CURRENT ACCOUNTS IN THE LONG RUN AND THE INTERTEMPORAL APPROACH:

A PANEL DATA INVESTIGATION

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Abstract

This paper is a theory-based study of the long-run determinants of the current account (CA). For many OECD economies after WWII, there has been more long-run variation in the CA data than is emphasised by a "Permanent Income" version of the intertemporal approach that is based on consumption smoothing and that allows only transitory CA imbalances. A theoretical model of the CA is developed, based on the "broader" variant of the intertemporal approach that stresses the long-term component of the CA. We find that some key theoretical predictions hold, while others fail, validating the approach but also pointing to its limitations.

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1. Introduction

The current account continues to be under scrutiny in public and policy debates, not least because of the persistent and often high imbalances shown by several OECD economies (including the UK and US where the deficit was of the order of 4-6 per cent of GDP in 2006). At stake is the potential eventual adjustment in terms of interest or exchange rates and the necessary policy realignments.[1] This interest has been echoed by the academic literature (e.g., Blanchard and Giavazzi, 2002; Chinn and Prasad, 2003; Kraay and Ventura, 2002; Ventura, 2002; Blanchard, 2007).

Much existing empirical work on the current account (CA) is based on the "intertemporal approach" to the CA and the canonical textbook model of Obstfeld and Rogoff (1995, 1996, Ch. 2), Razin (1995), and Sen (1994). Under perfect international capital mobility, agents use international trade to hedge themselves against transitory shocks in the economy's resources, and to smooth their consumption. Under a number of stylised assumptions (most notably representative agent with quadratic utility and interest rate-subjective discount rate equality guaranteeing no consumption growth), one derives a "bare-bones" version of the intertemporal approach that may be termed the Permanent Income model. Though highly stylised, this model has been the testbed for the entire intertemporal approach most consistently used in the literature. Specifically, a number of papers follow the methodology of Campbell (1987) and Campbell and Shiller (1987) and develop a present-value test of the Permanent Income model (Sheffrin and Woo, 1990; Otto, 1992; Ghosh, 1995; Bergin and Sheffrin, 2000; Nason and Rogers, 2006). Formal tests of this model have routinely failed, and a consensus as to the likely erroneous assumptions has not yet emerged. This is significant, because this strand seems to have provided the only formal test of the intertemporal approach in the literature. While the search for "culprits",

[1] As an example of such an adjustment, at the end of 2006, there has been a sharp US dollar depreciation potentially linked to re-balancing the large foreign positions in US assets – the result of years of US current account deficits.

or sources of failure, goes on (Nason and Rogers, 2006), we do not seem to be close to any consensus as to the likely sources of failure and the necessary amendments to the approach.

Other aspects of the theory are elsewhere tested with a varying degree of formality. Among recent literature, Bussiere *et al*. (2006) estimate an extended Permanent Income version of the intertemporal approach with a panel of Eastern European data. Corsetti and Panagiotou (2005) emphasise the cointegrating vector between consumption, output and foreign liabilities arising out of the intertemporal budget constraint, and use it to estimate the innovations to these variables. Glick and Rogoff (1995) and Marquez (2004) focus on other aspects of the theory, particularly the effect of productivity on current accounts. Yet, it is unclear whether these tests amount to an overall acceptance or rejection of the intertemporal approach. [2]

This empirical rejection of the Permanent Income model should cause little surprise. The reason is the stylised observations reported in Section 2. Those point to considerable cross-sectional variation and long-term intra-country movements in current accounts (as a ratio over GDP), as well as to short-term variability. Yet, the Permanent Income model emphasises the role of the current account in smoothing only transitory fluctuations of an economy's resources via intertemporal trade. In other words, the model points to transitory deviations of the economy's net resources as the sole drivers of current accounts. As such, it is incapable of matching the long- or medium-run current account movements found in the data. We conclude that the present value tests of the Permanent Income model commonly employed in the literature bias the results towards rejection of the theory.

[2] Other approaches to the CA include the portfolio-based ones of Bussiere, Chortareas and Driver (2002), Kraay and Ventura (2002), and Ventura (2001); the latter two papers also make a big distinction between short-run and long-run determinants of current accounts. Portfolio considerations are included in our empirical work but are not emphasised in our theoretical framework, as they are endogenous in the long run. Blanchard and Giavazzi (2002) link the discussion of current accounts with international capital mobility and the "Feldstein-Horioka puzzle".

With this argument as departure point, this paper presents a theory-based empirical investigation of current accounts. The underlying model is a more general version of the intertemporal approach, which can in principle generate the prediction of more than cyclical movements of current accounts. While this framework guides our empirical work, the latter more broadly also investigates the role of factors suggested by other studies. We use panel data in order to utilise all the information available in cross-sectional (long-term) as well as the time-series (medium- to long-term) current account behaviour.

More specifically, we make a number of contributions to the literature. First, we review some facts about current accounts as mentioned above; we believe that these facts have not been drawn to the literature's attention sufficiently. We also discuss their implications for the empirical tests of the intertemporal approach commonly based on its Permanent Income version. Second, we modify the intertemporal approach, particularly its variant that emphasises consumption-tilting, so as to develop a long-run model of the current account, a task that does not seem to have been undertaken explicitly in existing literature. We let this theoretical framework inform our empirical investigation. Most of the panel data studies to-date (e.g. Debelle and Faruqee, 1996; Calderon *et al*., 2002; Chinn and Prasad, 2003; Gruber and Kamin, 2005) are not based on any formal framework but are only vaguely guided by theory. Our emphasis on this variant of the approach stems from the belief that it can potentially provide a fruitful framework for understanding the long-run tendencies of the current account. Thirdly, we investigate empirically the main implications of this model but also the role of additional factors suggested by previous literature using a panel of 14 OECD economies. This is also an innovation in so far as the current account has not been analysed extensively with panel data methods; yet, such methods are essential for capturing the current account patterns described more fully below. Thus, while we build on much previous theoretical and empirical work, we believe that the combination (a) of the version of the intertemporal approach derived here, (b) to be estimated by panel data methods, has not been undertaken in the literature.

The paper is structured as follows. Section 2 reviews some stylised facts of current accounts, and discusses their implications for the textbook intertemporal approach. This leads to the development of a more general version of the intertemporal approach in Section 3, emphasising the long-run, consumption-tilting-based tendency of the current account. The model's testable implications and methodology are reviewed in Section 4 and lead on to the empirical work in Section 5. Finally, Section 6 concludes.

2. The current account in OECD economies: Stylised facts

As these observations have not been highlighted adequately in the literature, we begin with a description of facts related to the current account (CA) as a ratio over GDP.[3] Table 1 reports sample means and standard deviations for $CAY \equiv CA/GDP$ and $\Delta CAY \equiv CAY - CAY_{-1}$ for each one among 16 OECD economies (see Section 3 on data construction, particularly Footnote 18). For this Table, the underlying sample periods vary slightly, but cover virtually all of the post-war period (from about 1950 to 2002), with annual data. A cross-sectional perspective is given by column 1 (CAY mean) – the mean of the ratio by country. A large amount of variation is observed: 8/16 countries have a negative ratio. Sample means range from Germany's 0.021 and Belgium's 0.019, to Greece's –0.068. In general, assuming conditional convergence and random deviations from the conditional steady states across countries, cross-sectional variation in the current account ratios captures differences in the steady-state ratios across countries. Thus, cross-country variation may be associated with differences in the long-run trends of current accounts. Furthermore, column 3 (the mean of ΔCAY, the change in CAY for each country) reveals a lot of diversity in the intra-country trends of current account ratios in a time series sense. We observe several mature economies such as Australia, Canada, Japan, the UK and the US (6/16 in all) having a tendency to see their current account ratios worsen over the post-war period. Country

[3] A notable exception is Gruber and Kamin (2005) which highlights patterns of current accounts between the US and Asia.

means for ΔCAY range from –0.002 to 0.0017. Assuming again conditional convergence, this diversity may signify a variety of patterns of convergence (from above or below) in the global economy.[4, 5] Finally, columns 2 and 4 (CAY and ΔCAY standard deviations) report the variation in the ratio's level and change across countries. The former incorporates both long- and short-run variation, while the latter is entirely short-run in nature.

[TABLE 1 ABOUT HERE]

We next examine the implications of such stylised observations for the intertemporal approach. In particular, we ask, how much of this observed variation in the current accounts is the intertemporal approach potentially capable of explaining? Under a whole host of maintained assumptions, the simplest textbook model of Obstfeld and Rogoff (1996, Ch. 2) develops the following equation for the current account (eqn 2.26):

$$CA_t = Z_t - \tilde{Z}_t + (r_t - \tilde{r}_t)B_t + \gamma_t\left(\tilde{r}_t B_t + \tilde{Z}_t\right)$$

Z_t is the "net cash flow" or domestic GDP net of investment and government expenditures; it is the resources potentially available to current and future consumption. γ_t is a factor of proportionality, depending on quasi-averages of interest and discount rates over time. Tildes (~) indicate permanent values (the annualised present value of future sequences of variables).[6]

[4] While it may be possible for these facts to be small sample properties, the data of Table 1 span 50 years and several countries, so this is unlikely.

[5] These two points raise important questions about sustainability of the CA – see Holmes (2006) and Baharumsha *et al.* (2005) for recent studies on CA sustainability; and Tsoukis and Alyousha (2001) and Alyousha and Tsoukis (2004) for discussion. One may note that even permanent deficits or surpluses may well be compatible with sustainability. Briefly, a sufficient condition for sustainability is that the growth rate of debt be less than the real interest rate. In dynamically efficient economies, the latter is higher than the rate of growth. So, to ensure external solvency, the external debt-GDP ratio (B/Y) should be constant in the steady state (a sufficient condition), implying that the debt (in levels) grows at a rate less than the real rate of interest. In this case, the current account-GDP ratio is: CA/Y=-(ΔB/B)(B/Y)=-g(B/Y). Providing this quantity is constant, it can be negative, even in the steady state, without violating sustainability.

[6] Maintained assumptions include fixed labour, no durables, and no adjustment costs of any kind (see Ikeda and Gobi, 1998). Using an open economy DSGE model, Nason and Rogers (2006) test the relevance of non-separability in utility, variable interest rates, fiscal policies and risk premia for the rejection of the

Before briefly explaining what each term in the above equation represents, it is useful to note that the intertemporal approach (under the same maintained assumptions) comes under two variants: A "Permanent Income" one assumes that the subjective discount rate equals the constant real interest rate, so that there is no consumption growth; the term is derived from the Permanent Income theory of consumption. In effect, this version allows only a "smoothing" role for the current account: to smooth temporary fluctuation in the net resources Z, so as to support a constant consumption level. This version is the basis for the test of the approach most commonly employed in the literature.[7,] A "broader version" allows for a parametric degree of impatience, indicated by deviations between the subjective discount rate and the interest rate; this leads to (positive or negative) consumption growth ("consumption tilting"). Because consumption may be systematically above or below income (for some time), this "tilting" version may relate the current account to the convergence process. As an economy converges from below, it borrows against future resources to support a higher consumption level than current resources allow. Conversely, mature economies should run current account surpluses. In this sense, the broader version is better placed to capture medium- and long-run developments in current accounts.

These two versions are nested on the RHS of the equation above. The "Permanent Income" model allows only for $CA_t = Z_t - \tilde{Z}_t$, while the other terms vanish (as $r_t = \tilde{r}_t = r$ and γ_t=0 under the assumptions of Permanent Income; see Obstfeld-Rogoff eqn. 2.18). As deviations of actual form "permanent" values are only stationary, in this model, the current account is driven by entirely cyclical and stationary deviations of resources from their permanent level. Stationarity precludes trends in a time series sense, and also implies zero asymptotic means (as these deviations are purely cyclical), so there ought not to be any cross-sectional variability. Thus, this equation can

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Permanent Income model. But it is unclear to what extent such additions to the model would enable it to account for the patterns reported above. Thus, these assumptions are maintained in our model of the next Section.

[7] The papers mentioned in the Introduction develop an equation relating the current account to ΔZ, impose it upon a Vector Autoregression of CA and ΔZ, and test the restrictions.

not possibly predict the richness of patterns uncovered in Table 1; any tests based on it (even solely time-series based) are biased towards rejecting the intertemporal approach, whatever its merits. The more general “broad version” that allows for consumption tilting requires the full equation above (and encompasses the narrower approach). Here, γ_t is a measure of how far the discount rate deviates form the interest rates, and hence of the strength of the tilting motive. In this case, the current account may follow the longer run movements dictated by $\tilde{Z}_t$ and B_t (which may well be integrated or show cross-sectional variation). Expressed as ratios over GDP (lower-case letters), the above equation would read:

$$ca_t = z_t - \tilde{z}_t + (r_t - \tilde{r}_t)b_t + \gamma_t\left(\tilde{r}_t b_t + \tilde{z}_t\right)$$

Despite its greater promise in accounting for the observations made above, such an equation seems not to have been tested in the literature. It forms the basis of the model developed in the next Section. (To simplify and since our focus is the long run, we in fact dispense completely with the cyclical component and consider only the steady-state current account ratio).

Concluding, from a look at the OECD panel data, there seem to be three relevant types of developments and sets of issues. Firstly, there exist considerable cross-sectional differences, both in sign and the magnitude of the average level of the current account ratio. Secondly, the mean of ΔCAY for each country raises questions about within-country trends and stationarity of the current account ratios. Thirdly, the short-run volatility of the CA/DGP ratio is the aspect of the data that most existing empirical models have focused on; it could yield limited information on the determinants of the CA, beyond helping tracking its short-run dynamics. Thus, the Permanent Income variant of the intertemporal approach to the current account leaves a lot to be desired regarding the first two sets of issues. In Section 3, we build a model based on the broader variant of the intertemporal approach that stresses the long-term component of the CA.

3. A model of the current account

The purpose of this Section is to review the intertemporally optimising, open economy macro model with a view to highlighting its implications for the current account. As mentioned, we build on what we have termed the "broader version" that allows for consumption tilting. The model is in the spirit of Obstfeld and Rogoff (1995, 1996, Ch. 2); Razin (1995); Sen (1994); Matsuyama (1987); Blanchard (2007) among others. We begin with the representative-agent model and proceed to a richer variant that allows for overlapping generations.

In both sub-Sections, we focus entirely on the "consumption-tilting" motive of the consumer as opposed to the "consumption-smoothing" one. In effect, we disregard the $Z_t - \tilde{Z}_t + (r_t - \tilde{r}_t)B_t$ transitory components of the current account in the equation of Section 2, and focus entirely on the $\gamma_t\left(\tilde{r}_t B_t + \tilde{Z}_t\right)$ part, which is steady-state-growth based (note the tildes).[8] To re-iterate a point already made, this is because we want to emphasise the long-run aspects of the current account as opposed to its transitory movements.

3.a. The current account in a representative-agent economy

In this subsection, we review the basic model of the CA based on the infinitely lived representative consumer paradigm.

We begin by the economy-wide resource constraint:

$$B_{t+1} = (1 + r_t^c)B_t + Y_t - C_t - I_t - G_t \qquad (1)$$

[8] This is reflected in removing cyclical components in estimation by taking 5-year averages (see Section 4 for more discussion).

The notation and assumptions are as follows:

B_t: Real foreign asset holdings at the beginning of period t;

r: Real interest rate on tradeables (assumed exogenous – a small-open-economy assumption – and constant; the latter assumption can be relaxed at the cost of more cluttered notation);

r^c: Real interest rate on the entire consumption basket, defined as:

$$(1 + r_t^c) \equiv (1 + r) P_{t-1} / P_t \tag{2}$$

P: Price index of the entire consumption basket in terms of the tradeables;

Y: GDP in real terms;

C: Consumption basket consisting of tradeables and non-tradeables, in real terms;

I: Real investment;

G: Real government spending - for simplicity assumed to be a constant fraction of GDP, G=γY, γ>0.

The consumer maximises life-time utility that takes the iso-elastic form,

$$U_t = \sum_{s=t}^{\infty} \left(1 + \beta\right)^{t-s} \frac{C_s^{1-1/\sigma}}{1 - 1/\sigma} \quad , \tag{3}$$

where σ>0 is the intertemporal elasticity of substitution in consumption and β>0 is the subjective discount rate.[9]

Maximisation of (2) subject to (1) yields the familiar consumption Euler equation:

[9] There is no leisure as an argument in period-subutility, which is also additive over time.

$$C_{s+1} = C_s(1+r_s^c)^{\sigma}(1+\beta)^{-\sigma} \quad (4)$$

Throughout this paper, we are going to concentrate on the steady-state, balanced-growth path.

In this light, the Euler equation (4) can be re-written as:

$$1+g^c = (1+r^c)^{\sigma}(1+\beta)^{-\sigma} \quad (5)$$

In (5), g^c is the (constant) rate of consumption growth in the steady state. In the balanced-growth path, all output and its components except consumption grow at the same rate g^y. Thus, using (4) and (5) into the budget constraint (1), we obtain optimal consumption in the steady state:[10]

$$C_t = \frac{r^c - g^c}{1+r^c}\left[(1+r^c)B_t + \frac{1+r^c}{r^c - g^y}Y_t\left(1-\gamma-g^K(K/Y)\right)\right] \quad (6)$$

The second term inside the square brackets is nothing but the present value (discounted by $1+r^c$) of the net resource (Y-I-G), which is growing at rate g^y. In terms of ratio over GDP:

$$(C/Y)_t = (r^c - g^c)(B/Y)_t + \frac{r^c - g^c}{r^c - g^y}\left(1-\gamma-g^K(K/Y)_t\right) \quad (6')$$

Intuitively, consumption is supported by interest payments from net foreign assets (allowing for the need to finance future growth) and a fraction of net domestic resources, Y-I-G.[11]

[10] It is useful to gather here all the additional notation we have used (all growth rates are in real terms): g^c: Consumption growth rate; g^y: Growth rate of output and its components; g^k: Growth rate of real capital; γ: Share of public spending in GDP; K/Y: Capital/output ratio in the steady state.

[11] In the benchmark case of a closed economy ($g^c=g^y$), the latter component consists of the entire domestic resource.

To relate this analysis to the current account, consider its aspect as net accumulation of foreign assets:

$$CA_t \equiv B_{t+1} - B_t \tag{7}$$

Combining (7) with (1) and substituting for consumption from the optimal rule (6') yields the following steady-state current account ratio – dropping subscripts as "grand ratios" are constant:

$$CA/Y = (r^c - \beta)(B/Y) + \frac{g^c - g^y}{r^c - g^y}\left(1 - \gamma - g^K (K/Y)\right) \tag{8}$$

Viewed as net (dis)saving by the aggregate economy (as ratio over GDP), (8) reveals that the current account is made up of two components (represented by the two terms on the RHS): First, part of the interest payments on its net foreign asset holdings – this term will be positive if net assets are positive; second, a fraction of current resources depending on the difference between consumption and output growth. A patient economy will start from a low initial level of consumption and save early on; subsequently, consumption growth will be higher than that of output (g^c-g^y>0) in order to use up all intertemporal resources. Thus, this economy will actually save part of its current resources, and the second term on the RHS of (8) will be positive.

So far, the foreign-assets-to GDP ratio has been treated as exogenous. Obstfeld and Rogoff (1996, Appendix 2A) show that the steady-state B/Y equals:

$$B/Y = -\frac{\left(1 - \gamma - g^K (K/Y)\right)}{r^c - g^y} \tag{9}$$

Inserting (9) into (8), we get:

$$CA/Y = \frac{-g^y}{r^c - g^y}\left(1 - \gamma - g^K (K/Y)\right) \qquad (8')$$

In the steady state, a small open economy can only hold debt;[12] as a result, its current account ratio can only be negative, as revealed by (8'). But this is a serious limitation of the representative agent model, as not all economies can have negative external positions. This prompts us to see a richer variant that ameliorates this defect, namely that based on overlapping generations.

3.b. Overlapping generations of infinitely lived consumers and the current account.

The preceding model of the current account based on the infinitely lived representative consumer faces the difficulty of admitting only net external debt in the steady state. The overlapping generations setup has been used to overcome this difficulty and derive more realistic and general conclusions. We follow Weil (1989) who assumes the existence of overlapping generations of infinitely lived consumers. The successive cohorts are of size 1, n, n(1+n), $n(1+n)^2$,…, $n(1+n)^{t-1}$, for cohort t. Thus, total population grows at rate n>0 and is of size,

$$N_t = (1+n)^t \quad , \qquad t \geq 0. \qquad (10)$$

[12] The case of positive net foreign assets is shown to be unstable; see the discussion in Obstfeld and Rogoff (1996, Appendix 2A). Equation (9) also ensures that the small open economy is solvent. As is well known, solvency is guaranteed if assets B grow at a rate less than the real interest rate. From $\Delta B/B=(CA/Y)(Y/B)$, combining (8') and (9), we have in the steady state $\Delta B/B=g^y$. This is less than r in a dynamically efficient economy, guaranteeing solvency.

Finally, to facilitate aggregation, this model makes the assumption of log utility (σ=1), in which case, we can approximate $r^c-g^c=\beta$, from the Euler equation (5). The special case of n=0 yields the infinitely lived representative agent model of the previous sub-Section.

Since each cohort behaves exactly like the representative agent of the previous subsection, aggregation of consumption is straigthforward and yields the same consumption and current account ratio as above, except that now output growth rate is *per capita*, since it is per capita net resources that determine cohort consumption; hence, the following replaces (6'):[13]

$$(C/Y)_t = \beta(B/Y)_t + \frac{\beta}{r^c - g^y + n}\left(1-\gamma - g^K (K/Y)_t\right) \qquad (6'')$$

Intuitively, consumption is supported by interest payments from net foreign assets (allowing for the need to finance future growth) and a fraction of net domestic resources, Y-I-G.[14]

Proceeding as before, we now derive the following current account (as ratio over GDP) equation:

$$\frac{CA_t}{Y_t} = (r^c - \beta)\frac{B_t}{Y_t} + \left(1 - \frac{\beta}{r^c - g^y + n}\right)\left(1-\gamma - g^K (K/Y)_t\right) \qquad (8'')$$

[13] As mentioned, Weil (1989) assumes the existence of *infinitely-lived* overlapping cohorts, each of fixed size; he shows that it is the arrival of new cohorts, rather than death that is critical for Ricardian equivalence. Weil (1989) builds on Blanchard (1985) who considers the same structure with a constant probability of death within a period, ϕ (and zero population growth). He shows that this augments the effective discount rate individuals face from r to r+ϕ; this will increase the proportion of lifetime resources an individual is prepared to consume currently to $\beta+\phi$ (which is intuitive, if the horizon is shortened). This increase will affect (6''), while the rest of our setup remains the same.

[14] In the benchmark case of a closed economy ($g^c=g^y$), the latter component consists of the entire domestic resource.

This generalises the current account equation (8) of the previous sub-Section. It should be pointed out that the consumption function (6’’) embedded in (14) is evaluated at the balanced-growth path, so that all growth rates and interest rates are constant. We note here that, given a foreign asset-to-GDP ratio B/Y, the current account ratio is positively affected by the consumption real interest rate.

Finally, in order to endogenise the asset ratio, definition (7) may be applied again to (8’’). Note however, that we should now consider the *aggregate* output growth rate, which for clarity we indicate as g^Y ($\equiv g^y+n$). We therefore have:

$$CA_t / Y_t = b_{t+1}(1+g^Y) - b_t , \tag{11}$$

with $b_t \equiv B_t/Y_t$ being the foreign asset-to-GDP ratio. This yields the following steady-state ratio:

$$b = \frac{r^c - g^y + n - \beta}{r^c - g^y + n} \frac{\left(1-\gamma - g^K (K/Y)\right)}{g^Y - r^c + \beta} \tag{12}$$

Inserting (12) into (8’’), we obtain the reduced form, steady-state current account ratio:

$$CA/Y = \left(\frac{g^Y}{g^Y - r^c + \beta}\right)\left(\frac{r^c - g^y + n - \beta}{r^c - g^y + n}\right)\left(1-\gamma - g^K (K/Y)\right) \tag{13}$$

We note that in the representative agent case, with no population growth (n=0) and with per capita and aggregate growth rates equal, (13) boils down to the current ratio derived in the previous sub-Section, (8’). Unlike there, though, there is no presumption as to the sign of (13). Hence, the model here is much less restrictive. Alternatively, noting that the consumption Euler equation (5) with log utility employed in this sub-Section (σ=1) has the implication for per capita consumption growth that $g^c = r^c - \beta$, and the definition for aggregate consumption growth rate $g^Y \equiv g^c + n$, we can re-write (13) in a form more compatible with data (in that it has aggregate growth rates rather than per capita ones):

$$CA/Y = \left(\frac{g^Y}{g^Y - g^C + n}\right)\left(\frac{g^C - g^Y + n}{g^C + \beta - g^Y + n}\right)\left(1 - \gamma - g^K (K/Y)\right) \qquad (13')$$

Making the reasonable assumptions that aggregate growth rates are always higher than the per capita ones (so that g^Y-(g^C-n)>0 and g^C+β+n-g^Y>0), both denominators are positive. It is now easy to derive the effects of the (aggregate) consumption and output growth rates on the CA-to-GDP ratio:

$$\frac{\partial CA/Y}{\partial g^Y} = \frac{-g^C + n}{\left(g^Y - g^C + n\right)^2}\frac{g^C - g^Y + n}{g^C + \beta - g^Y + n}\left(1 - \gamma - g^K (K/Y)\right) -$$

$$- \frac{g^Y}{g^Y - g^C + n}\frac{\beta}{\left(g^C + \beta - g^Y + n\right)^2}\left(1 - \gamma - g^K (K/Y)\right)(< 0) \qquad (14a)$$

and

$$\frac{\partial CA/Y}{\partial g^C} = \frac{g^Y}{\left(g^Y - g^C + n\right)^2}\frac{g^C - g^Y + n}{g^C + \beta - g^Y + n}\left(1 - \gamma - g^K (K/Y)\right) +$$

$$+ \frac{g^Y}{g^Y - g^C + n}\frac{\beta}{\left(g^C + \beta - g^Y + n\right)^2}\left(1 - \gamma - g^K (K/Y)\right) > 0 \qquad (14b)$$

Two aspects of these “multipliers” are notable: Firstly, the signs differ: That of the output groth rate is positive under the maintained assumption of a positive per capita consumption growth rate (g^C-n>0), which is valid in our sample – hence the sign is in a parenthesis. A *lower* growth rate of output means that proportionately more resources are available early on (than under a higher rate), so that the tendency for a deficit early on diminishes. On the other hand, the consumption growth rate exerts an unambiguous positive effect on the current account ratio. As it rises, the economy becomes more patient, with a lower early consumption level and higher subsequent growth rate (relative to that of output); this economy saves more early on and therefore builds a positive foreign asset position and current account. Secondly, there is homogeneity between the two is broken: The two in general should not be expected to have equal coefficients.[15]

Finally, it is also easy to see that the sign of the effect of the population growth rate (n) on the current account ratio is in principle ambiguous.

$$\frac{\partial CA/Y}{\partial n} = \frac{-g^Y}{\left(g^Y - g^C + n\right)^2}\frac{g^C - g^Y + n}{g^C + \beta - g^Y + n}\left(1 - \gamma - g^K (K/Y)\right) + \\ + \frac{g^Y}{g^Y - g^C + n}\frac{\beta}{\left(g^C + \beta - g^Y + n\right)^2}\left(1 - \gamma - g^K (K/Y)\right) \qquad (14c)$$

so that $\operatorname{sgn}\left\{\frac{\partial CA/Y}{\partial n}\right\} = \operatorname{sgn}\left\{-g^Y\left(g^C + \beta - g^Y + n\right) + \beta\left(g^Y - g^C + n\right)\right\} < 0$, at least again under the maintained assumption of a positive per capita consumption growth rate (g^C–n>0).

In this light, we may derive an estimable equation by linearising (13') as follows:

$$CAY_{it} = a_0 + a_1 g^Y_{it} + a_2 g^C_{it} + a_3 n_{it} + a_4 x_{it} + u_{it} \qquad (15)$$

For each country i, the dependent variable is the current account-to-GDP ratio, $CAY_{it} \equiv (CA_{it}/Y_{it})$, the coefficients α_1-α_3 are given by the partial derivatives (14a-c) evaluated at the sample means,

[15] We are grateful to a referee that pointed this implication out to us.

the intercept α_0 picks up the constant (including the partial derivatives times the variables at their sample means values), and x_t introduces other regressors emphasised by previous literature that will be reviewed below. Straightforward observation of (14a) and (14b) yields a testable restriction between these two partial derivatives, written in terms of the coefficient notation as follows:

$$a_1 + a_2 = CAY / g^Y \tag{16}$$

Equation (16) provides a formal test of the validity of the long-run version of the intertemporal approach to the current account as exemplified here. To aid intuition on what this restriction implies, it is useful to write it in elasticity form as, $\varepsilon^{ca,g^C} \dfrac{g^Y}{g^C} + \varepsilon^{ca,g^Y} = 1$, where

$\varepsilon^{ca,g^c} \equiv \dfrac{\partial CA/Y}{\partial g^C} \dfrac{g^C}{CA/Y}$ and likewise for ε^{ca,g^Y}. In other words, the (quasi) elasticities of the current account ratio with respect to the growth rate of output and consumption should add up to unity. This makes clear that they work in opposite ways: A higher growth rate of consumption (later) implies more saving (now) and fosters a positive external balance, whereas a higher output growth (later) implies less resources (now), fostering an external deficit. We shall test for the restriction in the form of (16) evaluated at the sample means of the current account-output ratio and the output growth rate.

4. Testable implications, control variables, and data

(13’) above provides the most general testable model of the current account. Due to its high degree of non-linearity, though, we shall estimate its linearised version (15). Below, we summarise the testable restrictions that the models developed in Section 3 impose on (16).

(a) $a_1<0$: The growth rate of aggregate output should affect the current account ratio negatively – see (14a).

(b) $a_2>0$: The consumption growth rate should affect it positively – see (14b).

(c) The above two coefficients are linked via (16).

(d) $a_3<0$: *Ceteris paribus*, i.e. given the aggregate consumption and growth rates, the population growth rate ought to affect negatively the current account ratio – see (14c).

(e) Theory suggests a role for the consumption real interest rate in the intermediate models (8) and (8''), or (8') and (13), but not the "reduced-form" version (13'). Its effect is somewhat complicated. Its partial correlation with the current account ratio (given in particular, the external asset ratio, B/Y, and the consumption growth rate) is unambiguously positive with external assets (B>0) – see (8) for the representative agent economy and (8'') for the overlapping generations setup after substituting $\beta = r^c - g^c$. In the case of external indebtedness (B<0), the sign of the partial correlation is ambiguous. In terms of a simple correlation (i.e., having substituted out the external position and the consumption growth rate), both (8') and (13) reveal a positive correlation. We shall test the partial correlation case, i.e. that underlying equations (8) and (8''), which is predicted to be of an ambiguous sign.

(f) In a similar manner, the external net financial asset position affects the current account positively both in the representative-agent economy (see 8) and the overlapping-generations economy (8''), in both cases if the consumption real interest rate is higher than the subjective discount factor, implying a positive per capita consumption growth rate ($g^c = r^c - \beta > 0$).

A further consideration, in the spirit of the intertemporal approach but not formally derived above, is the association between the current account and initial GDP. Assuming that convergence applies, countries starting at a lower initial GDP level will experience faster output growth and more resources later, which they may trade off against earlier consumption, thus experiencing an early current account deficit.[16] Thus, there should be a positive association between the current account deficit and initial income. This implication may be understood as the joint product of the intertemporal approach coupled with the convergence hypothesis and it is in the spirit of the analysis of convergence and growth theory. Another, somewhat heuristic, interpretation of initial GDP is as a proxy for the "net resource" $(1-\gamma-g^K(K/Y))$ in the model above. Initial GDP will be included as a controlling variable in the regressions that follow, alongside the other variables suggested by the broader literature and reviewed next.

Existing literature empirical modelling of the current account suggests a number of relevant factors, without offering any apparent consensus. Our aim is to embed their findings in a more general empirical model, which provides a more sound basis for the assessment of our testable hypotheses. In their extension of the Permanent-Income-based approach, Sheffrin and Woo (2000) place the CA ratio in a VAR with the change in "net output" (Y+rB-I-G) and the consumption real interest rate (and it is argued that the real appreciation component of r^c is more important than the real interest rate itself). Lee and Chinn (2002) also model the CA ratio with real appreciation in a bivariate VAR. In contrast, Chinn and Prasad (2003), in their study of the long-term determinants of current accounts, show that the government budget balance, net foreign assets (financial wealth of the country), demographics (dependency ratios), relative income (an indicator of convergence effects, as argued above) and measures of openness and of financial deepening are among the most important. But the set of key determinants varies somewhat between industrial and developing countries, between methods of estimation, and between low-frequency (cross-section) and higher frequency (panel-data) estimation. Ventura (2001) and others put the emphasis on external wealth and country portfolios. In a similar vein, Blanchard and Giavazzi (2002) emphasise relative incomes, net financial asset positions at the beginning of the period, demographics, and financial deepening.

[16] It might be argued that after catching up, even the low-starter countries will have to run surpluses to repay earlier deficits, so the association with initial GDP may not be a tight one. The important point remains, however, that lower initial GDP implies deficits early on, at least for some time.

These findings lead us to include the following among the regressors x_{it} in (15):

- A lagged dependent variable to capture medium-run dynamics not modelled above;
- Initial GDP as suggested by convergence arguments;
- An Openness index (exports+imports of goods and non-factor services/GDP), as suggested various studies including Chinn and Prasad (2002) and Gruber and Kamin (2005), where it is argued that, on the whole (though coefficients vary between regressions both in sign and significance), more open economies experience worse current accounts. It will be seen below that this index has a robust positive relationship with CAY; its sign however is the opposite of that in Chinn-Prasad.
- The (total) budget surplus as a proportion of GDP. The two competing hypotheses here are Ricardian Equivalence, which would imply no association with the current account, and the "twin deficits hypothesis", which would suggest a positive coefficient. Empirically, the literature does not speak with one voice on the issue (see Abell, 1990; Kearney and Monadjemi, 1990; Kollman, 1998; Ergec *et al*, 2005; Corsetti and Mueller, 2006).
- A measure of net external financial assets as a ratio over GDP (Net Fin Assets/GDP), due to Lane and Milesi-Ferretti (2001);
- An index of liquid assets/GDP (Liquid wealth/GDP), due to Kraay *et al*. (2000), as this has been argued to increase consumption and therefore reduce saving and GDP;
- The M2/GDP ratio, as a proxy for financial deepening (Blanchard and Giavazzi, 2002);
- The relative price/real exchange rate (Real ER – bilateral with the US) from the OECD. Due to its definition (effectively foreign price level over the domestic), this is expected to be positively associated with the current account. As it is possibly jointly determined with the current account (as relative prices determine trade flows that underlie to a large extent the external balance), it is instrumented, along with the budget deficit, to deal with possible simultaneity.
- Furthermore, we present evidence of the industrial output/GDP (IPY) being quite significant across methods of estimation. This is an empirical finding that we have come across quite by

chance, and is included as a control variable. It seems to have been ignored by existing literature; we comment on its significance below.

Our data is annual and comes from the IMF/IFS databank and the OECD.[17, 18] Importantly, since we intend to focus on the medium to long-run links, we take five-year averages of our data (starting from the average for 1968-70, and then 71-75, 76-80 and so on till 2000, creating a total of 7 averaged data points); this follows standard practice (see e.g. Blanchard and Wolfers, 2000; Chirinko *et al*., 2004).[19] The rationale is to filter out business cycle-frequency variability which can be quite strong in both current accounts (see Baxter, 1995) and industrial production, and can bias the results.[20]

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[17] Following standard practice in the work on the intertemporal approach (e.g. Otto, 1992; Ghosh, 1995; Sheffrin and Woo, 2000), the current account is constructed as CAY=(GNP-C-I-G)/GDP, in obvious notation. Industrial production commonly refers to the output of the following sectors: Mining and quarrying; manufacturing; gas and electricity. The IP series is given as an index in real terms, 1995=100; the IPY ratio is constructed by taking the IPY ratio for 1995 by actual data on IP and GDP, and updating it using the GDP series and the IP index. The real exchange rate (source: OECD) is "the rate of currency conversion that equalises the purchasing power of different countries by eliminating differences in prices" (effectively: relative prices) – this is bilateral with respect to the US, national currency per dollar. The real interest rate is constructed according to (2), again from IMF/IFS data.

[18] Data limitations (mainly non-availability of GNP series) reduced the countries included to those of Table 1. The net financial asset data set compiled by Lane and Milesi-Ferretti (2001) excludes Belgium and Japan. Thus, the number of countries was reduced to the final 14 – those of Table 1 minus Belgium and Japan.

[19] The period covered was 1968-2000 because of the non-availability of the GNP series – see also the previous footnote. Thus, we have a total of 98 data points (= 14 countries x 7 observations for each).

[20] As is well known, coefficient estimates from regressions with annual or quarterly data may be biased if the time-series variation of the relevant series largely reflects adjustments to transitory rather than permanent shocks (Chirinko *et al*. 2004, p.2-3); for this reason, Chirinko *et al*. argue, "an elasticity estimated with time-series data at quarterly or annual frequencies will tend to be lower than the "true" long-run elasticity" and illustrate their argument with the frequency-domain properties of ordinary and averaged-data estimators; see Shapiro (1986), Kiyotaki and West (1986) and Chirinko *et al*. (2004) for more references.

5. Empirical evidence

[TABLE 2 ABOUT HERE]

Our main results are presented in Table 2. The key variables suggested by theory (the growth rates of aggregate output – g^Y, consumption – g^C, and population – n) are listed first. A number of control variables suggested by previous literature follow lower down. The method of estimation is Two-Stage Least Squares, instrumenting the Real Exchange rate (Real ER) which may be endogenous and the budget surplus (because of potential "current account targeting", see Summers, 1988).[21] The first column shows a baseline regression, including the lagged dependent variable. The output growth rate is negative and significant, as suggested by theory, whereas the consumption growth rate is positive (as predicted) but insignificant (albeit with a t-statistic of about 1.5 – not shown – that is not entirely negligible). The population growth rate also has the predicted sign (negative) but is insignificant. The lagged dependent variable shows some small but insignificant autocorrelation. This is perhaps not surprising as the movements at high frequencies have been filtered out with the use of 5-year averages. Openness is strongly significant; its sign however (positive) is the opposite of that in Chinn and Prasad (2002). Furthermore, the coefficient of the industrial output/GDP (IPY) ratio is quite significantly positive. As mentioned, this finding seems to have been ignored by existing literature. Net external financial assets is also very significant, as expected. The budget surplus is negative and insignificant, bringing this finding closer to the Ricardian Equivalence rather than the "twin deficits hypothesis". The real exchange rate affects positively (as expected) but insignificantly the current account. Finally, initial GDP positively and quite strongly enters this regression, giving strong support to the argument that connect the current account with convergence: The lower the initial position, the faster is convergence from below, and the higher the external deficit required to support an initial standard of living that is above current resources. Conversely, a higher initial position is associated with a greater external surplus.

[21] The first lags of the instrumented variables enter as instruments alongside the levels of variables assumed to be exogenous.

The other regressions of Table 2 provide robustness checks (dropping the lagged dependent variable, introducing time fixed effects, cross-section random effects and employing GMM estimation as a generalisation of 2SLS, based on Arellano and Bond, 1991). Generally, the results do not change much. The output growth rate becomes insignificant under fixed and random effects, but retains its strong significance (and negative sign) everywhere else. The consumption and population growth rates are uniformly insignificant (albeit with, on the whole, correct signs). Openness continue to be quite significant, but with a sigh (positive) somewhat at odds with one might expect (see above). There are some signs that the real exchange rate is significant in two regressions; in view of this and generally borderline insignificant t-statistics elsewhere, one must conclude that it is weakly significant. This is perhaps an indication that the exchange rate may influence the current account at low frequencies and in the cross-section, rather than the short or medium run, hence its weak significance. Initial GDP and the net financial position are generally quite strongly significant and positively related to the current account, indicating the relevance of general resources, either in the form of income in the early stages of convergence, or of external useable balances. These arguments are in line with the discussions above and findings of earlier literature. Finally, it is worth pointing out that the explanatory power of these regressions (R-squared in the range of 0.5-0.7) compare favourably to levels achieved in similar panel data studies (e.g., Chinn and Prasad, 2003, and Gruber and Kamin, 2005, typically present R^2s of the order of 0.4-0.5).

[TABLE 3 ABOUT HERE]

Table 3 presents further variations on the main theme. Essentially, the population growth rate and the real exchange rate (both insignificant earlier on) are dropped here – the justification for dropping the latter is that a model like (13') purports to estimate a "reduced-form" in which there is no role for relative prices, so it is worth investigating how that model would fare. Firstly, the model is estimated with Pooled OLS, time fixed effects, and cross-section random effects, before turning to 2SLS estimation (to cover for any potential endogeneity in the budget surplus, as suggested by the "current account targeting" thesis, Summer, 1988; and for any potential endogeneity in the net (external) financial assets, which are the cumulated current accounts, though one could well argue that these are largely predetermined). The main results do not change much from Table 2. The coefficient of the output growth rate is negative and significant, that of consumption mostly positive and insignificant. The coefficient of the budget surplus is positive and barely significant, while those of industrial production, openness, and initial GDP continue to be positive and quite strongly significant. Liquid wealth is added as a regressor in the first three columns; its coefficient is positive (which is somewhat puzzling, as those assets could fuel consumption and therefore a current account deficit) and mostly insignificant. Liquid wealth is dropped in column 4 and the money supply-GDP ratio is entered; it is significant but has the opposite sign (negative) from that expected if this variable is to be interpreted as a proxy for financial deepening and development. The sign that emerges rather suggests the alternative interpretation that this variable acts as a proxy for credit available for consumption, and/or for a real exchange rate appreciation (domestic prices rising by a monetary expansion).

[TABLE 4 ABOUT HERE]

Finally, Table 4 presents further variations, this time by entering the consumption-based real interest rates as suggested by (8) and (8'') – see the discussion in Section 4.[22] As mentioned, theory does not suggest a clear sign for this variable in a multiple regression model. The real interest rate itself appears with a negative coefficient and significant in only one of the 3 regressions that are presented. The sign is indicative of a mostly externally indebted economies, see above. But this set of regressions as a whole presents some anomalies. A number of regressors (output growth rate, industrial production) that used to be significant drop mostly into insignificance now, and the net external asset position becomes of ambiguous significance.

[22] The consumption real IR is instrumented because it depends on real appreciation which is simultaneously determined as the current account. The instruments for this Table are the usual (see above) plus the lagged real GDP-deflator based IR and the lagged real appreciation. Because of data limitations, two further countries are dropped (Germany, Greece) to reduce the sample to 12 countries.

Conversely, the population growth rate becomes significantly negative. Liquid wealth now has the expected sign (negative) and is significant most of the time. On the whole, these regressions do not yield a clear-cut message. While there some signs that the consumption-based real interest rate may be weakly relevant for the model for the current account developed here, we feel that the picture is not clear enough. This may well be because the real interest rate works differently for debtor and creditor countries, so on average its significance is weakened.

On the whole, column 2 of Table 2 provides, in our view, the best regression in terms of a number of criteria, that is, empirical fit, parsimony, and consistency with the theory. So, we choose to test the theoretical restriction (16) on the basis of this particular estimated equation. In our sample of 14 countries, the ratio CAY/g^{Y} evaluated at the samples means equals -0.25984. Estimating the equation by imposing $\alpha_1+\alpha_2=-0.25984$ and performing an F-test, we find the F-statistic to be 3.5, less than the critical value $F(1,74)=4$ (at the 5 per cent significance level).[23] Thus we cannot reject the null that the theoretical restriction (16) is upheld.

6. Conclusions

Theory-based empirical modelling of the current account is scarce. More specifically, rigorous empirical tests of the intertemporal approach to the current account, particularly with regard to its longer-term implications, are lacking. This paper aims to fill this gap by looking at the determinants of the current account (as a ratio over GDP) in the long run in the light of this approach. It is motivated partly by the observation (from descriptive statistics of the current account ratio in 16 OECD economies during the post-war period) that there is more long-run variation (in both a cross-section and time-series senses) in the data than the consumption-smoothing variant of the intertemporal approach to the CA can hope to explain. The broader aim is to provide a theory-based study of the empirical determinants of the current account. To facilitate these aims, a model of the current account is developed in Section 3, based on the variant of the intertemporal approach that stresses the long-term component of the current account. The main estimable equation is (15). The approach yields a key test (16) and other testable hypotheses discussed in Section 4. These formed the basis of an empirical model of the current account, augmented by other factors emphasised in the empirical literature. The overall approach taken in the paper and the key restriction (16) seem not to have been followed in previous literature.

Our panel data estimation of our OECD sample (with 5-year averages, 1968-2000) offers a number of lessons on the validity of the broader version of the intertemporal approach; more widely, it also reveals a number of important determinants of the current account. We review this evidence here in line with the testable hypotheses derived in the previous Section.

- The growth rate of real output enters negatively and significantly fairly consistently across specifications.
- The consumption growth rate is positive but insignificant most of the time (although its t-statistic is non-negligible).
- The theoretical restriction (16) is upheld.
- The population growth rate enters negatively (as predicted by theory) but mostly insignificantly.
- The consumption real interest rate is negative but only occasionally significant.
- Among the other determinants suggested by broader arguments and earlier literature, initial GDP enters positively and significantly almost in every specification.
- There is not much role for dynamics, as this has been mostly smoothed out by averaging.
- Evidence on the relevance of a number of further determinants also emerges. Among those, it is worth noting the positive effect of industrial production in GDP; the also positive effect of the external net financial asset position; openness (positively); and liquid assets (negatively).

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[23] The critical value is based on the F-tables with one restriction and 74 degrees of freedom, resulting from

On the whole, the version of the intertemporal approach developed here that emphasises the long-run determinants of the current account receives mixed support. A key aspect of it is forward planning: agents, and economies, can borrow against future resources to support a standard that is higher than the initially lower resources; eventually, all available resources are consumed. This implies that higher future resources, i.e. a higher rate of output growth, give rise to an external deficit now – this receives support; higher current resources give rise to a surplus now – this also receives support, but is not formally part of the model of Section 3; a higher consumption growth rate means more saving now and a higher external balance – this effect receives the right sign but is not significant; the population growth rate should affect the external balance negatively – again, this receives the right sign but insignificantly; net financial assets should shore up external balances due to the interest payments on them – this receives support. The key restriction (16) is upheld on the basis of our preferred estimates shown in column 2 of Table 2. At the same time, a number of other determinants like openness and industrial production are seen to play a key role in the empirical modelling of the current account; the latter is a novel empirical finding of this work, neglected b previous literature. Jointly, these factors point out to the limitations of the intertemporal approach to offer, on its own, a full picture of the current account. Hence, both the relevance and the limitations of the long-run version of the intertemporal approach are the themes highlighted by this paper.

Concluding, we believe that current accounts and external imbalances will continue to receive attention in the future. For the reasons already exemplified, the framework highlighted here is arguably a fruitful one for empirical modelling of the current account, though naturally by no means the last word. Future work is called upon to further investigate, extend and refine both the theoretical framework and the empirical findings presented here.

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84 effective data points (98 minus one observation x 14 used up in instrumentation) minus 10 regressors.

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Table 1: Sample means and standard deviations of

CAY (≡CA/GDP) and ΔCAY (≡CAY-CAY$_{-1}$)

Country	CAY Mean	CAY St Dev	ΔCAY Mean	ΔCAY St Dev
Australia	-0.033	0.030	-0.0020	0.0364
Austria	-0.001	0.021	0.0009	0.0156
Belgium	0.019	0.026	0.0012	0.0116
Canada	-0.015	0.019	-0.0002	0.0130
Denmark	0.000	0.025	0.0017	0.0160
Finland	0.000	0.035	0.0014	0.0212
France	0.007	0.016	0.0006	0.0111
Germany	0.021	0.015	0.0011	0.0121
Greece	-0.068	0.021	0.0016	0.0198
Italy	-0.007	0.020	0.0004	0.0162
Japan	0.012	0.015	-0.0002	0.0118
Neth'lands	-0.014	0.313	0.0011	0.4511
Spain	-0.038	0.050	-0.0002	0.0291
Sweden	0.006	0.024	0.0009	0.0180
UK	-0.004	0.016	-0.0001	0.0139
US	0.000	0.015	-0.0013	0.0059

Table 2: Panel Data Estimation. Dependent Variable: CAY

Method	2SLS	2SLS	2SLS with Fixed Effects	2SLS with Random effects	GMM	GMM
Constant	-0.08***	-0.09***	-0.07***	-0.09***		
g^y	-0.53**	-0.53**	-0.10	0.08	-0.47**	-0.55***
g^c	0.94	0.94	0.13	0.60	-0.09	0.31
Pop. growth rate (n)	-0.30	-0.31	-0.15	0.20		
CAY(-1)	0.04				-0.12	0.14**
IPY	0.14*	0.14*	0.13	0.09		
Openness	0.08***	0.09***	0.07***	0.07	0.11**	0.12***
Real ER	0.00	0.00	0.00**	0.00**		
Budget surplus/Y	-0.08	-0.08	-0.07	-0.36		
Initial GDP	0.00***	0.00**	0.00**	0.00		
Net Fin Assets/GDP	0.03**	0.04**	0.06***	0.06***	0.12**	0.12***
Adj. R-Sq.	0.62	0.62	0.73	0.54	N/A	N/A

Notes: Asterisks *, ** and *** indicate significance at the 10%, 5% and 1% significance levels, respectively.

Table 3: Panel Data Estimation. Dependent Variable: CAY

Method	OLS (Pooled Regression)	Fixed Effects	Random effects	Random effects	2SLS	2SEGLS (cross-section random effects)
Constant	-0.08***	-0.10***	-0.08***	-0.08***	-0.7***	-0.08***
g^y	-0.58***	-0.44**	-0.56***	-0.50**	-0.28	-0.58**
g^c	0.6	0.42	0.60	0.52	-0.99	0.62
Pop. growth rate (n)						
IPY	0.15**	0.23***	0.15***	0.17***	0.16*	0.15***
Openness	0.09***	0.09****	0.09***	0.09***	0.08***	0.09***
Real ER						
Budget/Y	0.11	-0.02	0.11	0.13*		0.11*
Initial GDP	0.00***	0.00***	0.00***	0.00***		0.00***
Liquid wealth/GDP	0.01	0.02	0.00*			0.01
Net Fin Assets/GDP	0.03*	0.07**	0.03**	0.03**		0.03**
M2/GDP				-0.65**		
Adj. R-Sq.	0.62	0.77	0.64	0.59	0.48	0.62

Notes: Asterisks *, ** and *** indicate significance at the 10%, 5% and 1% significance levels, respectively.

Table 4: Panel Data Estimation. Dependent Variable: CAY

Method	EGLS (cross-section random effects)	2SEGLS (cross-section random effects)	2SEGLS (cross-section random effects)
Constant	-0.05*	0.02	0.12***
IPY	0.08	-0.14	-0.50
Net Fin Assets/GDP	0.03	0.10*	0.16***
g^y	-0.29	0.20	-0.81***
Openness	0.08***	0.07	0.02*
g^c	0.21	-2.25	1.02***
Budget	0.10	0.18	
Initial GDP	0.00***	0.00	
Liquid wealth/GDP	-0.02	-0.25*	-0.23***
Real (CPI-based) IR	-0.01	-0.12	-0.15**
Pop. growth rate (n)	-1.02**	-1.35*	
Adj. R-Sq.	0.48	0.30	0.39

Notes: Asterisks *, ** and *** indicate significance at the 10%, 5% and 1% significance levels, respectively.