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Current Accounts in the Long and the Short Run

1. *Introduction*

Countries are subject to transitory income shocks such as changes in the terms of trade, fluctuations in production, policy reforms, natural disasters, and many others. There is ample evidence that countries use their assets to buffer or smooth the effects of these shocks on consumption, raising savings when income is high and vice versa.[1] The main goal of this paper is to improve our understanding of the combination of assets that countries use for this purpose. In particular, we ask: How do countries allocate the marginal unit of savings between domestic and foreign assets? Or, equivalently, what are the effects of fluctuations in savings on domestic investment and the current account?[2]

The traditional view is that countries invest the marginal unit of savings in foreign assets. Underlying this view are the assumptions that investment risk is weak and diminishing returns are strong. The first assumption ensures that countries invest their savings only in those assets that offer the highest expected return. The second assumption implies that

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1. For evidence on consumption smoothing, see Deaton (1992, pp. 133–134), who writes that "consumption is less volatile than income, it fluctuates less about its trend, the amplitude of its business cycle variation is less, and the variance of its growth rate is less than the variance of the growth rate of income."
2. Why do countries use assets to smooth consumption rather than simply buy insurance abroad? Implicit in this paragraph and basically in all that follows is the assumption that countries are unable or unwilling to sell their idiosyncratic risk. This assumption is a central tenet of the intertemporal approach to the current account (see Obstfeld and Rogoff, 1995), and it is widely thought to provide an accurate description of reality. The question of why this is so is one of the most intriguing puzzles in international finance. See Lewis (1999) for a survey of the literature on this topic.

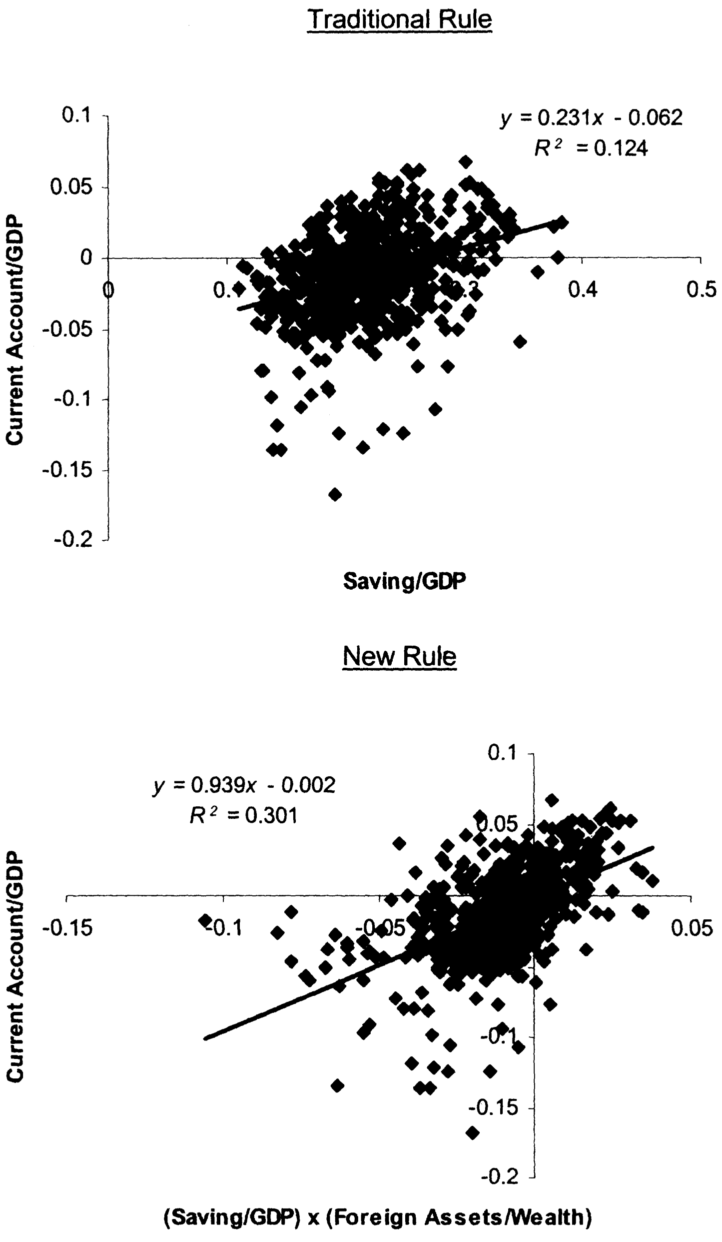
investing any fraction of the marginal unit of savings in domestic capital would lower its expected return below that of foreign assets. Hence the marginal unit of savings is invested in foreign assets, justifying the *traditional rule* that fluctuations in savings lead to fluctuations in the current account of roughly the same magnitude. While theoretically coherent, this rule has consistently been rejected by the data. The top panel of Figure 1 shows pooled annual observations of the current account and savings for 21 OECD countries over the past 30 years. A regression of the current account on savings delivers a slope coefficient that is positive but much lower than one. This is nothing but the famous result of Feldstein and Horioka (1980) that fluctuations in savings lead to parallel fluctuations in investment, with only minor effects on the current account.

In an earlier paper, we proposed a new view: that countries invest the marginal unit of savings like the average one (Kraay and Ventura, 2000). This is what one should expect if, in contrast to the traditional view, investment risk is strong and diminishing returns are weak. The first assumption implies that countries are unwilling to change the composition of their portfolios, unless shocks have large effects on the distribution of asset returns. The second assumption ensures that the distribution of asset returns is unaffected by the way countries invest the marginal unit of savings. Hence, the marginal unit of savings is invested like the average one, leading to the *new rule* that fluctuations in savings lead to fluctuations in the current account that are equal to savings times the share of foreign assets in the country portfolio. This rule not only is theoretically coherent, but it also provides a surprisingly good description of the data. The bottom panel of Figure 1 shows that a simple regression of the current account on the interaction between savings and the share of foreign assets delivers a slope coefficient close to one and a zero intercept. Moreover, this interaction term by itself explains around 30 percent of the observed variation in the current account.[3]

Hidden in the bottom panel of Figure 1 is a vast difference between the predictive power of the new rule in the long and the short run. Figure 2 illustrates this point. In the top panel, we have plotted the average current account over a thirty-year period against the average of savings times the

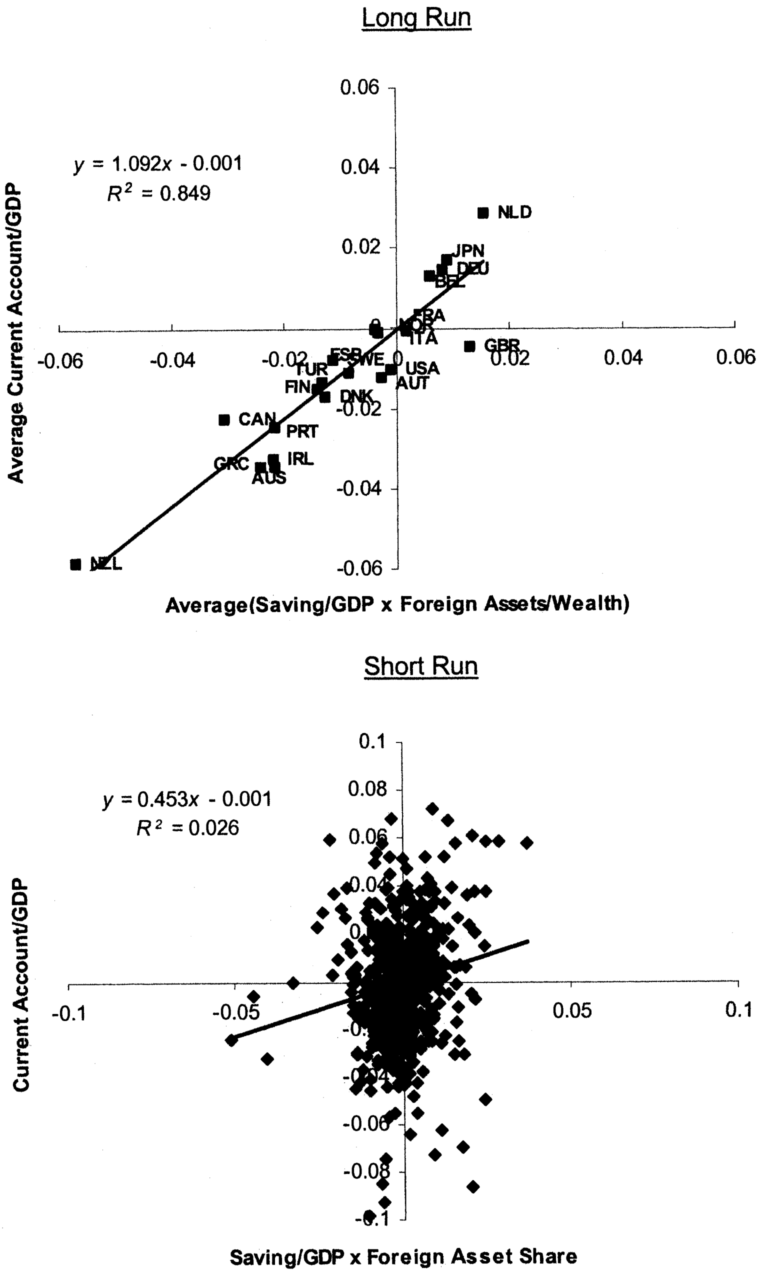
3. Since foreign assets constitute a small fraction of observed country portfolios, this view implies that fluctuations in savings should mostly lead to parallel fluctuations in investment, and is therefore consistent with Feldstein and Horioka's finding. What we found most surprising about this view in our earlier paper is that it has sharply different implications for the current account response to an increase in savings in debtor and creditor countries. Since debtors by definition hold more than their wealth in domestic capital, they invest at home more than the increase in savings, resulting in a current account deficit. In contrast, creditor countries invest at home less than the increase in savings, resulting in a current account surplus.

Figure 1 THE TRADITIONAL RULE AND THE NEW RULE



Note: The top (bottom) panel plots the current account balance as a share of GDP against gross national saving (gross national saving interacted with the foreign asset position), pooling all available annual observations for an unbalanced panel of 21 OECD countries over the period 1966–1997.

Figure 2 PORTFOLIO GROWTH AND THE CURRENT ACCOUNT



Notes: The top panel plots the period average of the current account as a share of GDP against the period average of gross national saving as a share of GDP interacted with the share of foreign assets in wealth for an unbalanced panel of 21 OECD countries over the period 1966–1997. The bottom panel plots the annual current account as a share of GDP against annual gross national saving as a share of GDP interacted with the annual foreign asset share, removing country means from both variables.

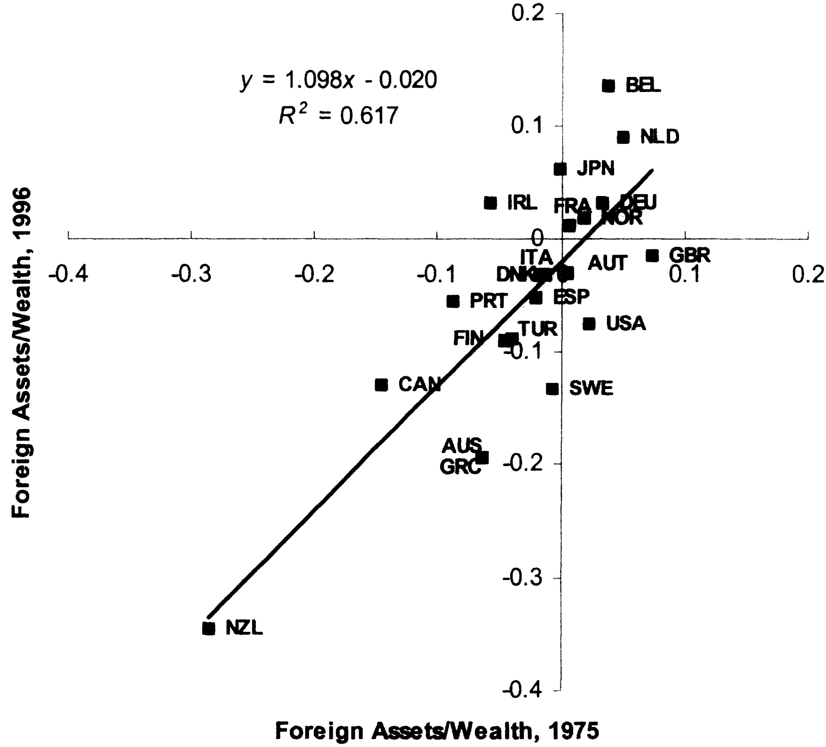
share of foreign assets during the same period. The new rule explains about 85 percent of the long-run or average cross-country differences in current accounts. In the bottom panel, we have plotted the (de-meaned) current account for each country and year against the (de-meaned) interaction of savings and the initial share of foreign assets in wealth for the same country and year. The new rule explains essentially none of the year-to-year within-country differences in current accounts. The contrast between the two panels indicates a discrepancy between the long- and the short-run behavior of the current account.[4]

How do we reconcile the apparently haphazard behavior of the current account in the short run with its neat behavior in the long run? Is the short-run relationship between savings and the current account just noise, or are there clear patterns behind this cloud of points? The main contribution of this paper, we think, is to provide clear answers to these questions. To do this, it is useful to start by pointing out that the new rule embodies the view that the current account primarily reflects *portfolio growth*, i.e. changes in the size of the country portfolio without systematic changes in its composition. The empirical success of the new rule in the top panel of Figure 2 simply reflects the observation that the composition of country portfolios has been remarkably stable in the long run. This is shown in Figure 3. If we want to understand why the new rule performs so poorly in the bottom panel of Figure 2, we must explain how and why in the short run increases in savings lead mostly to *portfolio rebalancing*, i.e. systematic changes in the composition of the country portfolio. If in addition we want to reconcile the two panels of Figure 2, we must go further and also explain why this short-run portfolio rebalancing is undone in the long run.

Our hypothesis is that this pattern is consistent with the view that adjustment costs to investment are important. If this is the case, an increase in savings that raises investment reduces the expected return to capital and induces countries to rebalance their portfolios towards foreign assets. Under these conditions, the short-run current account surplus is larger than the one predicted by the new rule. Once savings return to normal, investment declines, adjustment costs disappear, and the country portfolio returns gradually to its original composition. Throughout this adjustment process, the current account surplus is smaller than the one

4. We also noted this discrepancy in our earlier paper, although it was much less pronounced in the smaller sample of 13 countries and 23 years (1973–1995) that we used there. Here, we have been able to extend our sample to 21 countries and up to 32 years per country (1966–1997). All the results obtained in the previous paper are confirmed and, to some extent, reinforced when we use the larger sample.

Figure 3 PERSISTENCE OF COUNTRY PORTFOLIOS



Note: Throughout the paper, we use an unbalanced panel of 21 OECD countries over the period 1966–1997. Since we can construct a balanced panel of observations for this set of countries only over the period 1975–1996, we use 1975 here as the initial period.

predicted by the new rule. In the long run, the shock does not affect the composition of the country portfolio, and the new rule applies.

With this theoretical picture at hand, we go back to the data to search for patterns in the discrepancies between the observed current account and what the new rule would predict. When we do this, the picture that comes out from the data turns out to be clear and unambiguous: on impact, countries rebalance their portfolios towards foreign assets, and the new rule systematically underpredicts the short-run effects of increases in savings on the current account. In the years that follow, countries rebalance their portfolios back towards their original composition. During this period, the new rule systematically overpredicts the current account. We find that the whole adjustment process lasts about five years. Overall, the evidence is consistent with the view that adjustment costs to investment are important and, to avoid paying them, countries use foreign assets as a buffer stock to smooth fluctuations in investment.

The theory presented here can also reconcile two apparently contradictory observations about the relationship between the current account and investment. On the one hand, the long-run or cross-sectional correlation between investment and the current account is weak (Penati and Dooley, 1984; Tesar, 1991). On the other hand, the short-run or time-series correlation between investment and the current account is consistently negative (Glick and Rogoff, 1995). The theory presented here predicts that in the long run, portfolio rebalancing is small and the correlation between the current account and investment should be positive in creditor countries and negative in debtor ones. We show that the data are consistent with this prediction and that the weak cross-sectional correlation is the result of pooling data from debtor and creditor countries. The theory also predicts that in the short run portfolio rebalancing is important and this introduces a source of negative correlation between the current account and investment. This is true in all countries, regardless of whether they are debtors or creditors. We present a simple decomposition of the cross-sectional and time-series correlations between the current account and investment that illustrates this point.

The paper is organized as follows: Section 2 presents a stylized model that encapsulates the main elements of our portfolio-based theory of the current account. Section 3 uses the model to study how countries react to income shocks. Section 4 examines the empirical evidence and interprets it from the vantage point of the theory. Section 5 investigates the relationship between investment and the current account. Section 6 concludes.

2. An Intertemporal Model of the Current Account

In this section, we present a stylized model of how the current account responds to transitory income shocks. Since we stop short of modeling the world equilibrium and focus instead on a small open economy, these shocks should be interpreted as country-specific or idiosyncratic risk. Following the tradition of the intertemporal approach, we simply assume that countries are unable or unwilling to sell this risk in international markets. In particular, we adopt the starkest form of this view by assuming that the only asset that is traded internationally is a noncontingent bond.[5]

5. The intertemporal approach was developed by Sachs (1981, 1982), Obstfeld (1982), Dornbusch (1983), Svensson and Razin (1983), Persson and Svensson (1985), and Matsuyama (1987), among others. Obstfeld and Rogoff (1995) survey this research.

The model captures what we think are the essential elements of a portfolio-based theory of the current account. This theory is built around the concept of country portfolio and a simple decomposition of the current account that relies on this concept. By the country portfolio, we refer to the sum of all productive assets located within the country plus its net foreign asset position. The latter consist of the sum of all claims on domestic assets held by foreigners minus the sum of all claims on foreign assets held by domestic residents. In our simple model, the only productive asset located within the country is the stock of capital, and the net foreign asset position is simply the stock of noncontingent bonds owned by the country. By the *composition* of the country portfolio, we refer to the share of the net foreign asset position in it. To interpret the evolution of the current account it is useful to break it down into two pieces: changes in the size of the country portfolio, which we call *portfolio growth;* and changes in the composition of the country portfolio, or *portfolio rebalancing.*[6]

We study a small country populated by a continuum of identical consumers. There is a single good that can be used for consumption and investment. Consumers have access to two investment opportunities: foreign loans and domestic capital. The interest rate on foreign loans is ρdt. To produce one unit of capital one unit of the single good is required. Since capital is reversible and does not depreciate, its price is equal to one and its return is equal to the flow of production minus operating costs. The flow of production generated by one unit of capital is $\pi dt + \sigma d\omega$, where π and σ are non-negative constants; and ω is a Wiener process, i.e., its changes are normally distributed with $E[d\omega] = 0$ and $E[d\omega^2] = dt$. That is, the flow of production is normally distributed with mean πdt and variance $\sigma^2 dt$. The operating costs αdt, are assumed to be proportional to the aggregate investment rate:

$$\alpha dt = \lambda \frac{dk}{k} \qquad (\lambda \geq 0), \tag{1}$$

where k is the aggregate stock of capital at the beginning of the (infinitesimal) period. Since capital does not depreciate, this is also the stock of capital that was used in production in the previous period. Note that we are treating the relationship between operating costs and investment as a congestion effect or negative externality. One set of assumptions that justifies this relationship would be that investment requires a public input

6. Implicit in this decomposition is the assumption that asset price revaluations are small. This might be a poor assumption in some episodes. See Ventura (2001) for an example that shows this.

that costs λ per unit of investment and the government finances this input by raising a tax α on capital. There might be alternative and more compelling sets of assumptions that deliver this relationship. The reason we adopt it here is simply that it provides a tractable and effective way to capture the notion of adjustment costs to investment.[7]

The representative consumer values consumption sequences with these preferences:

$$E\int_0^{\infty} \ln(c)/e^{-\delta t}\, dt \qquad (\delta > 0). \tag{2}$$

Given our assumptions about the flow of production and the operating costs, the return to capital is $(\pi - \alpha)dt + \sigma d\omega$; and the representative consumer's budget constraint can be written as follows:

$$da = \{[(\pi - \alpha)(1 - x) + \rho x]a - c\}dt + (1 - x)a\sigma d\omega, \tag{3}$$

where c, a, and x denote consumption, wealth, and the share of foreign loans in the portfolio of the representative consumer. The budget constraint illustrates the standard risk–return trade-off underlying investment decisions. Each extra unit of wealth invested in domestic capital rather than foreign loans increases the expected return to wealth by $(\pi - \alpha - \rho)dt$, at the cost of raising the variance of this return by $\sigma^2 dt$. Finally, we assume that it is not possible to short-sell the capital stock, i.e., $x \leq 1$.

The representative consumer solves (2) subject to (3), taking the path of α as given. Solving this problem, we find the optimal consumption and portfolio decision[8]:

$$c = \delta a, \tag{4}$$

$$x = 1 - \max\left\{\frac{\pi - \alpha - \rho}{\sigma^2}, 0\right\}. \tag{5}$$

7. The q-theory postulates that investment raises the price of investment goods relative to consumption goods, leaving the productivity of capital constant. We instead postulate that investment lowers the productivity of capital, leaving the relative price of investment and consumption goods constant. It is likely that in real economies, both sorts of adjustment costs to investment are important. See Lucas (1967) for an early model that considers both types of adjustment costs; and Caballero (1999) and Dixit and Pyndick (1994) for two excellent expositions of existing models of adjustment costs of investment.
8. Merton (1971) solved this problem first. See also the appendix in Kraay and Ventura (2000).

When deciding their consumption, consumers behave as in the permanent-income theory of Friedman. Equation (4) shows that consumption is a fixed fraction of wealth and is independent of the expected return and volatility of available assets. When deciding their portfolio, consumers behave as in the mean–variance theory of Markowitz and Tobin. Equation (5) shows that the shares of each asset in the portfolio depend only on the mean and variance of the different assets and not on the level of wealth. The kink in the demand for foreign assets is the result of the short-sale constraint on domestic capital, i.e. $x \leq 1$.

In equilibrium, the demand and supply of capital must be equal, and this implies that

$$(1 - x)a = k + dk. \tag{6}$$

The left-hand side of equation (6) is the demand for capital. Since we have assumed that only domestic consumers hold domestic capital, this demand is equal to the share of their wealth that these consumers want to hold in domestic capital, times wealth. The right-hand side of equation (6) is the supply of capital, and consists of the capital stock at the beginning of the period plus the investment made during the (infinitesimal) period.

This completes the description of the model. There are two state variables (k and a) and one shock ($d\omega$). The new-rule model of our previous paper obtains as the limiting case in which $\lambda \to 0$. In this case, there are no adjustment costs to investment and the only state variable is the level of wealth. Assume that $\pi > \rho + \lambda(\rho - \delta)$. This parameter restriction ensures that the economy is productive enough so that the short-selling constraint on capital is never binding. Then, it is straightforward to use equations (1)–(6) to obtain the dynamics for the capital stock and wealth[9]:

$$\frac{dk}{k} = \lambda^{-1}\left(\pi - \rho - \sigma^2 \frac{k}{a}\right)dt, \tag{7}$$

$$\frac{da}{a} = \left[\sigma^2\left(\frac{k}{a}\right)^2 + \rho - \delta\right]dt + \frac{k}{a}\sigma\, d\omega. \tag{8}$$

Equations (7)–(8) provide the law of motion of the system from any given initial condition and sequence of shocks. Our next goal is to use this

9. To derive equations (7)–(8), remember that in the limit of continuous time $dkdt \approx 0$.

dynamical system to study how the current account responds to income shocks.

3. *Portfolio Growth and Portfolio Rebalancing*

To illustrate the model's implications, we analyze the behavior of savings, investment and the current account after a transitory income shock. To do this, it is useful first to establish some notation. Let S and CA be savings and the current account, each as a share of wealth, i.e., $S = da/a$ and $CA = d(xa)/a$. It follows that, along any particular sample path that we consider, the current account can be written as

$$CA = xS + dx. \tag{9}$$

Equation (9) shows that it is possible to interpret the current account as the sum of two terms. The first one measures the change in the stock of foreign assets that would keep constant the composition of the country portfolio, and this is what we refer to as *portfolio growth*. The second term measures the change in the composition of the country portfolio, and this is what we refer to as *portfolio rebalancing*.

To develop intuitions about the interplay between these two components of the current account, we present next a series of examples. In all of them, we assume the following sample path for the production shock:

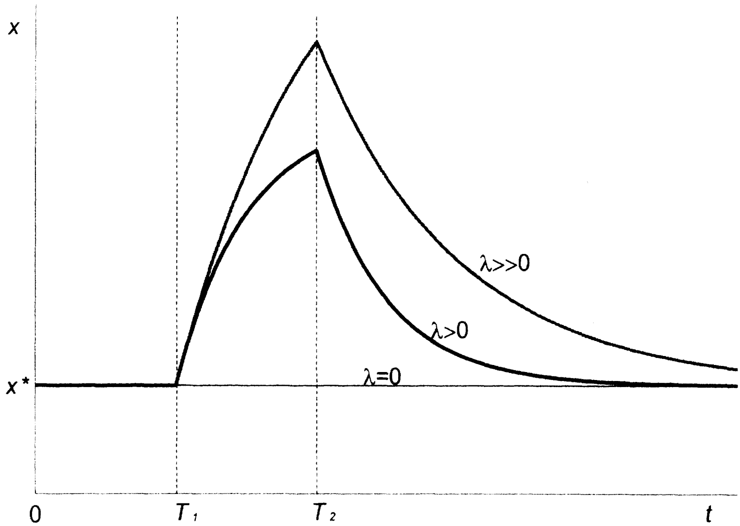
$$d\omega = \begin{cases} 0, & t \in (-\infty, T_1), \\ \frac{\varepsilon}{\sigma} dt, & t \in [T_1, T_2) \quad (\varepsilon > 0), \\ 0, & t \in [T_2, \infty). \end{cases} \tag{10}$$

That is, the country experiences a sequence of unexpected production shocks equal to εdt times the capital stock for a finite period and zero afterwards. We refer to the period $[T_1, T_2)$ as the *shock period* and to $(-\infty, T_1)$ and $[T_2, \infty)$ as the *pre-* and *postshock periods*, respectively.

Figure 4 shows the behavior of the foreign asset position along this sample path. Regardless of the initial condition, during the preshock period the share of foreign assets converges towards

$$x^* = 1 + \frac{1}{2\lambda} - \sqrt{\left(\frac{1}{2\lambda}\right)^2 + \frac{\lambda^{-1}(\pi - \rho) - \rho + \delta}{\sigma^2}}.$$

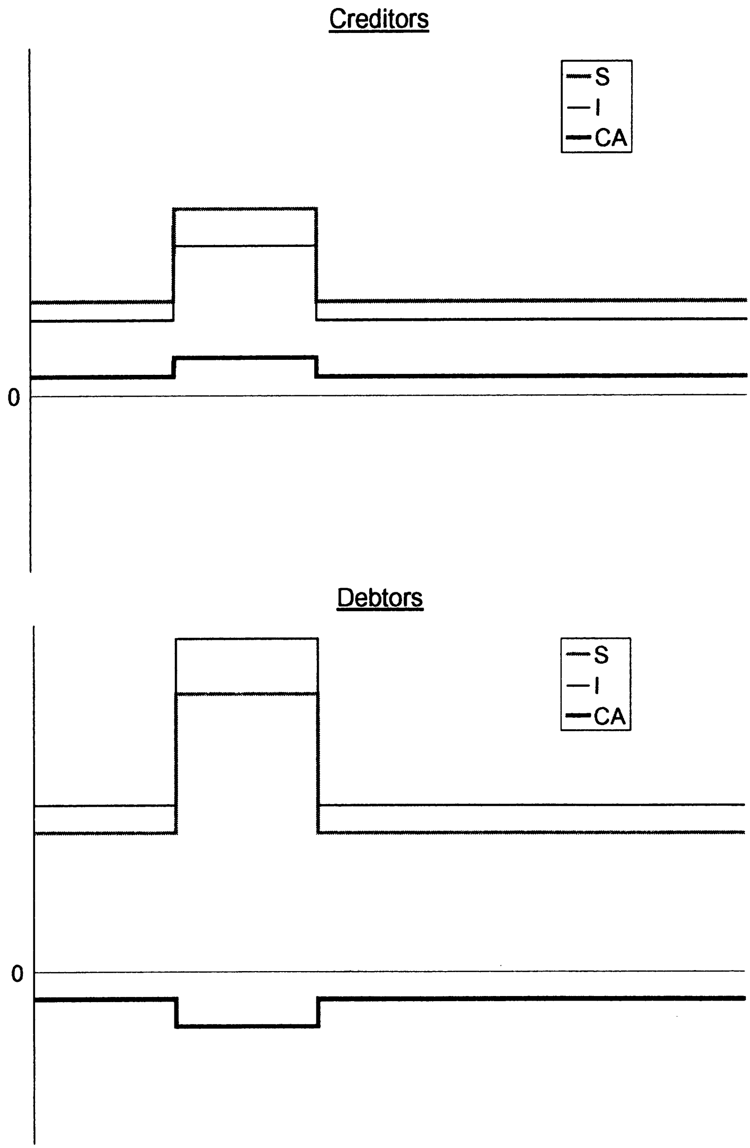
Figure 4 THE SHARE OF FOREIGN ASSETS IN WEALTH



The simulation behind Figure 4 assumes that this value has been reached by $t = 0$. During the shock period the share of foreign assets increases steadily, albeit at a declining rate. The magnitude of this increase depends on λ. High values of λ imply that the effects of increased investment on operating costs are large and provide a strong inducement for investors to rebalance their portfolios towards foreign assests. During the postshock period, investment and operating costs decline. As a result, the share of foreign assets slowly returns to its preshock level. We next study the implications of this behavior of the share of foreign assets for the current account.

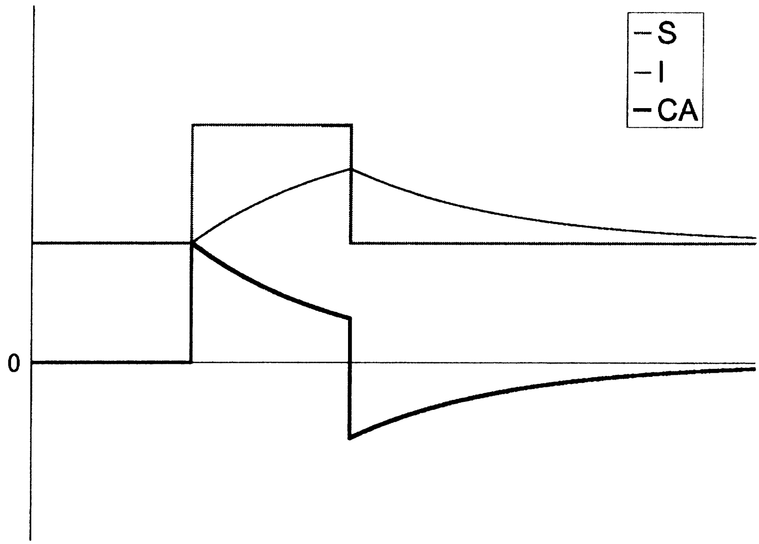
Consider first the case in which adjustment costs to investment are negligible, i.e, $\lambda \to 0$. Figure 4 shows that in this case the share of foreign assests is constant throughout. As a result, there is no portfolio rebalancing, i.e., $dx = 0$; and the current account is equal to portfolio growth, i.e., $\text{CA} = xS$. This is the new rule model that we analyzed in our previous paper, and its implications for a creditor and a debtor country are depicted in Figure 5. The top panel shows a creditor country, i.e. $x^* > 0$, while the bottom panel shows a debtor country, i.e. $x^* < 0$. Both countries raise their savings during the shock period as a result of the standard consumption-smoothing motive. Both countries also invest these marginal savings in domestic capital and foreign loans in the same proportions as their average portfolio. Since the foreign asset share is small in absolute value, we find that in both countries the increase in investment

Figure 5 PORTFOLIO GROWTH



Notes: This figure shows saving (S), Investment (I), and the current account (CA), following a positive shock, in debtor and creditor countries, for the case $\lambda = 0$.

Figure 6 PORTFOLIO REBALANCING



Notes: This figure shows saving (S), investment (I), and the current account (CA) following a positive shock, in a country with zero initial foreign assets, for the case $\lambda > 0$.

is of the same order of magnitude as the increase in saving. But it is not exactly the same, and this leads to different current account responses in debtor and creditor countries. In the creditor country, investment increases somewhat less than savings and the current account registers a surplus. In the debtor country, investment increases somewhat more than savings and the current account registers a deficit. This is the main result of our previous paper.

Consider next the case in which adjustment costs to investment are no longer negligible, i.e., $\lambda > 0$. Figure 6 shows the case of a country that is neither a debtor nor a creditor. By choosing the case $x^* = 0$, we know that in the absence of adjustment costs, the current account would be zero before, during, and after the shock. The country raises its savings during the shock period for the same consumption-smoothing motive as before. But adjustment costs now discourage large swings in investment, and this affects how these savings are distributed between domestic capital and foreign loans. During the shock period, the country uses most of its increase in savings to purchase foreign loans, while investment increases only gradually. Consumers rebalance their portfolios towards foreign assets, because the increase in investment raises operating costs and this lowers the expected return to domestic capital. The portfolio-rebalancing component of the current account is positive, and as a result the new rule underpredicts the current account surplus in the short run. In the postshock period investment falls slowly, but remains higher than normal for a while. Since productivity has returned to its preshock level, savings return to normal and the higher than normal investment is now financed by sale of foreign loans. Consumers rebalance their portfolios back towards their original composition, because the decline in investment lowers operating costs and this raises the expected return to domestic capital. The portfolio-rebalancing component of the current account is therefore negative, and as a result the new rule overpredicts the current account surplus in the medium run. As time passes, the country portfolio returns to its original composition and the new rule applies again in the long run.

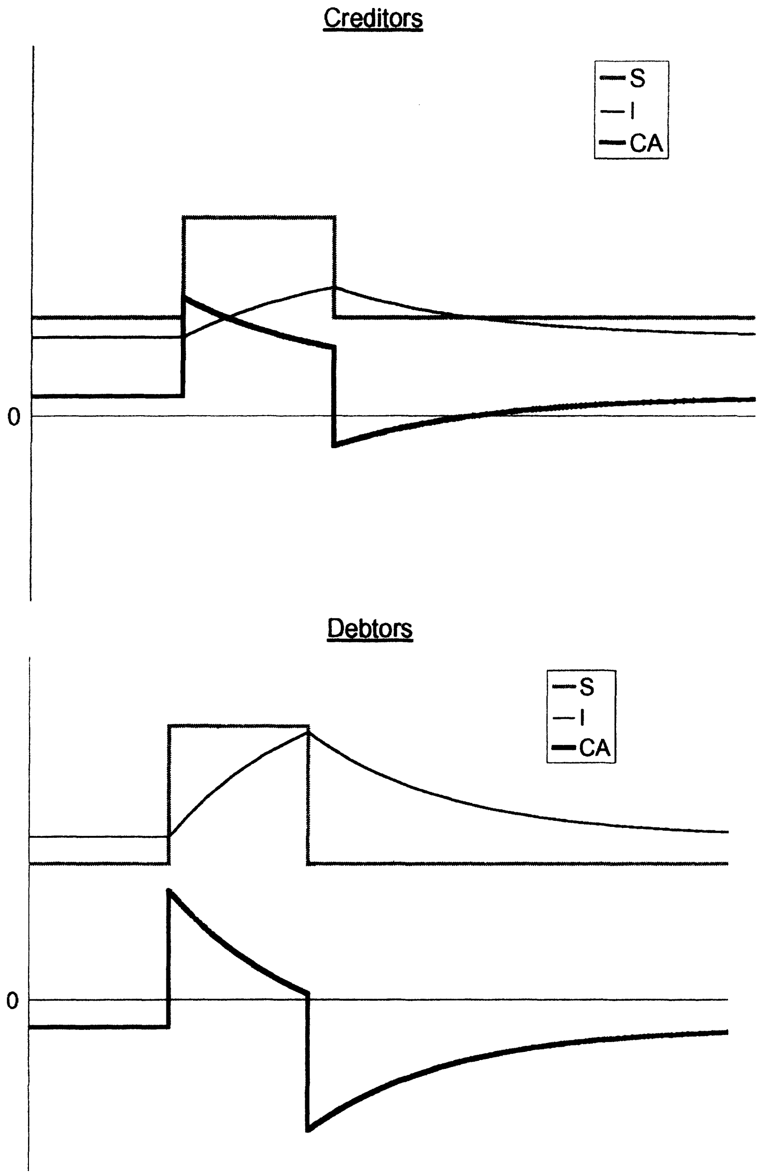
This example clearly shows the role of foreign loans as a buffer stock to smooth the fluctuations in investment. Without access to foreign loans, countries would be forced not only to invest all of their savings at home but also to do so contemporaneously. Access to foreign loans permits countries to spread their domestic investment over time and, in this way, avoid paying high adjustment costs. To do this, countries temporarily place their savings in foreign loans and slowly convert them into domestic investment.

It is possible to design more complicated examples in which the current account exhibits richer dynamics. For instance, Figure 7 shows the case of positive adjustment costs in a creditor and a debtor country. One can interpret these examples as a combination of portfolio growth and portfolio rebalancing along the lines of the explanations of Figures 5 and 6. The theory developed here therefore equips us with a clear picture of the factors that determine how the current account reacts to increases in savings. The next step is to go back to actual data and attempt to interpret them from the vantage point of the theory.

4. *The Process of Current Account Adjustment*

In the introduction, we argued that in the long run most of the variation in current accounts in OECD countries is due to portfolio growth effects, while in the short run, current account fluctuations primarily reflect changes in the composition of country portfolios or portfolio rebalancing. We based this point on the observation that the simple interaction of a country's foreign asset share with its saving, averaged over the past thirty years, proved to be a very good predictor of the country's average current account. However, the same interaction using annual data proved to be

Figure 7 PORTFOLIO GROWTH AND PORTFOLIO REBALANCING



Notes: This figure shows saving (S), investment (I), and the current account (CA), following a positive shock, in debtor and creditor countries, for the case $\lambda > 0$.

a very poor predictor of year-to-year fluctuations in current accounts. This was shown in the two panels of Figure 2.[10]

The theory presented above has the potential to explain these observations. In the presence of adjustment costs to investment, the theory predicts that in the short run countries react to transitory income shocks by raising savings and rebalancing their portfolios towards foreign assets. If these costs are sufficiently strong, the theory can therefore explain why the short-run variation in the current account is dominated by portfolio rebalancing and not portfolio growth. The theory also predicts that in the aftermath of the shock countries gradually rebalance their portfolios back to their original composition. Therefore the theory can also explain why the long-run variation in the current account is dominated by portfolio growth and not portfolio rebalancing.

The theory also has very clear predictions for the patterns of portfolio rebalancing that we should observe in the data. The new-rule (portfolio-growth) component of the current account underpredicts the actual current account during the shock period as countries rebalance their portfolios towards foreign assets, whereas it overpredicts the current account after the shock as countries rebalance their portfolios back towards its original composition. In other words, a contemporaneous increase in savings should be associated with a positive portfolio-rebalancing component of the current account, whereas past increases in savings should be associated with negative values in the same component. Moreover, for the new rule to apply in the long run, these positive and negative components should be roughly of the same magnitude. In this section, we show that the data are consistent with these predictions.

We begin by decomposing observed current accounts into portfolio-growth and portfolio-rebalancing components. As in the theory, let x_{ct} denote the share of foreign assets in the portfolio of country c at the beginning of period t, and let S_{ct} and CA_{ct} denote gross national saving and the current account balance as a fraction of GDP during period t. We measure

10. Of course, one could argue that this discrepancy between the between-country and within-country results is simply due to much greater measurement error in the within-country variation in current accounts and portfolio growth than in the between-country variation. While measurement error is certainly present, we think it is clearly not the whole story. One way to see this is to notice that (1) measurement error in the RHS variable in our regression will bias the slope coefficient downward by a factor equal to the signal-to-noise ratio, and (2) measurement error in both the LHS and RHS variables will bias the R^2 by a factor equal to the product of the signal-to-noise ratios in the two variables. Since we observe a slope coefficient of one-half and an R^2 that falls from 0.85 in the between regression to 0.03 in the within regression, this implies a signal-to-noise ratio of only 0.55 in the RHS variable and 0.06 in the LHS variable. While there are clearly various measurement issues in our data, we find it implausible that the data are as noisy as this calculation would suggest.

the portfolio-growth component of the current account as $PG_{ct} \equiv x_{ct}S_{ct}$, i.e. the net purchases of foreign assets that would be observed during period t if a country were to distribute its saving between domestic and foreign assets in the same proportion as in its existing portfolio at the beginning of the period. We measure the portfolio-rebalancing component of the current account residually as the difference between the actual current account and the portfolio-growth component, i.e., $PR_{ct} \equiv CA_{ct} - x_{ct}S_{ct}$.

To implement this decomposition, we require data on current accounts, saving, and the share of foreign assets in country portfolios. We obtain annual data on current accounts in current U.S. dollars from the International Monetary Fund's *International Financial Statistics*. We measure gross national saving as the sum of the current account and gross domestic investment in current U.S. dollars, and express both as a fraction of GDP in current U.S. dollars, obtaining investment and GDP from the World Bank's world development indicators. We obtain data on the share of foreign assets in wealth from Kraay et al. (2000). We restrict attention to the set of 21 industrial countries for which at least 20 annual observations on this variable are available over the period 1966–1997 covered by this dataset.

With data on saving and the portfolio-rebalancing component of the current account in hand, we estimate a series of dynamic linear regressions of the form

$$PR_{ct} = \alpha_c + \sum_{v=1}^{p} \phi_{cv}\, PR_{c,t-v} + \sum_{v=0}^{q} \gamma_{cv} S_{c,t-v} + \beta_c' Z_{ct} + u_{ct}, \tag{11}$$

where PR_{ct} and S_{ct} are the portfolio-rebalancing components of the current account and saving as described above, Z_{ct} is a vector of control variables, and u_{ct} is a well-behaved error term. We then use the point estimates of the coefficients to retrieve the implied impulse response function of portfolio rebalancing in period $t + k$ to an increase in saving in period t, i.e. $\partial PR_{c,t+k}/\partial S_{ct}$. These impulse responses provide us with a picture of how countries change the composition of their portfolios following an increase in saving. The results of four such regressions are summarized in Table 1. The top panel of Table 1 reports the estimated coefficients, while the bottom panel reports the corresponding impulse response functions using the 21-country sample of annual observations. The estimated impulse response functions are also plotted in the four panels of Figure 8.

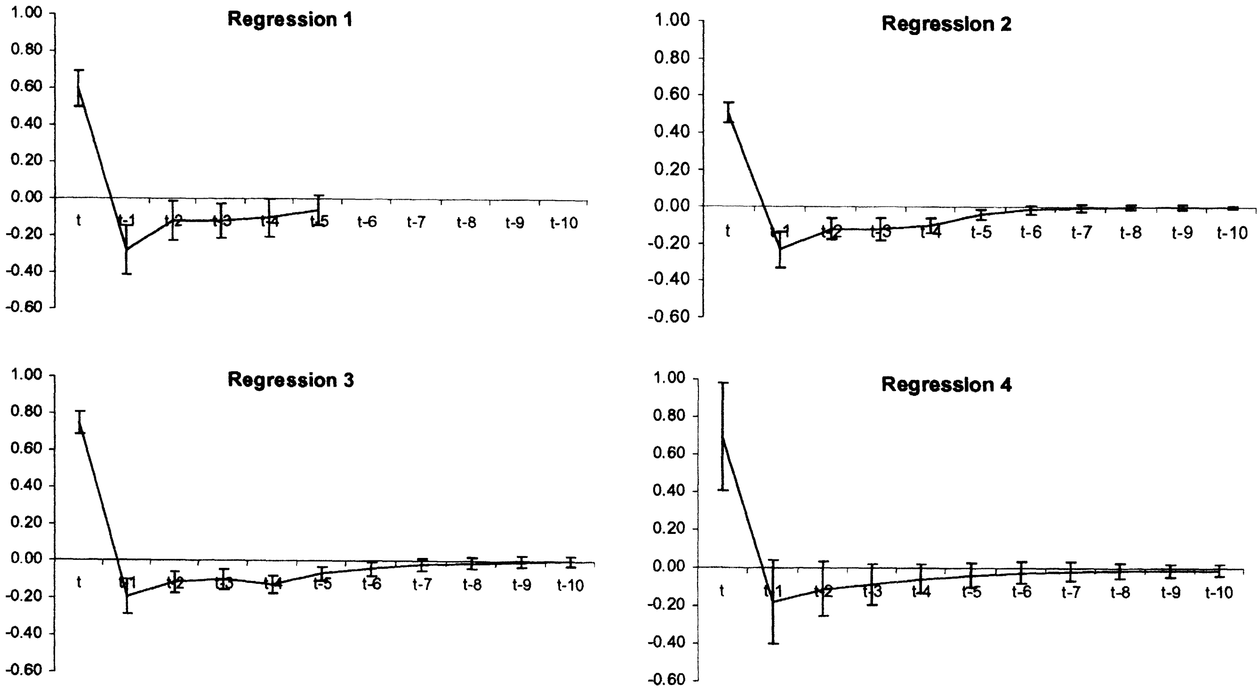
We begin by assuming that all of the slope coefficients are the same across countries. In our simplest specification, we also set $p = 0$ and intro-

Table 1 PORTFOLIO REBALANCING AND SAVING (ANNUAL DATA FOR 21 COUNTRIES)

	Regression 1		*Regression 2*		*Regression 3*		*Regression 4*	
	Coef.	*S.E.*	*Coef.*	*S.E.*	*Coef.*	*S.E.*	*Mean Coef.*	*SD of Coefs.*
Coefficient Estimates								
sy	0.598	0.096	0.504	0.080	0.746	0.079	0.691	0.286
sy(−1)	−0.281	0.133	−0.611	0.102	−0.824	0.104	−0.767	0.383
sy(−2)	−0.120	0.106	0.112	0.077	0.109	0.070	0.123	0.167
sy(−3)	−0.120	0.095	−0.043	0.073	0.040	0.067		
sy(−4)	−0.102	0.103	−0.031	0.065	−0.063	0.061		
sy(−5)	−0.060	0.078	0.020	0.058	0.019	0.057		
pr(−1)			0.754	0.056	0.845	0.057	0.837	0.216
pr(−2)			−0.114	0.069	−0.081	0.066	−0.152	0.186
pr(−3)			−0.031	0.049	−0.076	0.047		
dq					−0.375	0.050	−0.390	0.198
dpop					−0.684	0.188	−0.267	1.293
Country effects	Y		Y		Y			
Year effects	N		N		Y			
Impulse Responses								
t	0.598	0.096	0.504	0.054	0.746	0.059	0.691	0.286
$t-1$	−0.281	0.133	−0.231	0.096	−0.193	0.095	−0.179	0.222
$t-2$	−0.120	0.106	−0.119	0.058	−0.114	0.056	−0.111	0.142
$t-3$	−0.120	0.095	−0.122	0.060	−0.098	0.054	−0.088	0.106
$t-4$	−0.102	0.103	−0.102	0.042	−0.122	0.047	−0.059	0.076
$t-5$	−0.060	0.078	−0.039	0.028	−0.068	0.040	−0.038	0.063
$t-6$			−0.014	0.024	−0.040	0.037	−0.024	0.057
$t-7$			−0.003	0.020	−0.019	0.035	−0.018	0.048
$t-8$			0.000	0.016	−0.008	0.033	−0.014	0.041
$t-9$			0.001	0.012	−0.002	0.030	−0.013	0.036
$t-10$			0.001	0.009	0.001	0.027	−0.011	0.032

Note: This table reports the results of estimating equation (11) in the paper. The first three regressions assume slope coefficients are the same across countries. The last reports the mean and standard deviation across countries of country-by-country estimates. Standard errors for the impulse responses in regressions 2 and 3 are simulated using 500 draws from the estimated distribution of coefficients.

Figure 8 PORTFOLIO REBALANCING IN RESPONSE TO UNIT INCREASE IN SAVING (ANNUAL DATA FOR 21 COUNTRIES)



Notes: This figure reports the impulse response of the portfolio-rebalancing component of the current account to a one-year unit increase in saving implied by our estimates (11) under the four different specifications discussed in the text. The vertical bars denote one-standard-deviation intervals around the estimated coefficients.

duce $q = 5$ lags of saving.[11] The results of this specification are reported in the first regression of Table 1. In this case, the impulse response function simply consists of the estimated coefficients on current and lagged saving. We find a strong positive contemporaneous correlation between saving and the current account. The point estimate of 0.6 can be interpreted as the fraction of an increase in saving that, on impact, would be invested in foreign assets by a country with zero initial foreign assets. This fraction would be slightly higher (lower) in creditor (debtor) countries because of the portfolio-growth component. Since the latter measures the current account balance that would keep the composition of their portfolios constant following an increase in saving, it is by construction positive in creditor countries and negative in debtor ones.

The subsequent lags of saving all enter with negative coefficients that are decreasing in absolute value and, with the exception of the first lag, are not significantly different from zero. These coefficients can be interpreted as the fraction of the initial increase in saving that is reallocated back towards domestic assets in each of the subsequent five years. Interestingly, the sum of the coefficients on current and lagged saving is -0.09, which is insignificantly different from zero. This suggests that the initial shift toward foreign assets is largely undone in the next five years, with the bulk of the readjustment occurring in the first year following the increase in saving. This pattern is consistent with the predictions of the theory.

The rest of Table 1 reports a variety of robustness checks on this basic result. We begin by introducing lagged values of the portfolio-rebalancing component of the current account, and find that the first and second lags are strongly significant, while third (and higher) lags are not.[12] Although this slightly alters the point estimates of the coefficients on current and lagged saving, we find that the shape of the impulse response function is very similar to that reported in the first regression. The main difference

11. In unreported results, we find that fifth and higher lags of saving are insignificantly different from zero in most specifications, and adding higher lags has little effect on the point estimates of the coefficients on the first five lags.

12. We are assuming here that the time dimension of our panel is sufficiently large that we can obtain consistent estimates of the coefficients on the lagged dependent variable in the presence of fixed effects relying on large-T asymptotics. Remember also that saving is constructed as investment plus the current account, and the latter is highly correlated with the dependent variable in equation (11). To the extent that the portfolio-rebalancing component of the current account is measured with errors that are persistent over time, this could introduce a correlation between the residuals and current and lagged saving. In the specifications with lags of the dependent variable, we test for and do not reject the null of no serial dependence in the residuals, and so we can rule out this potential source of bias in our estimated impulse responses.

is that the initial shift toward foreign assets is slightly smaller than before, at 50% of the increase in saving.

In the next regression we augment the specification of the previous one with several additional control variables. To the extent that there are other shocks to returns that change the desired composition of country portfolios, and to the extent that these are correlated with saving, this will bias our results in directions which depend on the signs of these correlations. For example, if there are global shocks which raise saving and investment in all countries (such as changes in world interest rates), we will be underestimating the size of the initial shift toward foreign assets when saving increases. Similarly, if in countries and years in which saving is high, factors that increase the desired rate of investment (such as population or productivity growth) are also high, we may again be underestimating the shift toward foreign assets. To control for these factors, we introduce year dummies to capture global shocks, population growth, and Solow residuals as a proxy for productivity growth.[13] The third regression of Table 1 is this augmented specification. Population growth and Solow residuals enter significantly with the expected negative signs, and we find a larger shift toward foreign assets than before, with 75% of the initial increase in saving allocated toward foreign assets. However, the subsequent pattern of adjustment is the same as before, with the initial shift toward foreign assets being reversed in the next few years.

In the final regression, we relax the assumption that the slope coefficients in equation (11) are the same across countries, and instead estimate this equation separately for each country. Because of the fairly short time series available for each country, we adopt a more parsimonious lag structure, introducing only two lags of the dependent variable and of saving, as well as population growth and Solow residuals. We report the average and standard deviation across countries of the estimated coefficients in the last columns of Table 1.[14] Not surprisingly, we find that the country-by-country parameters are much less precisely estimated, and the dispersion across countries in the point estimates is large. Nevertheless, we find

13. We construct Solow residuals as the growth in GDP at constant prices less growth in employment times the period average share of labor in GDP, drawing the latter two variables from the OECD labor-force statistics and national accounts.

14. In the presence of parameter heterogeneity across countries, the pooled estimates reported in the previous two regressions will not deliver consistent estimates of the average (across countries) of these parameters when there is a lagged dependent variable (Pesaran and Smith, 1995). However, the average across countries of the estimated coefficients will provide a consistent estimate of the average response. We find results that are quantitatively quite similar across all specifications despite this potential source of bias in the estimates which impose parameter homogeneity across countries.

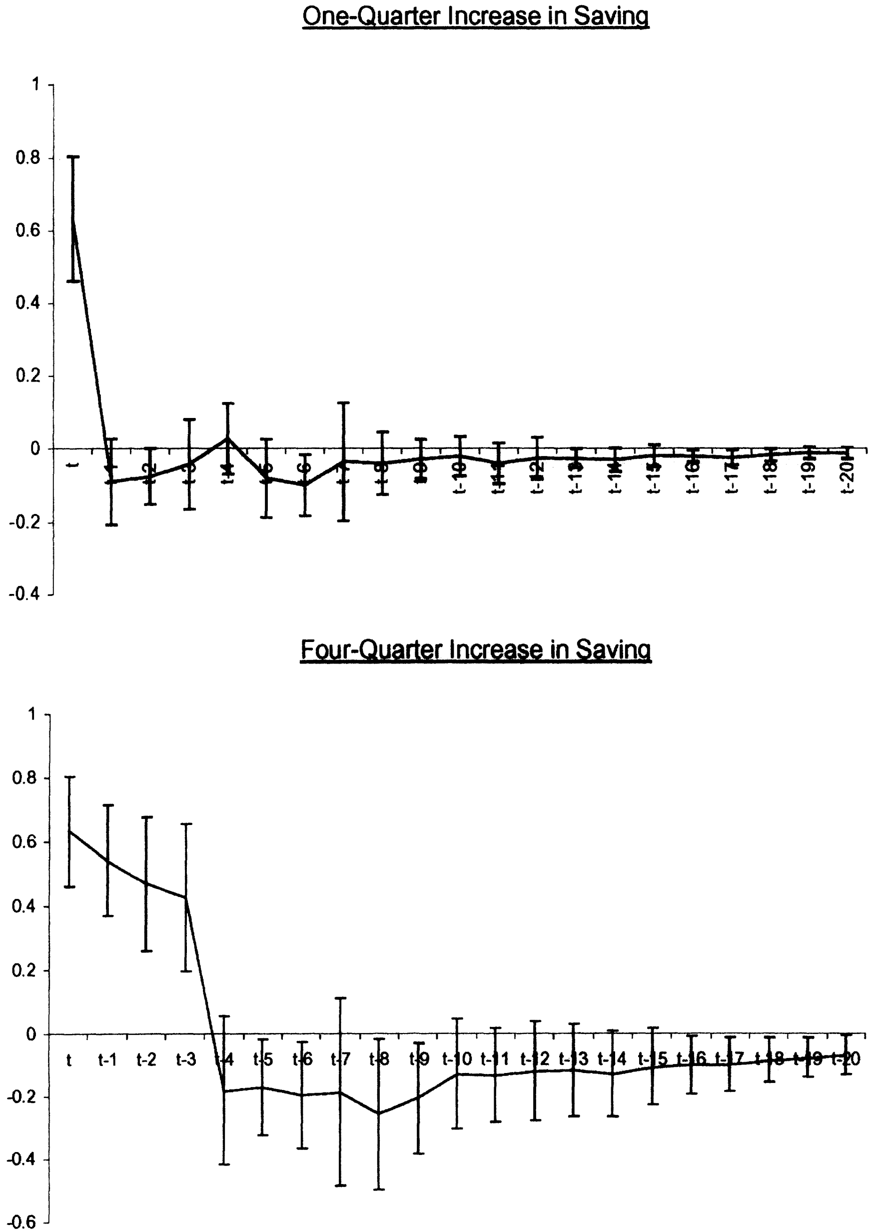
results that are qualitatively and quantitatively quite similar to those in the previous regressions. On average, the fraction of an increase in saving that is allocated to foreign assets is 0.7, and this initial shift toward foreign assets is quickly undone in subsequent periods.

One drawback of the annual data on which we have relied so far is that they are not informative about the intrayear dynamics of saving and the current account. For 12 of the countries in our sample, we were able to obtain quarterly observations on the current account, investment, and GDP beginning in 1980 or earlier from the *International Financial Statistics* and the OECD *Quarterly National Accounts*. For these countries, we linearly interpolate the annual data on the foreign asset share and use the result to construct quarterly portfolio growth and rebalancing components. We then re-estimate equation (11) using quarterly data, introducing eight lags of the portfolio-rebalancing component of the current account, and eight lags of saving. We do not have the quarterly data on population or employment growth required to introduce the same control variables as in the previous regressions with annual data (regressions 3 and 4 in Table 1). We therefore include only a set of period dummies and real GDP growth as controls.

As before, we summarize the results of these country-by-country regressions by computing the mean and standard deviation across countries of the estimated impulse responses. As shown in the top panel of Figure 9, we find that on impact, just over 60% of an increase in saving that lasts one quarter is invested abroad. Beginning immediately in the next quarter, this initial shift toward foreign assets begins to be reversed as countries run current account deficits. If we consider a shock to saving that lasts four quarters, the pattern that emerges is very similar to what we saw in the annual data. This is shown in the bottom panel of Figure 9. During the shock period, countries run positive but declining current account surpluses as they use foreign assets as a buffer stock to smooth investment. In subsequent years, countries run current account deficits in order to restore their original preshock portfolios.

To sum up, while portfolio growth explains much of the long-run variation in current accounts, portfolio rebalancing dominates in the short run. In all of our specifications, we find that the portfolio-rebalancing component of the current account follows a remarkably clear pattern. On impact, up to three-quarters of a shock to saving is invested abroad as countries use foreign assets as a buffer stock to smooth investment in the face of adjustment costs. In subsequent periods, the initial increase in saving produces current account deficits as countries shift their portfolios back to their original composition.

Figure 9 PORTFOLIO REBALANCING IN RESPONSE TO UNIT INCREASE IN SAVING (QUARTERLY DATA FOR 12 COUNTRIES)



Notes: This top (bottom) panel of this figure reports the impulse response of the portfolio-rebalancing component of the current account to a one-quarter (four-quarter) unit increase in saving implied by our estimates (11), using quarterly data for 12 OECD countries. The vertical bars denote one-standard-deviation intervals around the estimated coefficients.

5. The Current Account and Investment

Over the past 20 years considerable empirical effort has been devoted to documenting the correlations between investment and the current account. Two stylized facts have emerged. First, cross-country correlations between investment and the current account are weak (Penati and Dooley, 1984; Tesar, 1991). Second, within countries the time-series correlation between investment and the current account is consistently negative (Glick and Rogoff, 1995). We document that these two stylized facts hold in our sample of countries in Figure 10. In the top panel we plot long-run averages of the current account as a fraction of GDP (on the vertical axis) against long-run investment rates (on the horizontal axis) for the 21 industrial countries in our sample. Across countries, we find a very weak negative correlation between the two, with a coefficient of -0.036. In the bottom panel, we plot the same two variables expressed as deviations from country means, pooling all available annual observations. Within countries, the correlation between investment and the current account is strongly negative, with a coefficient of -0.329.[15]

This difference between the correlations between the current account and investment in the long and in the short run is consistent with the view of the current account proposed in this paper. To see this, it is useful to write the current account and investment as follows:

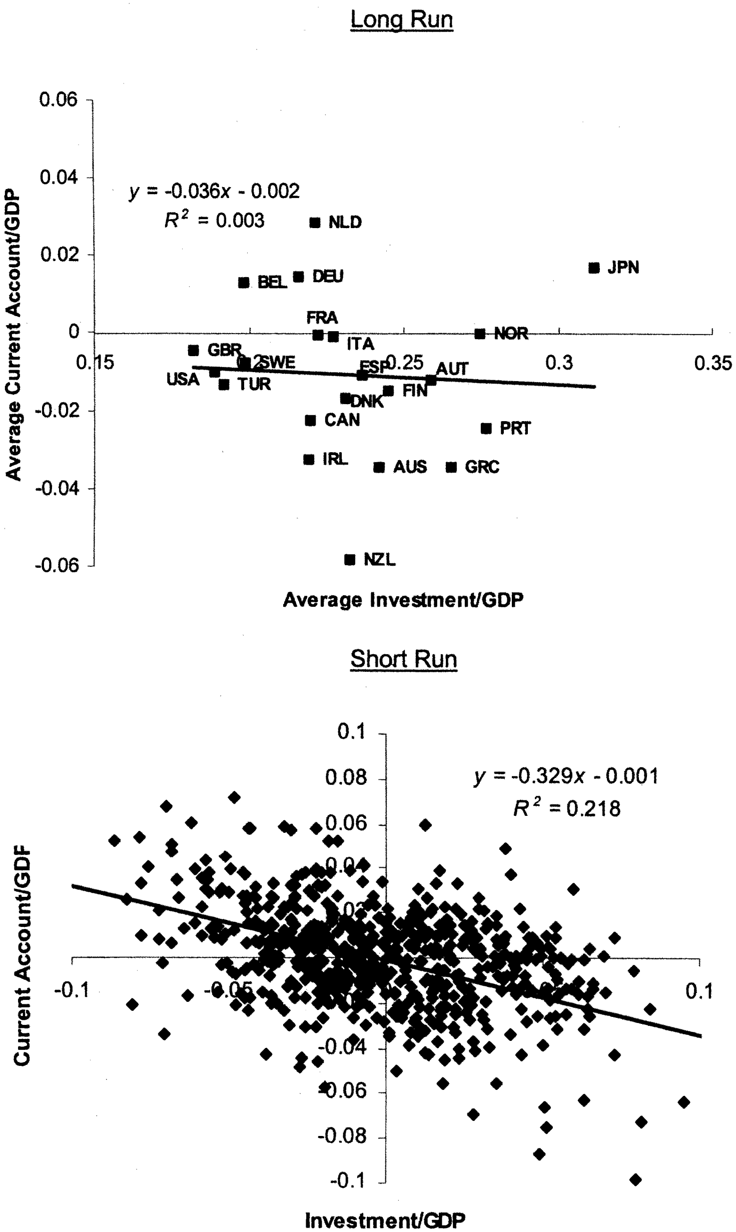
$$CA_{ct} = x_{ct}S_{ct} + PR_{ct}, \tag{12}$$

$$I_{ct} = (1 - x_{ct})S_{ct} - PR_{ct}. \tag{13}$$

These equations decompose the current account and investment into their portfolio-growth and portfolio-rebalancing components. The key observation to explain the pattern of correlations between the current account and investment is that the long-run relationship between these variables is dominated by their portfolio-growth components, while the short-run relationship is dominated by the portfolio-rebalancing components. To make this statement precise, we decompose the coefficient of a regression of the current account on investment into the contributions of portfolio growth and portfolio rebalancing. Let β be this regression coefficient, and define

15. This is almost exactly the same as the average of country-by-country estimates reported in Glick and Rogoff (1995).

Figure 10 INVESTMENT AND THE CURRENT ACCOUNT



Notes: This figure plots the current account as a share of GDP against gross domestic investment as a share of GDP, using an unbalanced panel of 21 OECD countries over the period 1966–1997. The top panel plots period averages, and the bottom panel plots deviations from country means.

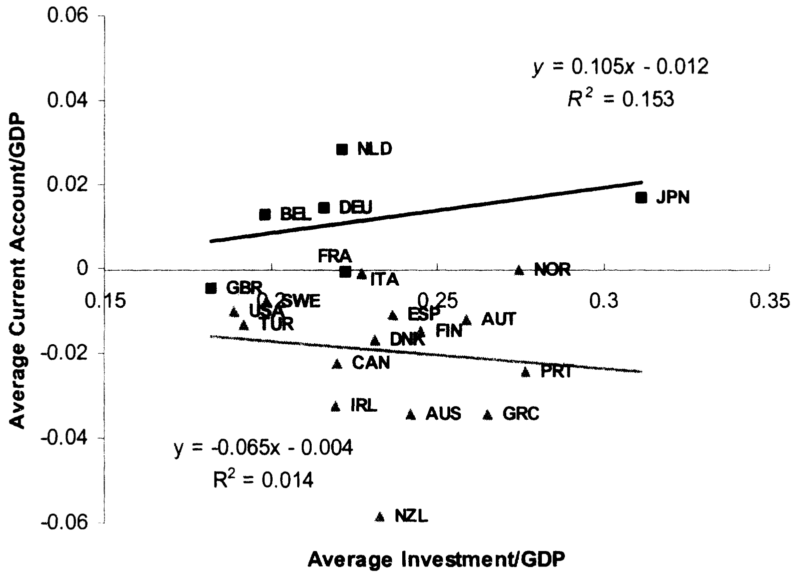
$$\beta^{PG} = \frac{\mathrm{Cov}(xS, (1 - x)I)}{\mathrm{Var}(I)} \quad \text{and} \quad \beta^{PR} = \frac{\mathrm{Cov}(CA, I)}{\mathrm{Var}(I)} - \frac{\mathrm{Cov}(xS, (1 - x) \cdot I)}{\mathrm{Var}(I)}.$$

Since $\beta = \beta^{PG} + \beta^{PR}$, we interpret β^{PG} and β^{PR} as the contributions of portfolio growth and portfolio rebalancing to the relationship between the current account and investment.

When we perform this decomposition on the between estimator in the top panel of Figure 10, we find that $\beta^{PG} = -0.041$ and $\beta^{PR} = 0.005$. Consistent with the theory, portfolio rebalancing plays no role in the long run, and the relationship between the current account and investment reflects only portfolio growth. Moreover, the theory predicts that the correlation between the current account and investment should be negative in debtor countries (where $x < 0$) and positive in creditor countries (where $x > 0$). The intuition is simple and follows immediately from the new rule: in debtor countries increases in saving generate even greater increases in investment, leading to current account deficits, while in creditor countries the increase in investment is less than that of saving, leading to current account surpluses. Since our sample of countries consists of a mixture of 15 debtor and 6 creditor countries, we should expect to find a negative but not especially strong correlation between investment and the current account in a cross section that pools all countries together. This is exactly what we found in the top panel of Figure 10. But when we divide our sample into debtors and creditors and compute the correlations separately in the two groups, we should find a negative correlation among debtors and a positive correlation among creditors. Figure 11 shows that this is the case. Of course, we have only a very small sample of creditors and debtors, and so these differences in slope should be taken with a grain of salt. Nevertheless, we note that they are consistent with the theory.

When we perform the same decomposition on the within estimator in the bottom panel of Figure 10, we find that $\beta^{PG} = -0.014$ and $\beta^{PR} = -0.315$. Consistent with the theory, portfolio rebalancing is important in the short run, and this introduces a source of negative correlation between the current account and investment. In the presence of adjustment costs, a shock to income in a given period triggers an adjustment process that lasts for many periods. In particular, a positive shock to income raises saving contemporaneously and is followed by several periods of portfolio rebalancing, as countries have higher than normal investment financed by current account deficits in order to restore their preshock portfolios. The opposite occurs when there is a negative shock. Thus positive shocks trigger a *ripple effect* of subsequent higher investment and lower current accounts, and vice versa for negative shocks. This effect is a source of negative correlation between investment and the current account within countries.

Figure 11 INVESTMENT AND THE CURRENT ACCOUNT IN THE LONG RUN IN DEBTORS AND CREDITORS



Notes: This figure plots the period average of the current account as a fraction of GDP against the period average of gross domestic investment as a fraction of GDP, using an unbalanced panel of 21 OECD countries over the period 1966–1997. The triangles (squares) correspond to countries with negative (positive) foreign assets averaged over the same period.

6. *Concluding Remarks*

By reconciling long- and short-run data, we further develop the view of the cyclical behavior of savings, investment, and the current account in industrial countries that we first proposed in Kraay and Ventura (2000). Faced with income shocks, countries smooth consumption by raising savings when income is high and vice versa. In the short run, countries invest most of their savings in foreign assets, only to rebalance their portfolios back to their original composition in the next four to five years. In the long run, country portfolios are remarkably stable, the new rule applies, and fluctuations in savings lead to fluctuations in the current account that are equal to savings times the share of foreign assets in the country portfolio. By using foreign assets as a buffer stock, countries smooth investment in order to save on adjustment costs.

An interesting implication of this view of international capital flows is that the stock of foreign assets and the current account are more volatile than consumption, investment, and the capital stock. But this does not mean that international capital flows are a factor that contributes to making macroeconomic aggregates more volatile or unstable. To the contrary, the view presented here suggests that the ability to purchase and sell foreign assets allows countries to smooth not only their consumption, but also their investment. Foreign assets and the current account absorb part of the volatility of these other macroeconomic aggregates.

Underlying the view proposed in this paper is the assumption that countries are unable or unwilling to use international financial markets to insure themselves against shocks. While few would question that this assumption is consistent with available evidence, it is certainly not consistent with existing theory. Until this inconsistency is resolved, we cannot claim a full understanding of international capital flows among industrial countries.

REFERENCES

Caballero, R. (1999). Aggregate investment. In *Handbook of Macroeconomics, Vol. 1B*, J. B. Taylor and M. Woodford (eds.). Amsterdam: Elsevier.

Deaton, A. (1992). *Understanding Consumption*. Oxford: Clarendon Press.

Dixit, A. K., and R. S. Pindyck. (1994). *Investment Under Uncertainty*. Princeton, NJ: Princeton University Press.

Dornbusch, R. (1983). Real interest rates, home goods, and optimal external borrowing. *Journal of Political Economy* 91:141–153.

Feldstein, M., and C. Horioka. (1980). Domestic savings and international capital flows. *Economic Journal* 90:314–329.

Glick, R., and K. Rogoff. (1995). Global versus country-specific productivity shocks and the current account. *Journal of Monetary Economics* 35:159–192.

Kraay, A., and J. Ventura. (2000). Current accounts in debtor and creditor countries. *Quarterly Journal of Economics* 95:1137–1166.

———, N. Loayza, L. Servén, and ———. (2000). Country portfolios. Cambridge, MA: National Bureau of Economic Research. NBER Working Paper 7795.

Lewis, K. (1999). Trying to explain home bias in equities and consumption. *Journal of Economic Literature* 37:571–608.

Lucas, R. E. (1967). Adjustment costs and the theory of supply. *Journal of Political Economy* 75:321–334.

Matsuyama, K. (1987). Current account dynamics in a finite horizon model. *Journal of International Economics* 23:299–313.

Merton, R. (1971). Optimum consumption and portfolio rules in a continuous-time model. *Journal of Economic Theory* 3:373–413.

Obstfeld, M. (1982). Aggregate spending and the terms of trade: Is there a Laursen–Metzler effect? *Quarterly Journal of Economics* 90:251–270.

———, and K. Rogoff. (1995). The intertemporal approach to the current account. In *Handbook of International Economics*, vol. 3, G. Grossman and K. Rogoff (eds.). Amsterdam: Elsevier.

Penati, A., and M. Dooley. (1984). Current account imbalances and capital formation in industrial countries, 1949–81. *IMF Staff Papers* 31:1–24.

Persson, T., and L. Svensson. (1985). Current account dynamics and the terms of trade: Harberger–Laursen–Metzler two generations later. *Journal of Political Economy* 93:43–65.
Pesaran, H., and R. Smith. (1995). Estimating long-run relationships from dynamic heterogenous panels. *Journal of Econometrics* 68:79–113.
Sachs, J. (1981). The current account and macroeconomic adjustment in the 1970s. *Brookings Papers on Economic Activity* 1:201–268.
———. (1982). The current account in the macroeconomic adjustment process. *Scandinavian Journal of Economics* 84:147–159.
Svensson, L., and A. Razin. (1983). The terms of trade and the current account: The Harberger–Laursen–Metzler effect. *Journal of Political Economy* 91:97–125.
Tesar, L. (1991). Savings, investment and international capital flows. *Journal of International Economics* 31:55–78.
Ventura, J. (2001). A portfolio view of the U.S. current account deficits. Brookings Papers on Economic Activity.

Comment[1]

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1. Introduction

This is a very interesting paper, and it contributes to our understanding of the determination of the current account in developed countries. In a previous paper [Kraay and Ventura (2000), henceforth KV] the authors developed a theory of the current account based on portfolio theory. They considered a world in which domestic residents can save in two assets: risky domestic capital and riskless foreign bonds. If the processes governing the returns to assets do not change much over time and if there are no other frictions, the optimal share of wealth in foreign bonds is kept to a constant level that depends only on the preference parameters and on the relative risk of domestic capital. This implies that when domestic consumers accumulate an additional unit of wealth, they invest it just like their existing portfolio. Since the current account is the change in the foreign asset position of a country, their theory implies that the current account should be roughly equal to the product of domestic saving (the increase in wealth) and the current share of foreign assets in the existing country portfolio. In the previous paper the authors argued that this theory explains very well the long-run evolution of the current account.

In this paper they instead show that even though in the long run the

1. I thank Aart Kraay and Jaume Ventura for kindly providing me their data set, and Alessandra Fogli for useful comments.

share of foreign assets in country portfolio is quite constant (consistently with their theory), in the short run there are significant deviations from the long-run share; in other words, short-run current account movements are not explained well by their theory. To reconcile this fact with their theory they modify their basic framework by introducing costs of adjusting domestic capital. These costs imply that in the short run countries are unwilling to change their domestic capital stock rapidly and thus shocks to their wealth will mostly affect their stock of foreign assets. Thus in the short run the share of foreign assets in their portfolio will be different from the long-run optimal constant level, but it will revert to that level in the long run. The authors call these deviations from the long-run share of foreign assets *portfolio rebalancing*.

Their theory implies that in response to a positive wealth shock we should on impact observe an increase in the current account and in domestic investment, but in subsequent periods a below average current account and above average investment. The authors identify wealth shocks in the data as shocks to saving, and they do find the response predicted by their theory, suggesting that portfolio rebalancing is indeed important in explaining the short-run behavior of the current account.

I believe that the authors, by bringing portfolio theory into international macroeconomics, have added an interesting dimension to the study of short-run current account dynamics. While the previous literature has stressed the role of the current account as the channel through which countries finance their investment to smooth their consumption (see for example Sachs, 1981), KV suggest another role: that of smoothing domestic investment growth to avoid adjustment costs.

In order to completely understand how an additional unit of saving is divided between domestic capital and foreign bonds, though, it is crucial to determine what is the cause of the increase in saving. If, for example, the increase in saving has been caused by a shock that has increased the return to domestic capital, such as a persistent productivity shock, then domestic consumers will want to invest all the additional saving, plus possibly foreign borrowing, in domestic capital; in this case increases in saving will be accompanied by current account deficits, as predicted by the standard intertemporal approach. If on the other hand the increase in saving does not change the relative return of the two assets, as for example in the case of a temporary productivity shock, then domestic consumers will want to invest it in both assets, and the increase in saving will be accompanied by current account surpluses, as described by KV.

I will first show that in the data both types of dynamics are present, suggesting the presence of two types of shocks; I will then present a simple intertemporal model of the current account that incorporates KV's

Table 1 MEDIAN CORRELATIONS, 21 COUNTRIES, 1966–1997

CA, Investment	*CA, Saving*	*Investment, Saving*
−0.40	0.29	0.78

All variables are ratios to GDP.

ideas and that can be used to assess the quantitative importance of the two types of shocks. The findings from the model are that both kinds of shocks and reactions are crucial to explain current account/investment dynamics.

The model can be also helpful to the reader in that it highlights the difference and similarities between the KV approach to the current account and the traditional intertemporal approach (see for example Backus, Kehoe, and Kydland, 1992, or Obstfeld and Rogoff, 1995).

2. *What Are the Data Telling Us about Current Account/Investment Dynamics?*

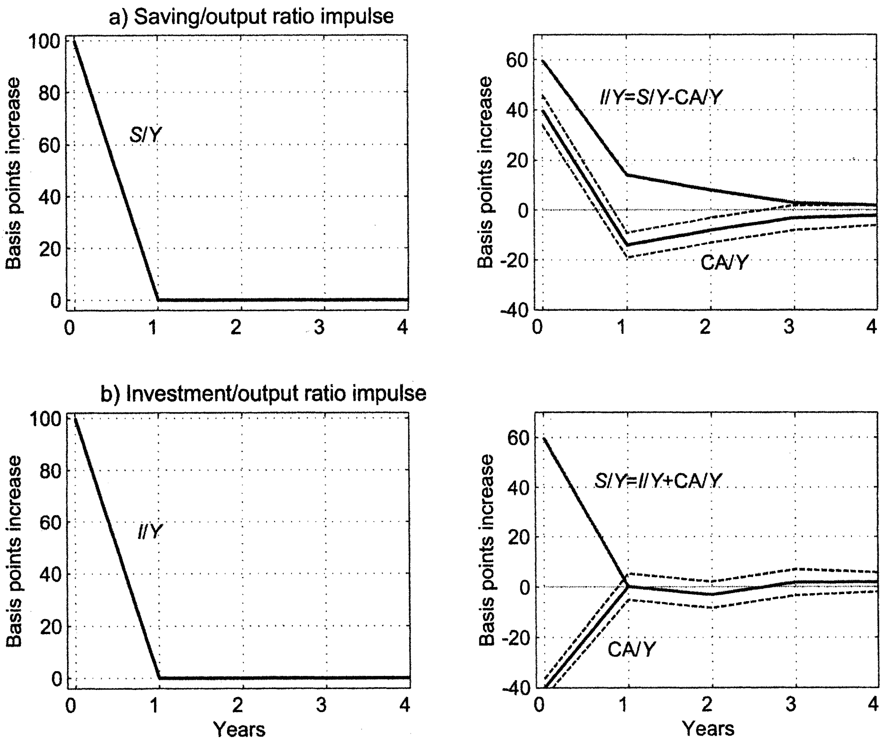
In this section I will extend in a simple way the data analysis of KV to further explore the relationship between investment, savings, and the current account.[2] Table 1 reports the median (across countries) correlations between these three variables.

Notice that even though investment and savings are quite strongly correlated, there is a large difference in the correlation between investment and current account (negative) and the correlation between current account and saving (positive). This observation suggests that the current account might respond differently depending on whether the underlying shock affects investment or affects saving. To further explore this idea it is useful to regress the current account-to-output ratio first on five lagged values of the saving-to-output ratio and then on five lagged values of the investment-to-output ratio.[3]

The estimated coefficients are then used to plot, in Figure 1, the current account responses to shocks in the saving-to-output ratio and the investment-to-output ratio. The top right panel depicts a temporary (exogenous) increase in saving, and the top left panel displays the responses of

2. The results presented in this section are based on the same data set used by KV.
3. The regressions also include country-specific fixed effects but no time dummies nor lagged values of the current account (as in KV's regression 1), and they are estimated using SUR. Results do not change significantly with the inclusion of time dummies or lagged values of the current account. The R^2 of the saving regression is 0.47, and that of the investment regression is 0.48.

Figure 1 CURRENT ACCOUNT RESPONSES TO A TEMPORARY 100-BASIS-POINT INCREASE IN (a) SAVING/OUTPUT RATIO IMPULSE AND (b) INVESTMENT/OUTPUT RATIO IMPULSE



Note: The dashed lines are two-standard-error confidence bands.

the current account (estimated) and of investment (derived using the current account definition) to that increase. Similarly the bottom right panel depicts a temporary increase in investment, and the bottom left panel displays the responses of current account and saving.

The top two panels confirm KV's findings: in response to an increase in saving, countries increase both their current account position and their domestic investment position, but in subsequent periods they rebalance their portfolio by running current account deficits and further increasing domestic investment; the current account works as the buffer stock used to smooth out the increase in domestic investment. The fact that, on impact, both domestic investment and the current account increase suggests the importance of shocks to saving that do not change the relative returns between domestic and foreign assets.

The bottom two panels, on the other hand, show that when investment is treated as the independent variable the current account and investment on impact move in opposite directions. This suggests that countries are also hit by shocks that increase the return to domestic investment relative to foreign assets, and in response to these shocks they will increase investment, financing it using domestic savings as well as foreign borrowing.

Admittedly the results of these regressions are a bit difficult to interpret and have to be taken cautiously, as all variables involved are endogenously determined in response to some fundamental shocks. In the next section we will therefore present a simple model that slightly modifies the traditional intertemporal model of the current account to incorporate the insights of KV and that include two types of shocks. The model will show that dynamic relationships between current account, investment, and saving like the one depicted in Figure 1 arise as the optimal response to these two shocks.

3. *A Small Open Economy Model*

Consider an open economy, inhabited by a continuum of infinite-lived identical consumers, in which a homogenous good is produced and can be used for consumption or investment. Consumers can invest in domestic capital k_t or in a risk-free real bond b_t at the exogenously given world interest rate R. Time is discrete, and in each period consumers have a unit of time that they can allocate between labor (l_t) and leisure ($1 - l_t$) and get utility from consumption (c_t) and from leisure. They discount future utility at rate β and solve the following problem:

$$\max \sum_{t=0}^{\infty} \beta^t \frac{[c_t^{\mu} (1 - l_t)^{1-\mu}]^{\sigma}}{1 - \sigma}$$

s.t.

$$c_t + x_t + \psi(b_t - \bar{b})^2 + b_t \leq Rb_{t-1} + w_t l_t,$$

$$k_t = (1 - \delta)k_{t-1} + x_t - \varphi\left(\frac{k_{t-1} - k_t}{k_{t-1}}\right)^2,$$

where σ is the parameter determining the intertemporal elasticity of substitution, x_t is the investment in domestic capital, w_t is the wage rate, δ is the depreciation rate of capital, and the parameter φ captures the intensity of the costs of adjusting the domestic stock of capital. Competitive firms rent domestic labor and capital to produce output y_t using a constant-return-to-scale technology, and the production process is subject to temporary (A_t^T) as well as persistent (A_t^P) productivity shocks[4] according to

$$y_t = A_t^P A_t^T k_{t-1}^{\alpha} l_t^{1-\alpha},$$

$$A_t^P = A_{t-1}^P + \varepsilon_t, \qquad A_t^T = \eta_t,$$

where α is the capital share in production and ε_t and η_t are normally distributed shocks with variances σ_ε^2, σ_η^2. For simplicity it is assumed that the permanent part of the shock process is a random walk, that the temporary part is i.i.d., and that the innovations to the shocks are uncorrelated.

The nonstandard element of the model is the term $\psi(b_t - \bar{b})^2$, which can be thought of as a convex bondholding cost and is a simple, even if crude, way of incorporating in this standard economy the insights of KV.

In a stochastic equilibrium of the KV model there is a unique long-run value of the foreign-bond position. This value is found by solving a portfolio problem, and it depends on the risk of domestic capital relative to foreign bonds and on the attitude of consumers toward risk. When shocks hit the economy, domestic households in the short run adjust the portfolio share of foreign bonds in order to reduce the capital adjustment costs. In the long run, though, mean–variance portfolio optimization makes the share of foreign bonds revert toward its long-run value (see Figure 4 of KV's paper).

When the economy presented here is solved using linear methods, the risk of the domestic capital (the variance of ε_t and η_t) has no effect on the portfolio decisions of domestic agents, and any average quantity of the foreign bond is consistent with a stochastic equilibrium. A consequence of this is that in a stochastic equilibrium the foreign-bond position is not mean-reverting and thus the dynamics discussed by KV are not present.

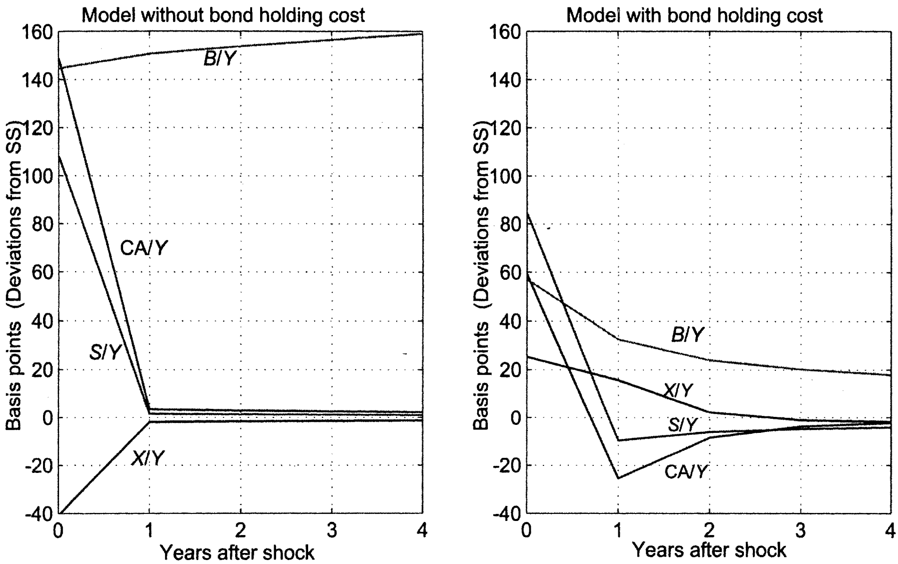
Introducing the bondholding cost is a simple trick that induces mean reversion in the foreign-asset position and thus allows the KV type of dynamics.[5] The long-run value around which foreign-asset position fluctuates and its degree of mean reversion are now exogenously determined by the parameters $\bar{b}$ and ψ.

To highlight the role of these bondholding costs, Figure 2 shows the impact of a temporary productivity shock on the current account (CA/Y), domestic investment (X/Y), saving (S/Y), and bond position (B/Y)

4. This specification allows a more flexible characterization of the persistence properties of productivity shocks. Both Baxter and Crucini (1995) and Glick and Rogoff (1995) have stressed the importance of the persistence of productivity in open economy models.

5. Heathcote and Perri (2002) also use this type of cost.

Figure 2 IMPULSE RESPONSES TO A TRANSITORY 1% PRODUCTIVITY SHOCK



relative to output for an economy with $\bar{b} = 0$. The left panel displays the response of the model with $\psi = 0$ (no cost), while the right panel displays the response of an economy with positive ψ.

Temporary productivity shocks increase current output but do not affect the future productivity of capital, so in the model without costs agents do not increase investment (X/Y falls) but save all the extra output in foreign bonds (CA/Y rises). This is what KV call the "traditional rule." Note that the bond position does not revert to its initial level. On the other hand, in the model with the costs, domestic consumers do not want to have a large change in their bond position, so they invest the additional output in domestic capital as well as in foreign bonds. The presence of adjustment cost on domestic investment is then the reason why on impact households mostly invest in foreign bonds while in later periods they reduce their foreign bond position, keeping investment in domestic capital high. Note also that now the foreign asset position exhibits mean reversion. Observe finally that the responses depicted in the right-hand panel of Figure 2 are very similar to the one presented by KV in Figure 6, showing that this simple change modifies the standard intertemporal model of the current account to establish the current account as a way of smoothing investment.

Table 2 BENCHMARK PARAMETER VALUES

Preferences	$\beta = \frac{1}{R} = 0.96, \quad \mu = 0.3, \quad \sigma = 2$
Technology	$\alpha = 0.36, \quad \delta = 0.08$
Shocks	$\sigma_\varepsilon = 1\%, \quad \sigma_\eta = 0.5\%$
Costs	$\varphi = 0.8, \quad \psi = 0.13, \quad \bar{b} = 0$

The remainder of this discussion will address the quantitative importance of this role. First the choice of the model parameter values is discussed, and then numerical results are presented.

4. *Parameter Values*

The model is calibrated to annual data. Setting preference and technology parameters is a standard exercise (see for example Mendoza, 1991), and the values are reported in the first two rows of Table 2.

There are two nonstandard calibration issues. The first is the identification of the importance of temporary vs. permanent productivity shocks. This is a quite hard empirical problem that has a close parallel in the labor literature. Here I take a crude approach of estimation by simulation. I first normalize the value of σ_ε (the variance of persistent shocks) to 1% and set σ_η (the variance of the temporary shocks) so that, when a productivity process is simulated for 38 periods and current productivity is regressed on lagged productivity, a coefficient of 0.81 is obtained.[6] This procedure yields a value for σ_η of 0.5%.

The second issue is the determination of the parameters of the bondholding costs. The steady-state bond position $\bar{b}$ is set to 0, which roughly matches the foreign bondholdings in the cross section of countries in the KV dataset. To set the value of the intensity of the bondholding costs (ψ), one possibility is to match the volatility of investment or of the trade balance relative to output (as in Schmitt-Grohé and Uribe, 2002). The problem with that approach is that there are many combinations of ψ and φ (the adjustment costs on investments) that yield the same value for the

6. The value of 0.81 is obtained by regressing the multifactor productivity of the private business sector (from BLS) on the lagged multifactor productivity and on a linear time trend. The frequency of the series is annual, and the time period is 1960–1997. Note that for a quarterly frequency this value would imply a persistence of productivity of roughly 0.95.

Table 3 CORRELATIONS, DATA, AND MODELS

	CA, Investment	*CA, Saving*	*Investment, Saving*
Data	−0.40	0.29	0.78
Models			
Benchmark	−0.36	0.28	0.78
No bondholding costs	−0.78	0.63	−0.06
No transitory shocks	0.69	0.15	0.78
Large transitory shocks	0.02	0.61	0.78

All variables are ratios to GDP. Statistics from the model are average across 100 simulations, each of 38 periods.

target statistics, and unfortunately the results of the model are sensitive to the particular pair of ψ and φ chosen.

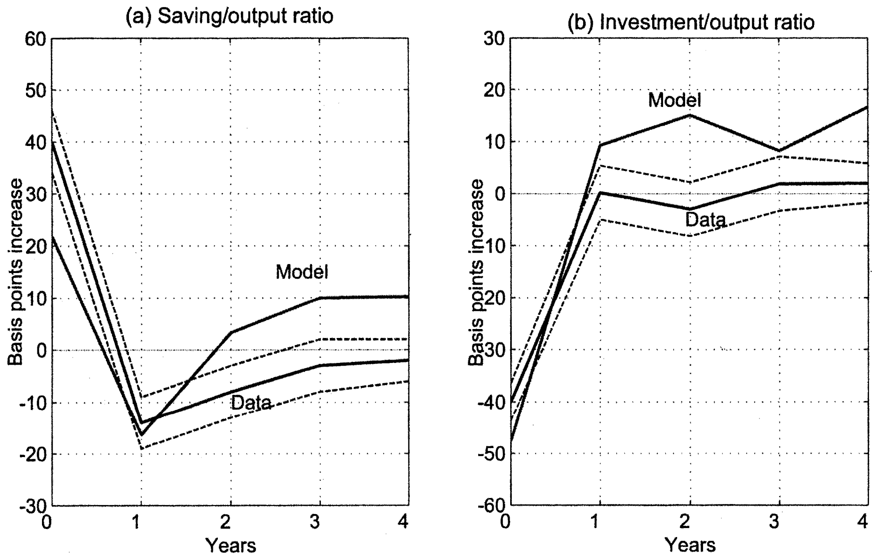
Note, though, from the impulse responses in Figure 2, that temporary productivity shocks always cause an increase in saving but, depending on the presence of the bondholding costs, cause either an increase or a decrease in investment; this implies that the correlation between savings and investment is highly sensitive to the size of the bondholding costs.[7] This observation suggests setting the bondholding cost to match the median correlation between investment and saving reported in Table 1 while setting the adjustment costs on investment to match a volatility of investment relative to output of 2.4.[8] This procedure yields values of $\psi = 0.13$ and $\varphi = 0.8$. The full set of benchmark parameters is reported in Table 2.

5. *Results*

In Table 3 the line labeled "Benchmark" reports the model's predicted current account/investment, current account/saving, and saving/investment correlations, using the benchmark parameter values. Although the model is calibrated to match only the investment/saving correlation, it does a good job in reproducing the other two correlations. Figure 3 reports the same current account responses presented in Figure 1, together with current account responses based on artificial data generated by the

7. One possible interpretation of the bondholding costs is the degree of international financial friction faced by the economy; with high bondholding costs countries international borrowing is costly and domestic saving is highly correlated with domestic investment; with low bondholding costs domestic saving and investment are not necessarily correlated.
8. This value is computed by taking the average of standard deviations of HP filtered annual real investment over HP filtered annual real GDP for the United States, Japan, Canada, and the European Union over the period 1966–1997. Data are from OECD quarterly national accounts.

Figure 3 DATA AND MODEL: CURRENT ACCOUNT RESPONSES TO (a) SAVING/OUTPUT RATIO, (b) INVESTMENT/OUTPUT RATIO



Note: The dashed lines are two-standard-error confidence bands.

model.[9] The figure suggests that the model is also able to capture quite well the entire dynamics of the current account in response to investment and saving fluctuations.

The remaining results presented in Table 3 establish that all elements of the model presented are indeed essential to understand the data.

The line labeled "No bondholding cost" reports the correlations predicted by a version of the model without the bondholding costs[10]; in this case in response to permanent productivity shocks agents borrow heavily to finance investment, leading to a counterfactually highly negative current account/investment correlation and to a counterfactually low saving/investment correlation. Also, in response to temporary productivity shocks, agents invest heavily in foreign bonds, leading to a counterfactually high correlation between savings and the current account.

The line labeled "No transitory shocks" shows that also the presence of transitory shocks is essential. The correlations reported there are from

9. The model-based impulse responses are computed by running on artificial data the same regression we run on the actual data.
10. In this parametrization of the model the adjustment cost on investment is set to a higher value so that the model still matches the relative volatility of investment.

a version of the model in which a single persistent productivity shock[11] is used and in which the parameters ψ and φ are chosen to match the same moments as in the benchmark case. Notice that in this case the model fails to reproduce the negative correlation between investment and the current account. The reason for this is that with a single persistent shock, investment tends to be very volatile relative to output, and quite large adjustment costs are required to match the relative volatility of investment in the data. When adjustment costs are large, agents do not undertake large investment in one period and hence do not need to run a current account deficit when they want to increase their investment.

Finally, the line labeled "Large temporary shocks" reports the results for a version of the model in which the predominant shocks are temporary productivity shocks[12] (like the shocks analyzed by KV). Notice that again the model cannot reproduce the negative correlation between investment and current account. When temporary shocks hit, on impact agents invest in domestic capital and in foreign bonds at the same time, and this induces positive correlation between the two variables; in the subsequent periods they rebalance their portfolio by keeping investment high and by running current account deficits, and this behavior induces a negative correlation between the variables. It turns out that quantitatively the two effects cancel, and that the overall correlation between investment and current account is close to 0 and not negative. This suggests that short-run current account dynamics cannot be understood using only the investment-smoothing argument.

6. *Concluding Remarks*

The previous literature has stressed the current account as a tool countries use to smooth consumption and finance their investment. This use seems particularly important when countries are hit by persistent productivity shocks. The important contribution of KV's paper is the suggestion of another role of the current account: in smoothing investment to reduce capital adjustment costs. This role seems important when countries are hit by temporary productivity shocks. The data and the simple model analyzed in these comments suggest that both shocks and thus both roles of the current account are at work and that both need to be considered

11. The persistence of this shock is set equal to the persistence of the composite shock in the original model.
12. In this case the variance of temporary shocks is set twice as large as that of permanent shocks, and the cost parameters are set to match the same moments. Obviously, in this case the persistence of the composite productivity does not match the data.

explicitly when trying to understand current account and investment dynamics.

REFERENCES

Backus, D., P. Kehoe, and F. Kydland. (1992). International real business cycles. *Journal of Political Economy* 100:745–775.

Baxter, M., and M. Crucini. (1995). Business cycles and the asset structure of foreign trade. *International Economic Review* 36:821–854.

Glick, R., and K. Rogoff. (1995). Global versus country-specific productivity shocks and the current account. *Journal of Monetary Economics* 35:159–192.

Heathcote, J., and F. Perri. (2002). Financial autarky and international business cycles. *Journal of Monetary Economics* 49:601–627.

Kraay, A., and J. Ventura. (2000). Current Account in debtor and creditor countries. *Quarterly Journal of Economics* 95:1137–1166.

Mendoza, E. (1991). Real business cycles in a small open economy. *The American Economic Review* 81:797–818.

Obstfeld, M., and K. Rogoff. (1995). The intertemporal approach to the current account. In *Handbook of International Economics*, G. Grossman and K. Rogoff (eds.). Amsterdam: Elsevier.

Sachs, J. (1981). The current account and macroeconomic adjustment in the 1970s. *Brookings Papers on Economic Activity* 1:201–268.

Schmitt-Grohé, S., and M. Uribe. (2002). Closing small open economy models. *Journal of International Economics*, forthcoming.

Comment

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1. *Introduction*

In terms of international capital mobility the world economy appears to be very closed and very integrated at the same time. During the East Asian financial crisis we saw enormous swings in net capital flows over a very short span of time, equal to 10% of GDP or more for some countries. During the same crisis net capital inflows to the United States almost doubled. Capital appears to rapidly reallocate across countries in response to perceived risk and expected returns. On the other hand, Feldstein and Horioka's (1980) finding that there is almost a one-to-one relationship between saving and investment rates in cross-section data remains true today, suggesting that almost all of national savings is invested at home and net capital flows remain relatively small. What could account for this seemingly paradoxical state of affairs?

The paper by Kraay and Ventura is a nice contribution that both documents this puzzle and sheds light on what may explain it. In my comments I will discuss both the evidence and theoretical explanations.

2. *The Evidence: Short Run vs. Long Run*

The starting point in developing their empirical evidence is the so-called *new rule*, which Kraay and Ventura documented in an earlier paper. The rule says that the change in the current account is equal to the change in national savings times the share of foreign assets in a country's portfolio. Since the share of foreign assets in the portfolio tends to be small due to home bias, this implies that most of a change in national saving is invested at home, consistent with Feldstein and Horioka's finding. The new rule appears to hold up very well in the long run, but not in the short run. The long run is captured by a cross-section relationship using the average over 30 years of saving and the current account as a percentage of GDP. The short-run relationship is found after subtracting from saving and the current account their long-run averages. In the long run the new rule holds almost perfectly, while in the short run it explains almost nothing of the relationship between the current account and saving.

The authors refer to the deviation from the new rule in the short run as the portfolio-rebalancing component of the current account: $CA_t - x_tS_t$, where x_t is the fraction of the portfolio invested abroad. In order to better understand what drives this deviation from the new rule, they regress $CA_t - x_tS_t$ on current and lagged saving rates, as well as several controls. The coefficient on current saving is large and positive, suggesting that about 60% to 70% of a change in savings is invested abroad (corresponding to a current account surplus). The coefficients on lagged savings are negative, though, with the sum of all coefficients close to zero. This suggests that for $x = 0$ a change in savings has little or no effect on the current account in the long run. It appears therefore that while initially most of a change in national savings is invested abroad, in the long run almost all of it is invested at home. Large swings in the current account are therefore possible in the short run, while the current account remains close to zero in the long-run.

The regressions on which the conclusions are based suffer from well-known endogeneity problems. Any time one regresses investment on saving or the current account on saving, it is questionable which affects which. The authors include some variables in the regression that can be expected to affect both saving and investment in the same direction, such as global shocks or population growth. That does not fully deal with the endogeneity problem, though. There may be exogenous shifts in investment that affect both saving and the current account and show up in the error term of a regression of $CA_t - x_tS_t$ on saving.

I have reason to believe though that the results will hold up to more careful empirical analysis. In Iwamoto and van Wincoop (2000) we compared the short- and long-run relationships between saving and investment rates by looking at correlations. This way one does not need to take a stand on the direction of causation. We captured the long run by looking at the cross-section relationship between saving and investment for OECD countries, and the short run by looking at the average time-series relationship for OECD countries. The results are summarized in Table 1.

In the raw data (using saving and investment rates as a share of GDP), the cross-section relationship is considerably stronger than the time-series relationship. In the second row we control for a variety of factors that might account for a positive relationship between saving and investment rates even when financial markets are perfectly integrated. For the cross-section data these are differences in growth rates, fiscal policy, and income levels across countries. For the time-series data they are global, business-cycle, and fiscal shocks. The correlations are based on the components of saving and investment rates that are orthogonal to these common factors. After controlling for common factors the cross-section correlation remains very high at 0.76. Since Feldstein and Horioka, a large literature has developed pointing to common factors as a potential explanation, so far none has convincingly held up for the cross-section evidence. The time-series correlation drops to a low 0.28 after controlling for common factors. It appears therefore that there is a strong long-term relationship between saving and investment that cannot be explained by common factors, while there is a very weak short-term relationship. This is in essence the same conclusion drawn by Kraay and Ventura.

The fact that the long-run cross-section relationship cannot be explained away easily by common factors suggests that Feldstein and Hori-

Table 1 CROSS-SECTION AND (AVERAGE) TIME-SERIES CORRELATION BETWEEN SAVING AND INVESTMENT FOR 15 OECD COUNTRIES

	Correlation	
	Cross section (1985–1990)	*Time series (1975–1990)*
Raw data	0.85	0.56
Controlling for common factors	0.76	0.28

oka, who interpreted the relationship as reflecting imperfect international capital mobility, were right after all. Data on saving and investment rates for regions within a country further confirm this. Iwamoto and van Wincoop (2000) show that for Japanese prefectures the cross-section correlation is close to zero. Other studies often obtain even substantially negative cross-section correlations for regions within a country. As pointed out, though, in van Wincoop (2000), the substantial negative correlations are a result of incorrect measurement of savings at the regional level. With a correct measurement of saving the correlations are close to zero. This evidence suggests that borders across regions within a country are much less of a barrier to capital flows than international borders. It remains to be explained, though, why the short-term (time-series) relationship is so much weaker than the long-term cross-section relationship between national saving and investment rates.

3. *The Theory: Why Is the Savings–Investment Relationship Much Weaker in the Short Run?*

The answer suggested by Kraay and Ventura is adjustment costs of investment. When there are substantial short-term adjustment costs, one may expect that in the short run most of an increase in saving is invested abroad. In the long run adjustment costs play no role and it is again the case that a rise in saving leads to a rise in domestic investment of similar magnitude. The paper illustrates this story in the context of a simple portfolio-choice model, in which agents can invest in domestic capital and foreign bonds. A critical assumption is that domestic capital can only be held by domestic agents. This is an exogenous home-bias assumption, which leads to the close relationship between saving and investment in the long run.

The paper only considers the impact of a temporary productivity shock. Although this can be used to illustrate the portfolio-rebalancing effect that leads to the deviation from the new rule in the short run (and therefore a weak short-run S–I relationship), the example tells us little about the long run. One could alternatively consider a permanent increase in saving, for example through a drop in the time discount rate. It will again be the case that in the short run most of the rise in saving is invested abroad due to the adjustment costs associated with domestic investment. In the long run the new rule will hold again, so that most of the rise in saving is invested at home.

The new rule can actually be expected to hold in the long run almost irrespective of particular modeling assumptions one makes. As long as one makes one of many possible assumptions to assure that there is a steady-state level of foreign bondholdings, the new rule applies. This can be seen as follows. With b and k respectively foreign-bond holdings and the capital stock, and g the steady-state growth rate, we have in steady state $S = db + dk = g(b + k)$ and $I = gk$. It follows that $CA = S - I = gb = xS$, where $x = b/(b + k)$ is the share of the portfolio invested abroad. The new rule becomes more than a simple accounting identity, though, when it is interpreted as saying that the current account is equal to saving times a *constant* x. In Kraay and Ventura (2000), the authors find that the fraction of the portfolio invested abroad indeed does not fluctuate a lot, although it fluctuates substantially more over a 10-year period than over a 1-year period. This appears to be inconsistent with the proposed theory, in which there is only portfolio rebalancing in the short run and not in the long run. In the theory expected returns are constant in the long run due to the constant-returns-to-scale production function, while in the short run expected returns can change due to adjustment costs.

Instead of temporary changes in x, as in the proposed theory, consider a case in which there are small permanent changes in the fraction invested abroad. The following example illustrates that this can have a much bigger impact on the current account in the short run than in the long run. Consider a shock that leads to a permanent increase in x from 0 to 0.01 and a permanent rise in savings from 10% to 15% of GDP. Since $CA = xS$ in the long run, it is easily checked that investment will rise by 4.85% of GDP in the long run, almost exactly the same as the rise in saving. The current account will rise by only 0.15% of GDP. So saving and investment move closely together in the long run, and applying the new rule when holding x at zero gives a reasonably close prediction (of zero) of the change in the current account. If the capital–output ratio is 3 (about average), b/y will immediately rise by 0.03, so that there will be an immediate current account surplus of 3% of GDP. In the short run therefore most of the increase in saving (60% of it) is invested abroad.

This example suggests that a model where shocks lead to small but permanent portfolio rebalancing can account for the evidence. One therefore does not need constant returns to scale in the long run. To capture the evidence best, a model should have the following features: (i) x is small, (ii) changes in x are relatively small, (iii) long-run changes in x are at least as big as short-run changes. In order to capture (i) endogenously, one can introduce features such as information asymmetries or contract enforcement problems. My guess is that such a model naturally also leads to (ii): the source of the home bias is likely also to make the fraction invested abroad relatively insensitive to expected returns. Finally, (iii) is easily captured as long as we avoid constant returns to scale in the long run and very large short-run adjustment costs.

4. *To Conclude*

The evidence that Kraay and Ventura have presented is intriguing. It suggests that the current account is an important buffer for shocks in the short run, but is relatively little affected by shocks in the long run. In other words, saving and investment are closely tied in the long run, but not the short run. The evidence begs for a theory. In my view models that endogenously introduced home bias are likely to be most fruitful for understanding these stylized facts. Along this line it would also be interesting to explore the implications of Obstfeld and Rogoff (2000), who have suggested trade costs as the source of all major puzzles in international macroeconomics, including the portfolio-home-bias and Feldstein–Horioka puzzles.

REFERENCES

Feldstein, M., and C. Horioka. (1980). Domestic savings and international capital flows. *Economic Journal* 90:314–329.

Iwamoto, Y., and E. van Wincoop. (2000). Do borders matter? Evidence from Japanese regional net capital flows. *International Economic Review* 41(1):241–269.

Kraay, A., and J. Ventura. (2000). Current accounts in debtor and creditor countries. *Quarterly Journal of Economics* 95:1137–1166.

Obstfeld, M., and K. Rogoff. (2000). The six major puzzles in international macroeconomics: Is there a common cause? In *NBER Macroeconomics Annual 2000,* B. S. Bernanke and K. Rogoff (eds.). Cambridge, MA: The MIT Press.

van Wincoop, E. (2000). Intranational versus international saving–investment comovements. In *Intranational Macroeconomics,* G. Hess and E. van Wincoop (eds.). Cambridge University Press, pp. 11–36.

Discussion

An issue that concerned a number of participants was the assumption that claims on capital could not be traded internationally. Robert Barro noted that if claims on capital can be traded internationally, gross rather than net foreign assets are what matter. In particular, he noted that there is always a positive relationship between savings shocks and the current account, but the magnitude of the effect depends on the percentage of the capital stock that is domestically owned.

On this point, Gian-Maria Milesi-Ferretti noted that the size of portfolio diversification has changed a lot over the authors' sample period. As an example, he said that for the United Kingdom, while foreign assets plus foreign liabilities were 40% of GDP in 1966, in 2002 they were 320% of GDP. He pointed out that this is a much more significant change than the change in net positions over the same period. As a result, he agreed with Barro in finding the authors' bond-type modeling strategy puzzling.

The treatment of shocks in the paper and resulting endogeneity concerns raised interest among the participants. Pierre-Olivier Gourinchas noted that the literature on the intertemporal approach to the current account suggests paying special attention to the distinction between transitory and permanent shocks. He felt that while Kraay and Ventura had dealt with this issue in the model, they had not paid it sufficient attention in the empirical part of the paper. He suggested that if the issue were addressed, it would affect the estimated impulse responses. Echoing the discussants, he also said he would have liked to see the authors consider other types of shocks in addition to productivity shocks; for example, shocks to government spending. He wondered whether, in the data, it would be possible to identify different kinds of responses to different shocks.

Alan Stockman also wondered whether different shocks might explain the short- and long-run behavior of the current account. He noted that this fact might be masked if shocks are not well identified. He also pointed out that among developed countries, there are lots of highly correlated shocks. He saw this as a problem for the paper, although there might be predictions about the differential behavior of countries that are more or less synchronized with the international business cycle.

Charles Engel questioned the contention that all of the explanations of the Feldstein–Horioka puzzle are unsatisfactory. He noted that he had always found the budget-constraint explanation convincing, as budget constraints imply a long-run relationship between savings and investment while leaving a great deal of flexibility in explaining the short-run relationship between them. He also pointed out that when there is a budget constraint, it is unlikely that there are instruments for saving that are uncorrelated with investment.

Also on the issue of endogeneity, Mark Gertler suggested that with quarterly data, the portfolio-rebalancing and savings variables could be embedded in a VAR, and their joint responses to standard identified shocks such as money shocks and productivity shocks could be examined. Bob Hall suggested that looking at cross-covariances in a general-equilibrium framework would be an attractive way of sidestepping the identification issues raised by the authors' regressions.

The authors' assumptions about adjustment costs were commented upon by several participants. Pierre-Olivier Gourinchas was worried that the results were not robust to adjustment-cost assumptions. He was concerned particularly by the fact that, as a result of the particular assumptions, investment doesn't jump in response to productivity shocks in the model.

Mark Gertler made some suggestions on how to explain the slow adjustment of investment without appealing to huge adjustment costs. In addition to the financial-market frictions discussed by Fabrizio Perri, he mentioned planning lags. He cited evidence documented by Owen Lamont that large corporations make investment decisions one year in advance, and that up to 90% of investment is committed in advance.

Gian-Maria Milesi-Ferretti argued that, in contrast to the maintained hypothesis of the paper, the share of net foreign assets in wealth is not empirically stable. As evidence, he referred to the authors' paper on country portfolios, which he said suggested that net foreign asset positions are nonstationary and that countries' positions as creditors and debtors change over time.

In response to the discussants and other participants, Jaume Ventura defended the authors' assumption of limited international risk sharing. He remarked that the intertemporal approach to the current account is successful precisely because of the home bias in portfolios it generates. He noted that recent research by Fabrizio Perri and Pat Kehoe explores how frictions such as lack of trust and the inability to write contracts might generate the budget constraint that the intertemporal approach to the current account takes as given. On Milesi-Ferretti's point on the stability of country portfolios, he acknowledged that country portfolios are not always stable. In particular, he remarked that the debt crisis in developing countries in the 1980s resulted in very unstable portfolios in those countries. He noted that the intertemporal theory of the current account does not work particularly well for developing countries. The budget constraint is on the one hand too tight, in that it does not allow for risk sharing, but on the other hand too loose, in that it allows countries to consume a lot in any given period, without regard for future willingness to pay. However, he maintained that the budget constraint is approximately correct for developed countries. On the issue of endogeneity and shocks, Ventura explained that the authors found their story with transitory shocks to income and consequent oscillations in savings more relevant than a story with permanent shocks to productivity, because they felt it did a better job of explaining the long-run as well as the short-run evidence.

Aart Kraay made a further comment on Milesi-Ferretti's point about the stability of country portfolios. He responded that the fact that not all developed-country portfolios are completely stable merely amounts to saying that the R^2 is not equal to one. On the issue of endogeneity, he pointed out that it is very difficult to find convincing instruments for savings. However, he felt that the most important thing to worry about is the possibility that there are omitted variables driving savings and investment in such a way as to give exactly the results in the paper. He said that the Feldstein–Horioka literature had searched for such variables, but had not had great success in explaining the cross section, and in any case these variables were controlled for in the empirical work.