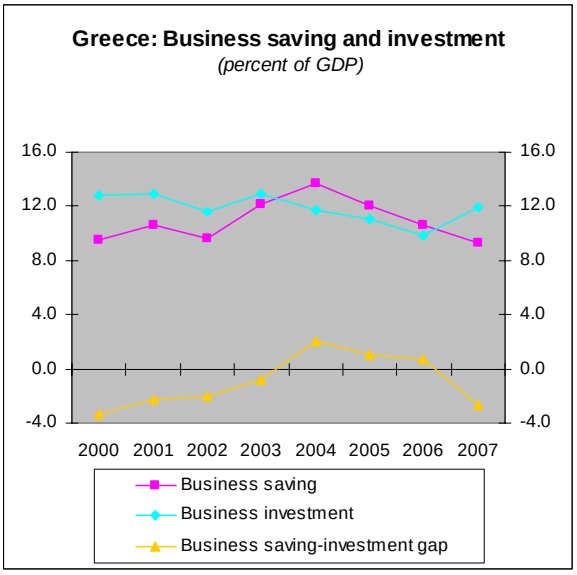
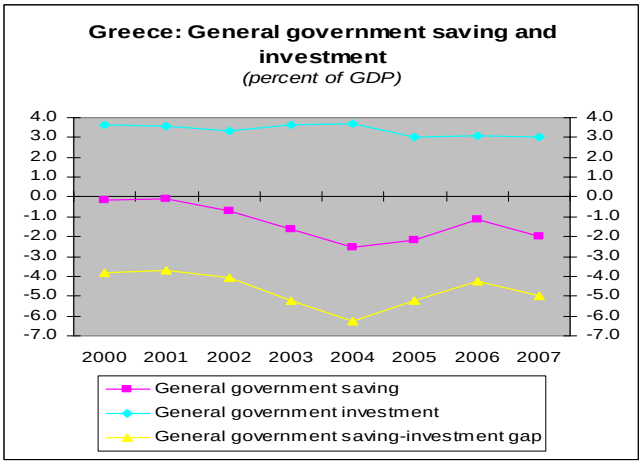

Greece: General governement saving and investment
(percent of GDP)
6,0
2,0
-2,0
-6,0
-10,0
-14,0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
General government saving
General government investment
General government S-I gap

FIGURE 2


Greece: Saving-investment gaps and current external balance
(percent of GDP)
7.0
5.0
3.0
1.0
-1.0
-3.0
-5.0
-7.0
-9.0
-11.0
-13.0
-15.0
2000
2001
2002
2003
2004
2005
2006
2007
Current external balance
General government saving-investment gap
Business saving-investment gap
Household saving-investement gap


Greece: Household saving and investment
(percent of GDP)
14.0
10.0
6.0
2.0
-2.0
-6.0
-10.0
-14.0
2000 2001 2002 2003 2004 2005 2006 2007
Household saving
Household investment
Household saving investement gap


Greece: Business saving and investment
(percent of GDP)
16.0
12.0
8.0
4.0
0.0
-4.0
2000 2001 2002 2003 2004 2005 2006 2007
Business saving
Business investment
Business saving-investment gap


Greece: General government saving and investment
(percent of GDP)
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
2000 2001 2002 2003 2004 2005 2006 2007
General government saving
General government investment
General government saving-investment gap

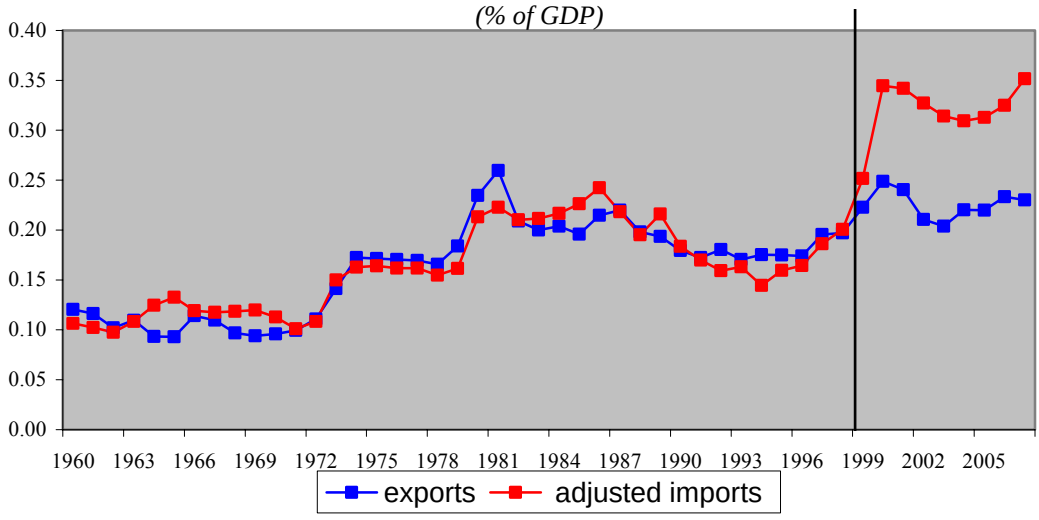



FIGURE 3
Greece: Exports and (adjusted) imports of goods and services
(% of GDP)