IMF Working Paper

WP/98/172 INTERNATIONAL MONETARY FUND

Research Department

International Capital Flows and National Creditworthiness: Do the Fundamental Things Apply as Time Goes By?

Prepared by Paul Cashin and C. John McDermott[1]

Authorized for distribution by Peter Wickham

December 1998

Abstract

This paper examines the optimality of international capital flows to a persistent net importer of capital, Australia, during its post-capital-controls period 1984-98. The results suggest that international capital flows were larger than optimal during the 1980s, but in the 1990s such flows have been broadly consistent with those predicted by the consumption-smoothing approach to the determination of the current account. The paper also discusses the main implications arising from measures of optimal capital flows, and compares them with the implications arising from the key concepts used in the determination of national creditworthiness.

JEL Classification Numbers: F32, F41, F47

Keywords: consumption smoothing, international capital flows, structural break, Australia

Authors' E-Mail Addresses: pcashin@imf.org; mcdermottj@rbnz.govt.nz

---

[1] John McDermott is an advisor at the Reserve Bank of New Zealand. Much of the paper was written while he was in the IMF's Asia and Pacific Department. The authors are grateful to Enrica Detragiache, Pietro Garibaldi, Hong Liang, Gian-Maria Milesi-Ferretti, Paul Masson, Nilss Olekalns, Miguel Savastano, Peter Wickham, and to seminar participants at the IMF for their comments and suggestions, and to Ivan Guerra for valuable research assistance. The opinions expressed in the paper are those of the authors, and should not be interpreted as representing the views of the organizations with which they are affiliated.

Contents Page

Summary

The main goal of this paper is to examine whether Australia's pattern of international borrowing in its post-capital-controls period (1984-98) was optimal, by comparing it with the pattern of borrowing predicted by an optimizing model of intertemporal consumption smoothing. The consumption-smoothing approach to the determination of the current account implies that international capital flows act as a buffer to smooth aggregate consumption in the face of temporary shocks to the economic fundamentals: changes in national cash flow (that is, changes in the level of output, investment, or government spending). In carrying out this examination, we also discuss the differing implications for national creditworthiness of the concepts of national solvency, the sustainability of current account imbalances, and the optimality of international capital flows.

We find that Australia's intertemporal budget constraint was satisfied over the full sample period (1984:1-1998:2), so that it was clearly creditworthy. We also find that a regime shift occurred in the relationship between consumption and national cash flow at 1990:4, separating the full sample period into early (1984:1-1990:4) and later (1991:1-1998:2) subperiods. The extent of international capital flows during the later (early) subperiod yielded a consumption path that was (was not) consistent with consumption smoothing and intertemporal optimality. Accordingly, it appears that, over time, Australia's international borrowing decisions have been increasingly determined by changes in its economic fundamentals.

I. INTRODUCTION

The ability of debtor countries to continue to run current account imbalances is an important issue facing borrowers and lenders in world capital markets, and typically involves analyzing several key questions. When is a debtor country insolvent? What is a sustainable path for a given country's current account imbalances? Is the pattern of international capital flows optimal? What is the meaning and interrelationship between these commonly-used concepts of national creditworthiness? The chief purpose of analyses of the sustainability of national indebtedness is to detect when countries might become insolvent, that is, unable to satisfy external obligations at their face values. In examining the above questions, this paper will undertake a detailed sustainability analysis for the interesting case of Australia, one of the largest and most persistent net borrowers on international capital markets over the last 140 years.

Over the period 1861-1939, on only 14 occasions did Australia generate a current account surplus, and between 1950-97, on only 4 occasions was a surplus achieved. Notwithstanding this, Australia has never defaulted on its external obligations, and has consistently been able to borrow externally with little difficulty. In the period 1861-1945, Australia's current account deficit averaged about 4 percent of gross domestic product (GDP), while between 1949-83 its deficit averaged about 2½ percent of GDP. Following the removal of capital controls in late 1983, the deficit doubled to average about 5 percent of GDP between 1984-97. The deterioration in Australia's current account position since the mid-1980s, and the associated increase in net external liabilities, has been accompanied by a vigorous debate as to the major causes, consequences and potential remedies (if any) required. The main goal of this paper is to examine whether Australia's pattern of international borrowing in its post-capital controls period (1984-98) is optimal, by comparing it to the pattern of borrowing predicted by an optimizing model of intertemporal consumption smoothing. In carrying out this examination, we also discuss the differing implications for national creditworthiness of the concepts of national solvency, the sustainability of current account imbalances and the optimality of international capital flows.

The consumption-smoothing approach to the determination of the current account implies that international capital flows act as a buffer to smooth aggregate consumption in the face of temporary shocks to the economic fundamentals: changes in output, investment or government spending. These shocks alter the intertemporal pattern of consumption (and implicitly, national saving), which, for given investment, generates current account imbalances and alters the demand for international capital (foreign savings). Accordingly, the consumption-smoothing model's predicted optimal path of the current account provides a benchmark against which to evaluate whether actual flows of international capital have been too large or not. The intertemporal (or consumption-smoothing) approach to international capital flows is derived from the permanent income theory of consumption and saving, and views international capital flows as the outcome of forward-looking dynamic saving and

investment decisions.[2] The model assumes that agents seek to minimize utility losses arising from their choice of consumption, where these losses are an increasing, convex function of consumption. A country's ability to minimize utility losses is conditioned by its adherence to its intertemporal budget constraint, which requires the present value of trade surpluses to equal the value of net external liabilities. In order to meet its intertemporal budget constraint, a country's consumption cannot remain invariant to changes in either current or future expected output, investment or government spending. However, utility losses will be minimized if, in response to newly-acquired information indicating a future temporary change in output, investment or government spending, agents smooth the proposed change in consumption over time. In predicting what capital flows should optimally be if agents consume in accordance with their permanent income, the approach assumes a high degree of capital mobility, an absence of capital market imperfections, and that agents follow consumption-smoothing behavior. The key prediction of the consumption-smoothing model is that a country's net international capital inflows will be positive (negative) whenever the economic fundamentals, given by national cash flow (defined as GDP net of government consumption spending and investment), is above (below) its permanent (annuity value) level.

Our analysis covers the period 1984:1-1998:2, following the move to a fully flexible nominal exchange rate regime for the Australian dollar in December 1983 and, at the same time, the complete removal of capital and exchange controls. These liberalization initiatives were part of a broad program of financial liberalization, which also involved deregulation of domestic financial intermediaries and the removal of lending and interest rate restrictions. As the consumption-smoothing model assumes that capital is freely mobile, the post-capital controls period enables us to undertake appropriate testing of the extent of capital mobility. [3]

The innovations of this paper comprise the use of a test for cointegration which allows for the presence of a structural break of unknown timing, and the construction of bootstrap-based confidence bands to provide a confidence interval with which to gauge the statistical

---

[2] Theoretical advances in this area of open economy macroeconomics were provided by Sachs (1982) and Svensson and Razin (1983). Empirical evaluation of these types of present value models of international capital flows has been undertaken by, among others, Agénor et al (1999), Cashin and McDermott (1998), Kent (1997), Ghosh (1995), Milbourne and Otto (1992), and Otto (1992), based on the methodology developed by Campbell (1987) and Campbell and Shiller (1987).

[3] During the ten years prior to 1984 Australia's exchange rate was determined under a managed float regime, with the dollar pegged to a trade-weighted basket of currencies. Until the late 1970s there were controls on capital outflows from Australia, and occasionally controls on capital inflows. The gradual removal of restrictions on capital inflows began in 1978 with the removal of restrictions on short-term borrowing; in the early 1980s restrictions on overseas investments in portfolio, equity and real estate investments were relaxed. In late 1983 the dollar was floated and remaining exchange and capital controls were removed. See Lowe (1995) for further details.

significance of the predictions of the consumption-smoothing model. The paper also provides a taxonomy for evaluating the macroeconomic consequences of persistent current account imbalances, highlighting differences in the key concepts used to evaluate national creditworthiness (intertemporal solvency, and the sustainability and optimality of current account imbalances).

Is Australia's international borrowing behavior optimal, when measured against the benchmark provided by the consumption-smoothing model? We find that Australia's intertemporal budget constraint was satisfied over the full sample period (1984:1-1998:2), and so its external borrowings have not breached the solvency condition requiring the present discounted value of future trade surpluses be equal to the value of net external liabilities. The extent of international capital flows during an early subperiod (1984:1-1990:4) implied that the consumption path was not consistent with a path that would maximize expected utility. In contrast, international capital flows in a later subperiod (1991:1-1998:2) implied a path for consumption which was consistent with expected-utility maximization under the consumption-smoothing model of the current account. Accordingly, it appears that over time, Australia's international borrowing decisions have been increasingly determined by the economic fundamentals (changes in output, investment and government spending).

We also set out the key interrelationships between the main concepts of national creditworthiness. If a country's intertemporal budget constraint is not satisfied, then the country is *insolvent* (as it is not satisfying its intertemporal budget constraint), and its path of current account imbalances is not *sustainable* (in that it will be subject to liquidity constraints being imposed by foreign lenders).[4] If a country does not breach its intertemporal budget constraint, foreigners may be willing to lend (implying that the path of its current account imbalances is sustainable), yet the country may make a *suboptimal* use of such capital flows (in that avoidable welfare losses were incurred because the path of private consumption was not smooth in the presence of shocks to output, investment and government spending). Finally, given solvency and either optimal or suboptimal borrowing behavior, questions as to the sustainability of current account imbalances may arise if lenders perceive that the intertemporal falls in consumption implied by the path of current account imbalances raise doubts as to the willingness of a country to meet its external obligations.

The remainder of the paper is organized as follows. In Section II we describe the derivation of the consumption-smoothing model. The econometric methods used to estimate this model are summarized in Section III (and Appendices I and II), and the results of the estimation are set out in Section IV. An economic interpretation of these results is given in Section V, focussing on the differential between the actual and optimal current account

---

[4] While this paper undertakes empirical tests of intertemporal solvency and the optimality of current account imbalances, tests of the sustainability of current account imbalances (in particular, the extent to which borrowing countries will be subject to liquidity constraints being imposed by foreign lenders) are outside the scope of the paper. For an Australian case study of sustainability, see Milesi-Ferretti and Razin (1996).

position, the implications of market failures in the savings-investment market, and key concepts in assessing national creditworthiness. Some concluding comments are set out in Section VI.

II. THE MODEL

The consumption-smoothing approach to international capital flows is derived from the permanent income theory of consumption and saving. In the context of a small open economy with access to world capital markets, the permanent income theory implies that temporary shocks (which by definition have a larger impact on current resources than on lifetime resources) may lead to large fluctuations in national saving and international capital flows.

Unlike earlier models of international capital flows (which emphasized issues of intratemporal trade), intertemporal models of the current account are driven by the representative agents' expectations of shocks to the economy, rather than any contemporaneous shocks themselves (Ghosh (1995)). For example, expectations of a (previously unanticipated, temporary) future investment boom would result, according to the consumption-smoothing model, in the country running a current account surplus, accumulating foreign assets (or reducing liabilities) in order to smooth the path of national consumption.

Following Sachs (1982), in deriving the consumption-smoothing model of the current account, consider a small, open economy composed of a large number of similar-lived consumers, each maximizing

$$E_t \sum_{j=0}^{\infty} \beta^j U(c_{t+j}) \qquad \textbf{(1)}$$

where E_t is the expectations operator, c_t is private consumption at time t, $U(.)$ is the time separable utility function such that $U' > 0$, $U'' < 0$, and β is the subjective discount factor ($0<\beta<1$) that reflects preference for current consumption over future consumption. Suppose that agents face an exogenous, fixed world real interest rate r each period, and that a riskless bond is the only internationally-traded asset in the model. Let b_t be the economy's stock of net external liabilities at the beginning of period t, y_t be output (or gross domestic product) which appears as stochastic returns to exogenously-determined investment under the small open economy assumption, i_t be investment (optimally chosen to maximize the net present value of

income), g_t be government consumption, and Δ is the first difference operator. [5] [6] The consumer's budget constraint is then

$$\Delta b_{t+1} = rb_t - (y_t - c_t - i_t - g_t) = -CA_t. \quad (2)$$

The interpretation of equation (2) is that the change in net external liabilities (Δb_{t+1}), and thus the current account balance ($-CA_t$), is given by "national cash flow" ($z_t = y_t - i_t - g_t$) less private consumption and less net foreign investment payments (rb_t).[7] For example, any expansion in government consumption, other things being equal, will reduce the national cash flow available for foreign investment and increase the inflow of net external liabilities, in turn increasing the current account deficit. Maximizing (1) subject to (2), while imposing a quadratic utility function $U(c_t) = c_t - c_t^2/2$ (which requires that $c_t<1$ for the marginal utility of consumption to remain positive) and the 'no Ponzi games' constraint yields

$$c_t^* = r\left[-b_t + (1+r)^{-1} E_t\left(\sum_{j=0}^{\infty}(1+r)^{-j} z_{t+j}\right)\right] \quad (3)$$

where c_t^* is the optimal level of consumption at time t, and it is assumed that the domestic rate of time preference is equal to the exogenous world real interest rate, $r = (1-\beta)/\beta$.[8] Along its optimal path, private consumption (c_t^*) depends on net wealth, which comprises the

---

[5] It is assumed that uncovered interest parity holds and there is free capital mobility. Given that the country is a small player on world capital markets, then the world interest rate is given and Fisherian separability will hold (investment will be chosen independently of the optimal level of consumption). Blanchard (1983) and Cooper and Sachs (1985) demonstrated that for such a small open economy, investment will occur until the marginal product of capital equals the world interest rate, so that investment (and output) are determined independently of the level of consumption. It is also assumed that the Ricardian government has access to lump-sum taxation to finance its expenditure, choosing a spending and taxation path that results in intertemporal solvency.

[6] As the model takes the supply side of the economy as given, it abstracts from certain features that may impinge on the current account balance, such as movements in the terms of trade, productivity shifts due to labor market and product market reforms, demographics, and resource booms.

[7] National cash flow is the analogue to Campbell's (1987) concept that, by the permanent income hypothesis, household saving is equal to the expected present value of future falls in household labor (cash) income.

[8] This assumption implies that consumption-smoothing is the only intertemporal incentive for running an unbalanced current account, and rules out time preference (consumption-tilting) motives for deficits—it will be relaxed below.

present value of the expected future stream of the cash flow, and the economy's existing stock of net external liabilities.[9] In equation (3), the private sector consumes the annuity value of its total discounted wealth, that is, the amount which can be consumed while leaving wealth constant.

We can also note from equation (2) that the current account is equal to net external liability accumulation ($b_{t+1} - b_t$), and so after simple manipulations using equations (2) and (3), it follows that optimal current account is given by (minus) the expected present discounted value of the changes in national cash flow

$$CA_t^* = -E_t\left[\sum_{j=1}^{\infty}(1+r)^{-j}\Delta z_{t+j}\right]. \qquad \textbf{(4)}$$

Equation (4) shows an important distinction between permanent and temporary shocks. Permanent shocks which leave national cash flow unaffected also leave the current account unaffected, as their expected change is zero. For example, a permanent increase in y_t will induce an equal increase in c_t, leaving saving and investment (and thus the current account) unchanged. However, a temporary reduction in cash flows from a fall in y_t will push the current account into a smaller surplus or larger deficit, as the (positive) change in cash flow will occur next period. In effect, the current account and capital flows are the devices by which a small open economy can smooth consumption: this is not possible in a closed economy, since saving must match investment contemporaneously. The optimal level of capital flows is that which allows rational agents to fully smooth their consumption in the presence of shocks to output net of investment and government spending.[10] That is, looking at the components of z_t in the stochastic setting of equation (4): output temporarily below its long-run discounted average (that is, its expected annuity value at the prevailing interest rate), or investment temporarily above its long-run discounted average, or government spending temporarily above its long-run discounted average, all else held constant, will each result in agents smoothing consumption by borrowing foreign savings (running a higher current account deficit), rather than lowering contemporaneous consumption.

---

[9] The imposition of quadratic utility implies that in the presence of uncertainty, consumption will be determined only by the expected present value of national cash flow, and not by its variability.

[10] Strictly speaking, consumption smoothing should only occur to the extent that there are temporary, *country-specific* shocks to national cash flow—shocks to world national cash flow should not induce any smoothing behavior (as interest rates would adjust to equalize world saving and investment). Kent (1997) found that over the period 1949-95, shocks to world national cash flow account for only a very small fraction of movements in Australia's national cash flow; accordingly, his consumption smoothing results were only slightly affected by the removal of the influence of world shocks on changes in Australian national cash flow.

As Sachs (1982) has pointed out, movements in the current account can be decomposed into two components. First, the consumption-tilting motive, whereby a country tilts its consumption toward the present or the future given differences between the country's subjective discount rate and the world real interest rate. Second, the consumption-smoothing motive, which smooths aggregate consumption in the presence of shocks to output, investment or government spending. The analysis, up to this point, has assumed that only considerations of future changes to national cash flow (consumption smoothing) motivate the economy to run either a current account deficit or a current account surplus. However, other intertemporal incentives for running unbalanced current account positions exist. Even if we assume that national cash flow will remain constant into the future (in which case there would be no need for consumption smoothing), if the economy's subjective discount rate, β, differs from the effective interest rate, $1/(1+r)$, then the economy may have an incentive to engage in consumption tilting. [11]

Under quadratic utility, the trend introduced by the consumption-tilting component of the current account can be defined as

$$\theta = \frac{\beta(1+r)r}{[\beta(1+r)^2-1]} \qquad \textbf{(5)}$$

where the incentive to "tilt" the path of optimal consumption results from divergences between the real world interest rate and the domestic rate of time preference, $(1-\beta)/\beta$. Consumption tilting results in a bias towards either current account deficits (because consumption is brought forward) or current account surpluses (because consumption is deferred), where these imbalances are created in a manner consistent with intertemporal solvency. For example, if $\beta < 1/(1+r)$ (that is, $\theta<1$ in equation (5)), the world capital market offers the country a rate of return that fails to compensate it for deferring consumption. Accordingly, economic agents have an incentive to tilt (shift) consumption to the present, run current account deficits, increase the economy's level of net external liabilities and then gradually lower consumption over time. Such an economy has a relatively high discount rate, and would choose to have a high level of consumption in the present period, but would lower consumption over time to assist in winding back its accumulating stock of external liabilities. Conversely, if $\beta > 1/(1+r)$ (that is, $\theta>1$ in equation (5)), economic agents have an incentive is to shift (tilt) consumption to the future, run current account surpluses, lower the economy's level of net external liabilities and then gradually raise consumption over time.

Since consumption tilting has implications for the current account that are entirely distinct from consumption smoothing, and as the emphasis of this paper is on the current account as a buffer for consumption, it is important to ensure that the optimal current account

---

[11] A country that is more impatient than the rest of the world will run current account deficits; the consumption-tilting part of the current account position is the level of the current account that would occur if all the economic fundamentals (that is, the components of national cash flow) are at their permanent level.

derived from equation (4) is compared to only that component of the current account that relates to consumption smoothing, and not to the actual current account (which potentially includes both consumption-smoothing and consumption-tilting components).[12] This requires that consumption tilting be filtered from the actual current account according to

$$CA_t^{sm} = z_t - \theta c_t - rb_t \qquad (6)$$

where CA_t^{sm} is the actual consumption-smoothing component of the actual current account. For example, when $\theta<1$ the consumption-smoothing current account deficit will be smaller than the measured current account position, since the incentive is for the economy to bring consumption into the present (and so run a current account deficit on consumption-tilting grounds). Given that c_t and $(z_t - rb_t)$ are both I(1) variables, then the estimated tilting parameter, $\hat{\theta}$, is the cointegrating parameter from a regression of $(z_t - rb_t)$ on c_t. Our focus in this paper is on the consumption-smoothing component of the current account, because without an explicit model of intergenerational welfare it is not possible to decide whether deferring/bringing forward consumption (that is, consumption tilting) is desirable. However, as long as the economy's objective function is of a form like equation (1), there will be avoidable deadweight costs from a failure to consumption smooth.

III. ESTIMATION METHOD

The estimation and testing procedure proceeds in four steps. The first step is to allow for the possibility that the cointegrated (long-run) relationship between private consumption (c_t) and national cash flow less payments on the outstanding stock of external liabilities ($z_t - rb_t$), from which we obtain an estimate of the consumption-tilting parameter, $\hat{\theta}$, has shifted at an unknown point in the sample. The possibility of a regime shift is allowed for because the period since capital account liberalization in 1984 has been marked by some significant policy framework changes in Australia, including: the adoption in 1993 of a monetary policy framework based on targeting inflation, the accelerating of the reduction of trade barriers, strengthening of prudential supervision of the financial sector, and a sizable program of fiscal consolidation. This period provides a very severe test of the empirical consumption-smoothing model, and suggests there is a possibility of a regime shift in behavior as the private sector adapts to the new economic environment. The timing of any such regime shift is likely to be unknown, because there is not necessarily a one-to-one correspondence between potential causes of a regime shift and its occurrence in the data. Use of the Gregory-Hansen (1996) test for cointegration is useful in this instance, since it allows for the timing of any regime shift to be unknown *a priori* (see Appendix I for details).

---

[12] The consumption-tilting (nonstationary) component of the actual current account is removed to construct the actual, consumption-smoothing (stationary) component of the current account. Beyond our desire to focus on consumption smoothing, this is necessary to ensure the validity of standard statistical inference techniques, which will be used for hypothesis testing in Section IV below.

The second step is to obtain an estimate of θ, in order to construct the stationary consumption-smoothing component of the current account by removing the nonstationary component of the actual series associated with consumption tilting. As noted above, this estimate can be obtained from equation (6) by estimating a cointegrating relationship between c_t and $(z_t - rb_t)$. This relationship was estimated using the Phillips-Hansen (1990) Fully Modified (FM) method, which yields an asymptotically correct variance-covariance estimator when estimating cointegrating vectors in the presence of serial correlation and endogeneity. The use of this variance-covariance matrix is important for the robustness of subsequent hypothesis tests.[13] The actual (consumption-smoothing) component of the current account, $\hat{CA}_t^{sm}$, is defined by the residuals of the cointegrating regression of equation (6), and to confirm the regression was indeed cointegrated, the Phillips-Ouliaris (1990) residual-based cointegration test was employed.[14] [15]

The third step is to calculate the optimal consumption-smoothing component of the current account. A direct test of equation (4) requires a method of estimating the expected values contained in it. That is, the derivation of the optimal (consumption-smoothing) current account requires a measure of anticipated future changes in national cash flow. One approach is to use current and lagged changes in national cash flow to predict future changes in national cash flow. In addition, and following Campbell and Shiller (1987), under the null hypothesis that equation (4) is valid (that is, consumption-smoothing holds), the current account itself should incorporate all the information available to consumers regarding expected changes to output, investment and government spending. That is, $-CA_t^{sm}$ should be the best forecast of the present discounted value of future changes in national cash flow. Accordingly, an estimate of the optimal current account can be obtained by using current and lagged smoothed current accounts to form some proxy of the expected values in equation (4). By including the smoothed current account in the conditioning information set, it is as if we can ascertain the information set used by agents in making their forecasts of future national cash flow. This can formally be accomplished by estimating a bivariate autoregressive model of the current account balance and the change in national cash flow.

---

[13] While the estimated actual consumption-smoothing component of the current account, $\hat{CA}_t^{sm}$, is I(0) it is not iid, because CA_t^{sm} will be endogenous to y_t, and CA_t^{sm} will most likely be correlated with CA_{t-1}^{sm}.

[14] Both the Phillips-Hansen FM estimation method and the Phillips-Ouliaris cointegration test were computed using the Bartlett kernel and the automatic bandwidth selector developed by Andrews (1991).

[15] As the series for $\hat{CA}_t^{sm}$ is constructed from the residuals of the cointegrating regression of equation (6), then $\hat{CA}_t^{sm}$ will contain some estimation error because the exact value of θ is unknown, and has to be estimated. This additional uncertainty needs to be taken into account in undertaking the test of whether equation (6) is a cointegrated regression, and so the Phillips-Ouliaris critical values (which have a larger critical region over which the null hypothesis cannot be rejected) are used to determine if $\hat{CA}_t^{sm}$ is I(0).

As a result, we estimate a first-order unrestricted bivariate vector autoregression (VAR) of the form $W_t = A\ W_{t-1} + \epsilon_t$, where $W_t = (\Delta z_t\ \hat{CA}_t^{sm})'$, ϵ_t is a 2×1 vector of disturbance terms, and A is a 2×2 matrix of coefficients. With the estimate of A from the VAR and using the fact that $E_t[W_{t+j}] = A^j\ W_t$, an estimate of the optimal consumption-smoothing component of the current account was computed as

$$\hat{CA}_t^* = [-1\ 0]\left[(1+r)^{-1}\ \hat{A}\right]\left[I_2 - (1+r)^{-1}\hat{A}\right]^{-1} W_t \equiv \hat{\Gamma} W_t \qquad (7)$$

where I_2 is the 2×2 identity matrix and Γ is a 1×2 matrix of coefficients.[16] Expression (7) is valid as long as both the infinite sum in equation (4) converges, and the variables appearing in the W matrix of the VAR system are stationary. Assuming that z_t is I(1), Δz_t will be I(0). Since under the null the actual (consumption-smoothing) current account (CA_t^{sm}) is equal to CA_t^*, which from equation (4) is a discounted sum of Δz_t, then CA_t^{sm} will also be I(0). The validity of the consumption-smoothing hypothesis can be tested by comparing the estimate of the optimal (consumption-smoothing) current account derived from equation (7) with the estimated actual (consumption-smoothing) current account derived from equation (6). In addition, a 95 percent confidence band around $\hat{CA}_t^*$ was estimated. Since traditional variance approximations for nonlinear functionals such as $\hat{CA}_t^*$ may be imprecise, a bootstrap method is used to estimate the confidence bands and the median estimate of $\hat{CA}_t^*$ (see Appendix II for details).

The fourth and final step is to conduct a number of hypothesis tests to evaluate the consumption-smoothing model. One testable implication is simply to examine the prediction of the consumption-smoothing model (as set out in equation (3)) that optimal private consumption, c_t^*, should only change if new information concerning national cash flow arrives. Under rational expectations, consumption changes should not be forecastable (because otherwise the country could not have been optimizing prior to the change), and so should follow a random walk.

Two further testable implications of the consumption-smoothing hypothesis arise from equation (4). The first testable implication is that the consumption-smoothing component of the actual current account (CA_t^{sm}) be stationary. Second, analogous to Campbell's (1987) consumption-smoothing hypothesis, the actual (consumption-smoothing) current account should "Granger-cause" (help predict) changes in national cash flow. This will be true whenever economic agents have better information about the future path of national cash flow (through news of political, institutional or other events) than is contained in past values of the

---

[16] The assumption of a constant real interest rate (r) assists in the derivation of equation (7), by allowing for the summation of a matrix geometric series. It also implies that the consumption-tilting parameter is constant, which allows for stochastic detrending of the actual current account data to focus on the stationary consumption-smoothing component of the current account. Recent empirical work by Kent (1997) indicates that the constant r assumption, which implies that shocks to national cash flow are idiosyncratic (rather than global) in nature, is particularly applicable for small, open economies like Australia.

change in national cash flow. For example, given an actual (consumption-smoothing) current account deficit exists, this should signal that an increase in future national cash flow is expected.

A fourth test is to examine whether the VAR parameters in equation (7) conform to the nonlinear restriction

$$\Gamma = [-1\ 0]\left[(1+r)^{-1}A\right]\left[I_2 - (1+r)^{-1}A\right]^{-1} = [0\ 1]. \qquad \textbf{(8)}$$

This restriction implies that movements of the actual (consumption-smoothing) current account reflect those of the optimal (consumption-smoothing) current account; failure of this restriction implies that the country is not optimally smoothing its consumption path. Examination of whether the actual (consumption-smoothing) and optimal (consumption-smoothing) current accounts are similar can be done by inspection of a plot of the respective series ($\hat{CA}_t^*$ and $\hat{CA}_t^{sm}$) or, more formally, by estimation of equation (7). As set out in equation (8), optimal consumption smoothing implies the joint parameter restriction Γ=[0 1], and nonrejection of these joint restrictions implies that movements in $\hat{CA}_t^{sm}$ fully reflect movements in $\hat{CA}_t^*$.

While nonrejection of the first two tests is evidence supportive of consumption smoothing, it does not necessarily imply that economic agents have been smoothing consumption. Apart from the well-known lack of power of unit root tests, consumption could follow a random walk if, for example, consumption was a function of income which, in a growing economy, follows a random walk. Nonrejection of the third (Granger causality) and fourth (restricted equation (7)) tests of the model are direct evidence in support of the hypothesis of consumption smoothing, as they indicate whether: the current account is informative about future changes to national cash flow; the actual current account is driven by changes in the optimal current account; and that there has been an appropriate use of capital flows to smooth consumption as a result of fluctuations in national cash flow.

IV. Empirical Results

The data used to estimate the parameters of the model are quarterly national accounts for the period 1984:1-1998:2, expressed in billions of 1990 Australian dollars, seasonally-adjusted at annual rates, and were obtained from the International Monetary Fund's

International Financial Statistics (IFS) database and official sources.[17] All data are converted into real terms by dividing by the implicit GDP deflator.

A. Estimating Consumption-Tilting in the Presence of a Structural Break

In estimating our cointegrating regression of the relationship between consumption and national cash flow less interest payments, we need to ensure that the residuals from the cointegrating regression of equation (6) are stationary.[18] Moreover, in carrying out the test for cointegration care needs to be taken, as in the presence of a regime shift in the relationship between the variables in the cointegrating regression, standard cointegration tests have low power (against the possibility of cointegration with a regime shift), and are therefore likely to falsely conclude there is no long-run relationship. Accordingly, we examine the data over the full period (1984:1-1998:2) in order to determine whether there is a structural break (regime shift) in the cointegrating relationship between c_t and $(z_t - rb_t)$.

The results of the Gregory-Hansen (1996) $Z(t)^*$ residual-based test for cointegration in the presence of a regime shift, and the Phillips-Ouliaris (1990) $Z(t)$ residual-based unit root tests for cointegration, are shown in Table 1. The Gregory-Hansen (1996) cointegration test (allowing for a structural break) is run for the full period (1984:1-1998:2), to examine whether there has been a one-time regime shift in the cointegrating relationship (column 3, Table 1). Such a shift is found in the data at 1990:4, indicating that the many exogenous shocks and policy changes implemented since liberalization of Australia's capital account in 1984 induced a regime shift in the long-run relationship between c_t and $(z_t - rb_t)$ at that time

---

[17] The data were obtained as follows: private consumption, *c*, *IFS* line 96f; government consumption, *g*, line 91ff; investment, *i*, lines 93ee+93i; GNP, *rb*+*y*, line 99a; GDP, *y*, line 99b; implicit GDP deflator, line 99bi; and $CA \equiv y - i - c - g$. Data on interest payments on external liabilities (*rb*) from 1997:2 onward have been taken from official sources (Australian Bureau of Statistics (1998)). An adjustment to the external data was made to take account of the unusual movement in the current account in 1997, as the bulk of the temporary increase in the measured current account balance in that year is explained by sales of gold by the Reserve Bank of Australia (A$1.8 billion in the June quarter and A$0.7 billion in the September quarter). This treatment is consistent with the national accounts presentation of the current account deficit (1993 *System of National Accounts*); accordingly, in this paper monetary gold (sales and purchases of gold among monetary authorities) is treated as a financial asset, and as a result transfers of monetary gold are reflected in the financial account and excluded from the actual current account (see Australian Bureau of Statistics (1997) for further details).

[18] Phillips-Perron (1988) unit root tests (using an intercept and trend) reveal that both c_t and $(z_t - rb_t)$ are I(1), so that there is a possibility that cointegration exists (see Table 2).

Table 1. Australia: Consumption-Tilting Parameter

Sample	$\hat{\theta}$	se($\hat{\theta}$)	$Z(t)^*$	$Z(t)$
1984:1-1998:2	0.927	0.005	-5.29*	
1984:1-1990:4	0.912	0.006		-3.62*
1991:1-1998:2	0.937	0.003		-3.27*

Notes: $\hat{\theta}$ is the Fully Modified estimate of the consumption-tilting parameter, derived from the cointegrating regression of national cash flow (less interest payments) on consumption (Phillips and Hansen (1990)). se($\hat{\theta}$) is the asymptotically correct standard error of this estimate. $Z(t)^*$ is the residual-based unit root test for cointegration of private consumption (c_t) and national cash flow net of payments on external liabilities ($z_t - rb_t$), allowing for a level shift in the cointegrating relationship and/or a shift in the slope coefficient -- the 5 percent critical value for this test is -4.95; values more negative than this imply rejection of the null hypothesis of no cointegration in the presence of a structural break (Gregory and Hansen (1996)). $Z(t)$ is the residual-based unit root test for cointegration of private consumption (c_t) and national cash flow net of payments on external liabilities ($z_t - rb_t$) -- the 5 percent critical value for this test is -2.76; values more negative than this imply rejection of the null hypothesis of no cointegration (Phillips and Ouliaris (1990)). An asterisk (*) indicates that the relevant null hypothesis can be rejected at the 5 percent level of significance.

(see Appendix I for details).[19] In Appendix I we graph $Z(t)^*$, which reveals that there is clearly a well-defined minimum. As stated above, it is important to note that there is not necessarily a one-to-one correspondence between potential causes of a structural break and its occurrence in the data. For example, a regime shift in any long-run relationship can occur after an exogenous shock or policy change because it may take time for economic agents to learn about the new economic environment.

Having found the structural break in the data, Phillips-Ouliaris $Z(t)$ residual-based unit root tests including seasonal dummies are then run for the two subperiods (1984:1-1990:4 and 1991:1-1998:2). The parameter tests all indicate a stable relationship between national cash flow and consumption at the 5 percent significance level (Table 1). Cointegration is accepted at the 5 percent significance level in both subperiods. Accordingly, we conclude from these regime shift tests that there is a statistically-significant difference in the value of the tilting parameters across the two subperiods.

The estimated consumption-tilting parameter from the cointegrating regression of national cash flow (less interest payments) on consumption is reported in Table 1 for the full sample period 1984:1-1998:2, and for the two subperiods, 1984:1-1990:4 and 1991:1-1998:2. In all three sample periods the estimated parameter is significantly less than unity, implying that Australia is consuming more than its permanent cash flow and must be running down its stock of external assets or increasing its external liabilities. Importantly, the preference for current consumption over future consumption (consumption-tilting) has become less pronounced in the later subperiod (1991:1-1998:2, with $\hat{\theta} = 0.937$) in comparison with the early subperiod (1984:1-1990:4, $\hat{\theta} = 0.912$). In earlier work using annual data, Cashin and McDermott (1998) found that the preference for current consumption over future consumption became more pronounced in the period 1975-94 ($\hat{\theta} = 0.932$), in comparison with 1954-74 ($\hat{\theta} = 0.987$). The 1975-94 period includes Australia's move to a floating exchange rate in late 1983, and the simultaneous removal of remaining capital controls and relaxation of restrictions on financial markets. The general picture which arises from these results is an increasing preference for current consumption over future consumption in the

---

[19] The null hypothesis of no cointegration is rejected (at the 5 percent level) by the test for cointegration in the presence of a regime shift (allowing the intercept and slope coefficients to shift). The smallest value of the $Z(t)^*$ statistic (-5.29) occurs at 1990:4, exceeding the 5 percent critical value of -4.95. This implies that the hypothesis of a common tilting parameter in both subperiods is rejected at the 5 percent level, and that c_t and $(z_t - rb_t)$ are cointegrated, conditional on a structural break in their relationship at 1990:4.

1980s when compared with earlier decades, followed by an increasing preference for future consumption over current consumption in the 1990s.[20]

Using estimates of θ and given an exogenous world real interest rate of 4 percent, we can derive an estimate of the Australian rate of time preference $[(1-\beta)/\beta]$, and compare it to previous findings. Our results here yield a value for the rate of time preference of 0.0437 for the period 1984:1-1990:4, and 0.0426 for the period 1991:1-1998:2; that is, 37 and 26 basis points over the world real interest rate, respectively. These estimates compare with those of Cashin and McDermott (1998), which were 5 and 27 basis points over the world real interest rate for the periods 1954-74 and 1975-94, respectively; and of Milbourne and Otto (1992) of 49 basis points over the world real interest rate for the period 1983:4-1989:1. In contrast, Kent (1997) finds the rate of time preference between 1949-95 to be only marginally (0.7 basis points) above the world real interest rate—however, for most of his sample period, Australia was constrained from borrowing on international capital markets, and so was forced to favor future consumption relative to present consumption.

The theoretical model of Section II implies that the rate of time preference is constant over the whole period. As described in Section II, we use a cointegrated regression to estimate the (assumed constant) consumption-tilting parameter, and then extract the stochastic trend component of the current account deficit. Following Ghosh (1995), we view this assumption of a constant rate of time preference as a pragmatic means of removing trends in the current account which result from factors not captured by the model. These trends, which may change over time, may be the result of removal of credit constraints, changing productivity, and/or changing demographic factors. As these factors change, the effective rate of time preference will also change. Although derived using similar techniques, the differing estimates of $[(1-\beta)/\beta]$ listed above have occurred because researchers used different sample periods. An important implication of these findings is that there are different trend components of the Australian current account in different periods. As a result, in the empirical part of this paper, we allow for a one-time endogenous change to the rate of time preference in our implementation of the consumption-smoothing model.

---

[20] In Cashin and McDermott (1998), data from the period 1954-74 clearly resulted in the rejection of the consumption-smoothing model of the current account, as it should have given the presence of capital controls. As for the period 1975-94, both c_t and $(z_t - rb_t)$ were marginally cointegrated, given that this twenty-year period mixed: a subperiod during which the consumption-smoothing model of the current account was inappropriate because of the presence of capital and exchange controls (1975-83); a subperiod during which economic distortions were prominent and distorted consumption choices (1975-90); and a subperiod during which the consumption-smoothing model was a valid representation of Australia's current account, due to the relative absence of capital controls and distortions (1991 onwards). Kent's (1997) results confirm our earlier findings of a significant rise in consumption tilting after the relaxation of capital controls in 1983.

B. Hypothesis Tests

Table 2 reports the results of tests of the unit root and stationarity hypotheses for the full period and the two subperiods. The tests are used to evaluate the predictions of the consumption-smoothing model that private consumption should follow a random walk and that the smoothed current account is stationary. The Phillips-Perron test is unable to reject the unit root hypothesis for private consumption for the whole period and both subperiods; a similar result holds for $(z_t - rb_t)$, which is found to be I(1) for the full period and both subperiods. Unit root tests are also show that the first difference of national cash flow is clearly stationary and so, under the consumption-smoothing hypothesis, the smoothed component of the current account should also be stationary.

Table 3 shows the results from the Granger causality tests. The standard F-test for the absence of "Granger-causality" from the current account to national cash flow is rejected at the 10 percent significance level for the full period and the later subperiod, implying that the current account weakly Granger-causes (helps predict) future changes in national cash flow, which is consistent with consumption smoothing. In contrast, Granger causality is not present for the early subperiod. This is evidence which indicates that, in the later (early) subperiod, the data is partly consistent (inconsistent) with the model's prediction that the current account is chosen by economic agents to reflect future expected changes in national cash flow.

The next step in the empirical exercise is to evaluate the performance of the consumption-smoothing model. A simple method of evaluation is to compare the correlation of the actual ($\hat{CA}_t^{sm}$) and optimal ($\hat{CA}_t^{*}$) smoothed current accounts.[21] Given the underlying assumptions of the consumption-smoothing model, it performs well in being able to track movements in the actual current account. The correlation between the two series is 0.288 for the full period (1984:1-1998:2), yet -0.288 for the early subperiod (1984:1-1990:4). This latter result confirms the findings of Milbourne and Otto (1992), as their analysis over a similar time period (1983:4-1989:1) found that the consumption-smoothing model did not perform well in modeling movements in Australia's current account position. That is, in this subperiod Australia's capital inflows were not consistent with optimizing behavior as predicted by the consumption-smoothing model. Moreover, this weak correlation indicates that, even after the relaxation of exchange and capital controls in the early-1980s, other key requirements of the consumption-smoothing model, in particular a lack of distortions and externalities affecting financial markets, appear not to have been present for the Australian

---

[21] An estimate of the optimal consumption-smoothing current account ($\hat{CA}_t^{*}$) was computed using equation (7), with a constant world real interest rate, r, of 4 percent. This rate was also used by Milbourne and Otto (1992), Cashin and McDermott (1998), and Kent (1997). The optimal current account was also computed with a constant world real interest rate equal to 2, 3, 5, and 6 percent, and, consistent with the above two studies, the results differed only marginally from those reported below.

Table 2. Australia: Unit Root Tests

Sample	c_t	z_t	$(z_t - rb_t)$
1984:1-1998:2			
level	1.209	0.206	0.817
first difference	-7.916*	-8.342*	-10.378*
1984:1-1990:4			
level	-0.737	-0.498	0.745
first difference	-5.865*	-4.902*	-7.886*
1991:1-1998:2			
level	0.468	-0.937	0.212
first difference	-5.828*	-6.597*	-6.245*

Notes: The variables tested were private consumption (c_t); national cash flow (z_t), which is output net of investment and government spending; and national cash flow net of payments on external liabilities, $(z_t - rb_t)$. For the Phillips-Perron (1988) unit root test (with a constant), the lag length was determined by the data-dependent method of Andrews (1991). An asterisk (*) indicates that the null hypothesis of a unit root can be rejected at the 5 percent level of significance (the 5 percent critical value is -2.93 (-3.00) for the Phillips-Perron test for t=50 (100) observations).

Table 3. Australia: Tests of the Consumption-Smoothing Model

Sample	Granger Causality		Nonlinear Restriction	
	F	*p*-value	Wald	*p*-value
1984:1-1998:2	3.005*	0.089	6.595**	0.037
1984:1-1990:4	0.027	0.870	6.463**	0.040
1991:1-1998:2	3.783*	0.065	2.000	0.368

Notes: The Granger-causality test is an F-test to determine if the actual (smoothed) current account ($\hat{CA}_t^{sm}$) causes (helps predict) changes in national cash flow (Δz_t); rejection of the null hypothesis of no causation indicates that the current account does have predictive power for future changes in national cash flow. The nonlinear restriction test is a Wald test to determine whether the estimated VAR coefficients satisfy a restriction of the consumption-smoothing model (that $\Gamma = [0\ 1]$ in equation (7)); rejection of this restriction indicates that movements of the actual (smoothed) current account ($\hat{CA}_t^{sm}$) do not reflect those of the optimal (smoothed) current account ($\hat{CA}_t^{*}$), and implies that the country is not optimally smoothing its consumption path. An asterisk (*) indicates that a test can be rejected at the 10 percent level of significance; a double asterisk (**) indicates that a test can be rejected at the 5 percent level of significance.

economy. Interestingly, the corr($\hat{CA}_t^{sm}, \hat{CA}_t^*$) rose to 0.917 in the later subperiod (1991:1-1998:2)—indicative that the above key requirements were increasingly present (see Section V.B below).

A more formal Wald test of the parameter restrictions implied by the consumption-smoothing model is also available, which examines whether there is a close association between movements in the actual (consumption-smoothing) current account and the optimal (consumption-smoothing) current account (Table 3). To pass this test, the parameters of the estimated bivariate autoregressive model should conform to certain restrictions of the consumption-smoothing model: specifically, as set out in equation (8), that Γ=[0 1] in equation (7). This nonlinear restriction on the VAR parameters of equation (7), examining whether the model implies a close association between movements in the actual and optimal current account measures, is not rejected at the 5 percent level of significance in the later period, but was clearly rejected in the early subperiod and in the full period. The rejection of the restriction in the early subperiod indicates that the differences between the actual (consumption-smoothing) current account and the optimal (consumption-smoothing) current account observed in the correlation analysis represent more than merely random sampling error. Overall, the consumption-smoothing model is clearly much more successful in explaining the behavior of international capital flows to Australia in the later subperiod than the early subperiod. Accordingly, Australia has engaged in consumption-smoothing behavior during the later subperiod (1991:1-1998:2), in that Australians responded to expected future changes in national cash flow by borrowing capital from abroad, rather than by altering contemporaneous consumption.

V. Interpretation of the Results

Our findings are consistent with, and build upon, previous empirical studies for the case of Australia. In concurrence with Milbourne and Otto's (1992) study using quarterly data, we find that during the 1980s the pattern of Australia's external borrowings was not consistent with maximizing utility in response to shocks to national cash flow. In the early 1990s a structural break occurred in the relationship between consumption and national cash flow, in that Australians became more willing to substitute future consumption for current consumption. Following this break, the current account data is consistent with the predictions of the consumption smoothing model.[22] Our key results are analyzed in more detail below.

---

[22] As to studies using annual data, Kent (1997) has recently confirmed our earlier findings that the data is consistent with the consumption-smoothing model after the mid-1970s, and that the failure of the smoothing model prior to that time largely reflects the existence of binding credit constraints (Cashin and McDermott (1998)).

A. Analysis of the Current Account Balance

The upper panel of Figure 1 shows the decomposition of the current account balance into its consumption-tilting and consumption-smoothing components.[23] The tilting component shifts sharply upwards in 1991 by nearly 2 percent of GDP, reflecting the impact of the regime shift, but is otherwise broadly flat. The consumption-smoothing component is more irregular, reflecting its nature as a buffer to shocks.

The lower panel of Figure 1 presents the actual and optimal current accounts, and the 95 percent confidence band around the median estimate of the optimal current account.[24] The median estimate of the optimal current account was used rather than the mean estimate because the empirical distribution of the optimal current account was heavily skewed toward larger deficits, which would result in the mean estimate of the optimal current account being biased downwards. The advantages of this method are that it has an equal probability of under- and over-estimation (unlike the predicted values derived from ordinary least squares, which have a higher probability of under-estimation), and it is an exact procedure (up to simulation error) rather than an asymptotic one.

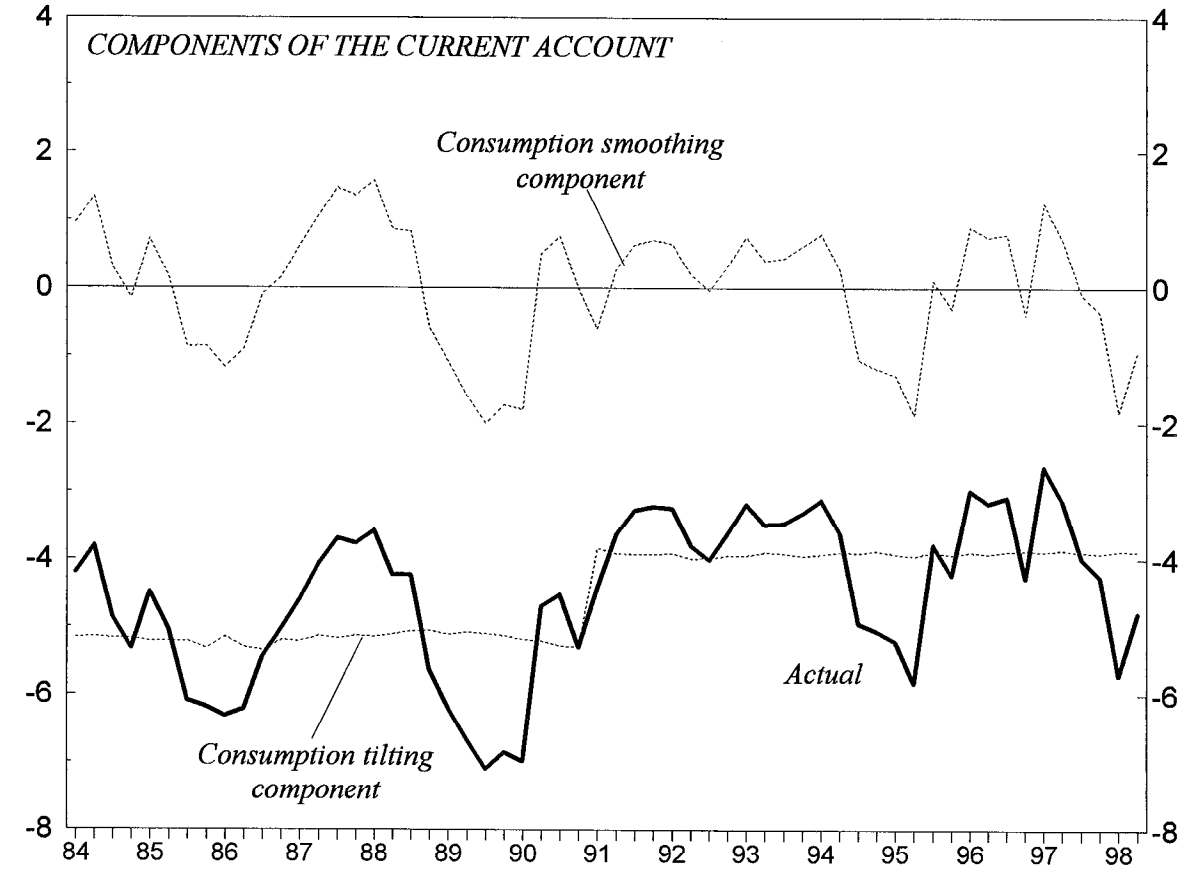
The consumption-smoothing model is successful in matching the direction and turning points of the actual current account series over the full sample period, and the actual and predicted optimal series are highly correlated, particularly in the later subperiod. However, the model is unable to explain several large and sustained movements in Australia's actual current account deficit, particularly the large deficits of the mid- and late-1980s, and mid- and late-1990s. The less than optimal consumption appears to stem from overshooting of the actual current account deficit, due to the effects of: (mid-1980s) the liberalization of financial markets (which enabled consumption to be maintained at a higher than optimal level) coupled with an income contraction due to an adverse terms of trade shock; (late-1980s) a positive terms of trade shock, accompanied by a highly-leveraged investment boom; and (mid-1990s) strong growth in imports of investment goods, coupled with a drought-induced contraction in rural commodity exports (Bullock, Grenville and Heenan 1993, Commonwealth of Australia 1998).

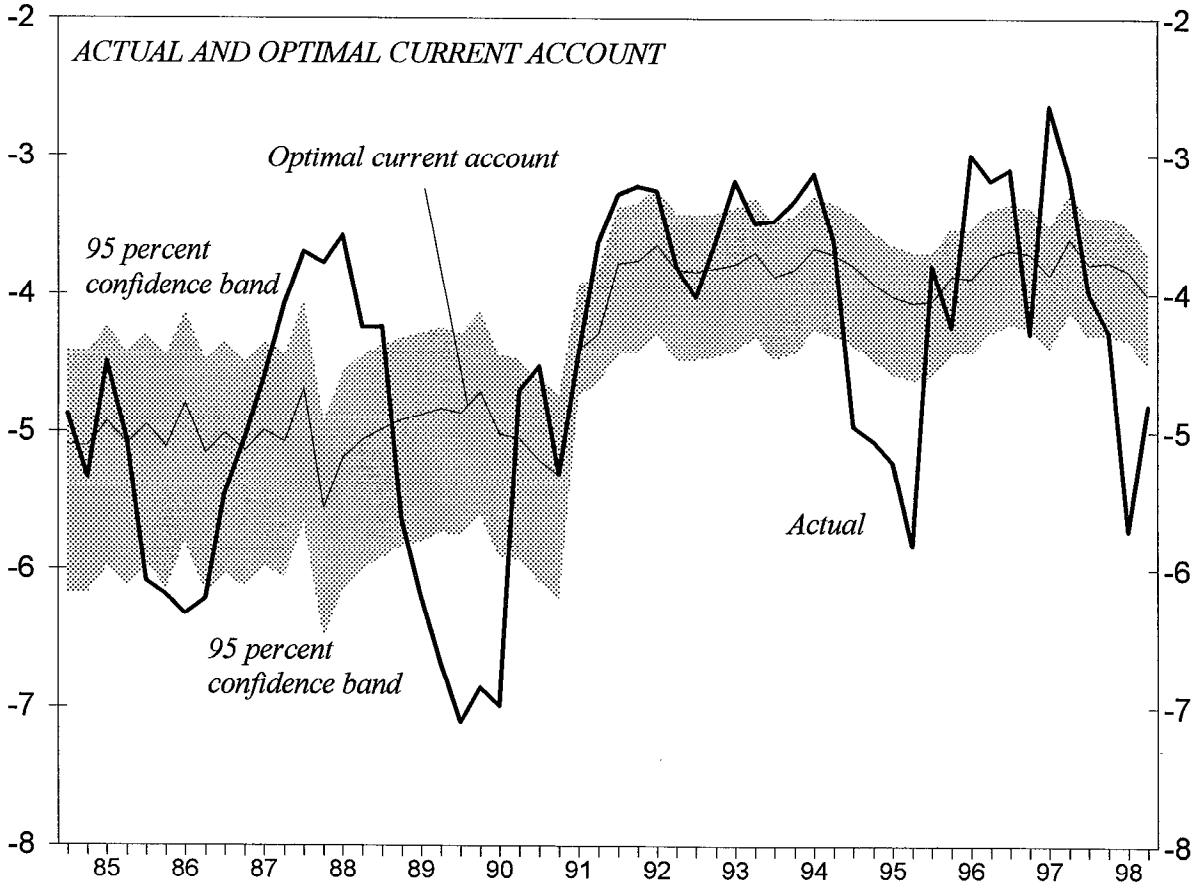
---

[23]The model uses national accounts data to estimate optimal current account behavior (as required by the theoretical approach), and Figure 1 plots the national accounts definition of the current account as the actual. However, the national accounts and balance of payments definitions do not match perfectly.

[24] The current account measures presented in Figure 1 are for the actual and optimal current account, after adding back the consumption-tilting component of the current account deficit. The confidence bands were generated by a bootstrap method around the median estimate of the optimal current account, which ensures that 50 percent of the draws from the empirical distribution of the optimal current account are above and 50 percent below the median at each point in time—see Appendix II for details.

Figure 1. Australia: Current Account Balance, 1984-98
(In percent of GDP)





Sources: IMF, International Financial Statistics; authors' calculations.

In the later subperiod (1991:1-1998:2), the actual current account path is close to the path of the optimal current account, and this is confirmed by the more formal tests of the model discussed above. In particular, the model correctly predicts the sign (though not necessarily the extent) of the change in the current account imbalances of the mid- and late-1990s, and appears to be capturing economically and statistically significant elements of actual external borrowing behavior in this subperiod. Interestingly, the actual current account deficit is just outside the lower standard error band for 1998:2, with the actual deficit expanding more rapidly than the optimal deficit to smooth consumption in the wake of the shock to output caused by the Asian economic crisis of 1997-98.[25] Importantly, the precision of the model is enhanced in the later subperiod, as evidenced by the narrowing of the standard error bands around the optimal current account through time.

Of course, the model does not fit perfectly, as no model would. The question becomes how to interpret deviations between the actual and optimal current account generated by the model. Part of the reason for the difference between the series is simply sampling error. But another reason may be suboptimal borrowing ($CA_t < CA_t^*$) or lending ($CA_t > CA_t^*$) behavior, relative to the extent of borrowing for consumption which would be predicted by the permanent income hypothesis. Interestingly, over both subperiods, instances of suboptimal external borrowing have not typically been offset by periods of suboptimal external lending.

B. Distortions, Country Risk and the Current Account

The deterioration in Australia's current account position since the mid-1980s, and the associated increase in net external liabilities, has been accompanied by a vigorous debate as to the major causes, consequences and potential remedies (if any) required. In a series of influential contributions, Pitchford used the intertemporal approach to argue that Australia's current account position should be of little concern, as under the assumption of a virtual absence of market failure (distortions and externalities affecting private savings and investment) the current account deficit was merely a result of optimizing behavior by forward-looking firms and individuals, with no implication of a need for corrective policy measures.[26] Pitchford argued that because in Australia's case most of the current account deficit in recent

---

[25] Prior to the onset of the Asian economic crisis, which began in Thailand in 1997:2, the actual current account deficit was more constrained than the optimal current account deficit. In the subsequent three quarters the actual current account deficit expanded rapidly, before contracting in 1998:2 (Figure 1).

[26] See Pitchford (1992, 1995) for a summary of his argument. The Pitchford view is very similar to the "Lawson doctrine", espoused by the British Chancellor Nigel Lawson in 1988 when the United Kingdom's current account went into deficit in spite of a strong fiscal position. See Corden (1977, pp. 50-51) for an early statement of the intertemporal approach to external balance.

decades can be attributed to the difference between private investment and private saving (where the former is driven by profit opportunities and the latter by how consumers choose to spread their consumption through time), there was little role for government intervention (by such instruments as fiscal tightening) designed to inhibit the creation of private liabilities by altering the dynamic path of domestic investment and consumption. If such distortions and externalities in financial markets exist, the first-best policy is to improve the efficiency of these markets, regardless of the current account balance.

The Pitchford view ran counter to those arguing that Australia's burgeoning current account deficits, and consequent rising stock of external debt, needed to be curtailed before they became economically unsustainable (Arndt 1989, The Economist 1995).[27] This more conventional view recommends that tight monetary/fiscal policy is needed to restrain aggregate demand and rein in the current account deficit. Using a Mundell-Fleming framework with limited international capital mobility, the conventional case for macroeconomic action on the current account rests on the existence of externalities in the borrowing process and distortions affecting private saving and investment behavior, neither of which are amenable to resolution at the source of their incidence. These defenses of the conventional view have argued that current account deficits and the associated build-up of external debt can be matters of public concern if saving and investment decisions are distorted by such market failures, which can induce: unsound private borrowing (due, for example, to tax provisions which favor borrowing or which favor debt over equity financing); or suboptimal private saving (due to the public provision of old-age pensions, unemployment and health benefits which lower the need for private provision in these areas and favor current over future consumption). In addition, even if the components of the current account (saving and investment) are based on undistorted private sector decisions, if public and private borrowers create externalities for one another (country risk) because this additional risk is not wholly internalized by individual borrowers, then the size of the current account as

---

[27] Australia's large current account deficits of the 1980s, in tandem with a significant real exchange rate depreciation, resulted in Australia's net external liabilities-to-GDP ratio rising from 23 percent in 1980-81 to 46 percent in 1989-90, with the external debt component of this total rising from 6 percent to almost 36 percent of GDP. Current levels of these measures are 62 and 40 percent, respectively (IMF (1998b)).

a whole may affect foreigners' willingness to lend (see Harberger (1986), Corden (1997)).[28] [29] Finally, Corden (1997) notes that if private agents are not Ricardian, and so do not fully offset the future tax implications of government debt finance with an increase in private savings, then public debt finance can give rise to a 'domestic distortion' in that private savings, and consequently national savings, are less than optimal.

The results of this paper suggest that there was external overborrowing for consumption purposes in the mid-1980s, late-1980s and mid-1990s. There are several commonly-cited explanations for the external overborrowing of the 1980s. These concentrate on policy distortions affecting national saving and investment, in particular the interaction between inflation and the domestic tax system and the contribution made by deregulation of domestic financial markets and the removal of currency and foreign capital controls.

Edey and Britten-Jones (1990) argue that distortions in Australia's tax system, particularly the tax deductibility of nominal interest costs, increases (reduces) the incentive to invest (save) when inflation is high. These nominal features of the tax system encourage a bringing forward of consumption or investment spending relative to the optimal saving-investment gap, by encouraging capital flows from low-inflation to high-inflation economies. Inflation also distorts investment signals through the concessional taxation treatment of capital gains (where real gains are only taxed on realization), which discourages from investment in assets yielding recurrent income. Through the immediate tax deductibility of nominal interest costs, inflation distorts financing decisions by creating an incentive in favor of debt over equity financing.

Fueled by the increased availability of credit in the wake of the deregulation of the Australian financial sector in the early 1980s, and a competition-induced fall in credit standards on the part of both lenders and borrowers in the late 1980s, strong economic growth and the abovementioned tax incentives to borrow led to a rapid rise in investment in more risky assets such as property and stocks, rather than plant and equipment (Macfarlane

---

[28] Country risk involves a domestic distortion in that individual borrowers treat the rate of interest on foreign borrowings as given, yet from the country's perspective there is an upward-sloping supply curve of foreign capital, due to the rise in probability of default. As a result a negative externality arises, because the marginal cost to the country of additional foreign borrowing exceeds the average cost.

[29] McKinnon and Pill (1996) also argue that, in the wake of economic reform and stabilization programs, overly optimistic expectations about changes in permanent income levels can induce overborrowing from the rest of the world, due to the failure of financial intermediaries to effectively transfer information between borrowers and lenders. A further domestic distortion involves the influence of implicit or explicit government guarantees on private debt, which distort the risk of default and may engender excessive external borrowing.

(1989, 1992), IMF (1998b)).[30] In turn, this asset price bubble of the late 1980s contributed to the sizeable differential between Australian and developed-country (G-7) inflation rates, which had disappeared by 1990 (apart from a brief reappearance in 1995).

However, the abatement of inflationary pressures in the 1990s has been assisted by both heightened external competition due to the greater openness of the economy, and by Australia's adoption in 1993 of a monetary policy framework committed to the achievement of low targeted rates of inflation. This decade has also seen: the extension of competition policy to the nontradeables sector of the economy; improved targeting of the welfare system; greater efforts to increase private (voluntary superannuation) and public (compulsory pension scheme) provision for retirement; reforms to further strengthen the already-high efficiency of intermediation and prudential supervision of the Australian financial sector; and a program of fiscal consolidation by the Commonwealth Government, designed to boost public savings and contribute to greater national savings (IMF (1998b)).[31] All of these developments significantly increase the likelihood that the saving and investment decisions underpinning the current account deficits of the 1990s are soundly based, and unlike the deficits of the 1990s, are subject to few policy-induced distortions. In the context of the sustainability of Australia's current account imbalances, these developments should also have enhanced the willingness of foreign lenders to continue to invest in Australia.[32]

While Pitchford's critics were correct to be alarmed by Australia's overuse of foreign savings in the 1980s, our findings for the 1990s confirm the basic thrust of Pitchford's intertemporal-based approach. When an economy is moving to eliminate undesirable causes of current account imbalances, particularly all potential sources of distortions to savings, investment and borrowing, then given the attainment of internal balance, any remaining deficits and net indebtedness can be taken to represent desirable use of foreign savings (Pitchford (1992)). Has Australia moved along the path of removing undesirable causes of current account deficits in recent decades? Our results indicates that this is so, and

---

[30] Debt financing in Australia was also favored by the double-taxation of dividends, prior to the introduction in 1987 of dividend imputation.

[31] As to the composition of external liabilities, between 1989-98 equity financing of the current account has risen from 23 to 32 percent of net external liabilities. As at 1998:1, about 44 percent of gross foreign debt is denominated in Australian dollars, while about 45 percent of Australia's gross foreign debt has a maturity of less than or equal to 1 year (Australian Bureau of Statistics (1998)).

[32] Moody's credit rating for Australia's long-term foreign currency debt has remained at Aa2 (the third-highest rating level) since 1989, having been downgraded from Aaa in the mid-1980s. In addition, the Australia-U.S. differential in real long-term interest rates (on 10-year government bonds) has fallen from over 500 basis points in 1991 to near zero in 1998 (IMF (1998b)). Over this period (1989-98), net external liabilities rose from 46 to 60 per cent of GDP (Australian Bureau of Statistics (1998)).

consequently Australia has reduced these causes of suboptimal intertemporal consumption smoothing, and made more appropriate use of external capital flows. In addition, these reforms have enhanced Australia's performance on those indicators which measure the vulnerability of economies to current account reversals.

C. Current Account Imbalances: Solvency, Sustainability and Optimality

A perennial issue for public and private agents in world capital markets concerns the sustainability of debtor countries' current account imbalances. While assessing the creditworthiness of nations is obviously a difficult task, a determination of national insolvency would imply that the intertemporal budget constraint of equation (2) would not hold with external liabilities valued at par. Three key questions are commonly asked in evaluating the macroeconomic implications of persistent current account deficits (Milesi-Ferretti and Razin (1996, 1998)). Is the debtor country solvent? Are the current account imbalances sustainable? Is the extent of international capital flows optimal?[33] Attention will now be turned to examining these issues, with an emphasis on the Australian context.

The solvency condition states that the present discounted value of future balance of trade surpluses must equal the present level of net external liabilities. In the presence of persistent current account deficits, at some future (unknown) point in time, balance of trade surpluses (that is, positive net transfers of national output to foreigners) need to occur. However, this is a long-run condition and is bereft of any direct behavioral content. As a result, intertemporal solvency imposes too few restrictions on the path of the current account and external debt to provide a reliable guide to policymakers of potential problems with a country's external position.

Given that the consumption-smoothing model has as a maintained hypothesis that countries remain intertemporally solvent, our cointegration results have implications for the solvency of capital inflows to Australia. As set out in equation (2), the current account deficit is formed as the difference between national cash flow net of payments on the outstanding stock of external liabilities, $(z_t - rb_t)$, and private consumption, c_t. As both c_t and $(z_t - rb_t)$ are I(1) variables, then as demonstrated by Hakkio and Rush (1991), cointegration between c_t and $(z_t - rb_t)$ is a necessary and sufficient condition for the country to be satisfying its intertemporal budget constraint. If these two variables are cointegrated, then over the long run, consumption cannot deviate too far from movements in the available resources of the economy (as described by $(z_t - rb_t)$). The results in Table 1 reveal that capital inflows to Australia were not in breach of the solvency conditions over the full period or for either subperiod. Therefore, under unchanged policies, capital inflows in all periods appear to have been consistent with the satisfaction of Australia's intertemporal budget constraint. However, even if a country's intertemporal borrowing constraint is not breached, such a path may yield

---

[33] This question has typically involved asking whether current account deficits have been "excessive" relative to the optimal benchmark provided by the consumption-smoothing model (Cashin and McDermott (1998)).

suboptimal external borrowing for consumption purposes if the consumption-smoothing model is rejected. In this sense, intertemporal solvency is a necessary yet not sufficient condition for the maximization of expected utility by smoothing the path of consumption in the face of shocks to national cash flow.

A related criterion concerns the sustainability of a given path of current account imbalances. An early approach to external sustainability relies on projecting into the future the current stance of macroeconomic policy and private sector behavior, and sustainability is ensured if the path for the resulting trade balance does not breach its intertemporal solvency constraint.[34] This approach examines whether, given that present stance of policy is maintained, any required "turning point" from trade deficits to trade surpluses is likely to occur without any corresponding "drastic" changes in economic activity or consumption. If unchanged policies are likely to induce either a dramatic policy shift to reverse the trade balance position (such as a financial tightening which induces an economic recession) or a financial crisis (such as a currency collapse which raises the probability of default on external obligations), either of which can cause a reversal of international capital flows and an inability to fully service external obligations at their original terms, then the current account position is unsustainable. The difficulty with this criterion is that agents' *expectations* of future policies, and not the policies themselves, influence today's current account position.

A more recent approach to assessing external sustainability is to use a composite set of macroeconomic, financial and external indicators to measure the likelihood of a balance of payments crisis, where such indicators are *complementary* to empirical studies of the dynamics of external liabilities (IMF (1998a)). This broader approach to gauging sustainability takes into account not only issues of solvency, but also tries to determine if a current account imbalance is vulnerable to "liquidity constraints" being imposed by foreign investors, who may become unwilling to continue to lend on current terms if a country has short-run economic difficulties. When foreign investors are concerned about a country's ability to meet its external (debt) obligations in the face of serious domestic or external shocks, then there will be limits on the sustainability of current account imbalances *over and above* those imposed by intertemporal solvency. These limits will be reflected in a diminished willingness by foreigners to lend, and will often take the form of capital flow reversals in situations of external crisis. In addition, even if there are no domestic distortions and a country has sufficient foreign exchange earnings to satisfy its external obligations, there may be uncertainties held by foreign investors as to a country's willingness to repay its past obligations, because either its current debt repayments are excessively onerous or it desires some form of debt relief. Such

---

[34] Typically, a simple measure of solvency for an indebted country has been to ensure that the ratio of external liabilities to GDP remains constant. An economy with growing output can run perpetual current account deficits and still maintain a constant liabilities-to-GDP ratio.

"repudiation risk" may also constrain new lending, and will adversely affect the sustainability of a given capital account position.[35]

What are these key additional indicators of uncertainty which impinge on the sustainability of any given capital account imbalance? Milesi-Ferretti and Razin (1996) examine several case studies of countries (including Australia) with persistent current account imbalances during the 1980s and 1990s, and focus their attention on indicators of a country's economic structure, macroeconomic policy and political economy. They find that sustainability of capital account imbalances typically rises with: the extent of openness to trade (which eases difficulties in servicing external debt); a low level of real exchange rate overvaluation; the level of national savings and investment (higher levels of both imply higher future growth through the buildup of productive capacity); the extent to which external debt is denominated in domestic currency; the extent to which external liabilities comprise equity financing; political stability; and the strength of the domestic financial system (which improves the quality of financial intermediation).[36] Later research has examined which of these sustainability indicators are useful predictors of reversals in trade or current account imbalances. This empirical literature finds that reversals are more likely in countries with: large current account imbalances, less open economies, a low level of reserves, and in the presence of adverse terms of trade shocks, higher world real interest rates and slow growth in industrial countries (Milesi-Ferretti and Razin (1998)).

What is the connection between the optimality of international capital flows and the sustainability of current account imbalances? In particular, beyond the implied satisfaction of intertemporal solvency, does the optimality of international capital flows influence either the willingness of the borrowing country to meet its external obligations, or the willingness of foreigners to continue to lend? Clearly, actual flows of international capital which are inconsistent with those sufficient to smooth the path of consumption in response to shocks to national cash flow involve avoidable expected-utility losses for domestic borrowers of international capital. That is, given the structure and assumptions of the consumption-smoothing model, foreign capital flows which deviate from the optimum generated by the model reflect a level of private consumption expenditure which deviates from the level which maximizes expected utility. Such behavior would indicate an inappropriate domestic *use* of foreign capital, but would convey little information to international lenders as to the sustainability of current account imbalances—as long as intertemporal solvency is satisfied, a greater than optimal volatility of the path of private consumption should be of little concern to foreign providers of capital.

---

[35] See Cooper and Sachs (1983) for an early description of the key determinants of a country's dynamic external budget constraint.

[36] Recent work by Kaminsky, Lizondo and Reinhart (1998) has focused on the nexus between banking crises, currency crises and current account reversals.

In summary, a useful taxonomy for evaluating the consequences for national creditworthiness of persistent current account imbalances is as follows. If a country's intertemporal budget constraint is not satisfied, then the country is insolvent (not creditworthy) and its path of current account imbalances is not sustainable. If a country does not breach its intertemporal budget constraint, foreigners may be willing to lend (implying that the path of its current account imbalances is sustainable), yet the country may make a suboptimal use of such capital flows by having a nonsmooth path of private consumption in the presence of shocks to national cash flow. Given solvency and either optimal or suboptimal borrowing behavior, questions as to the sustainability of current account imbalances may arise if lenders perceive that the intertemporal falls in consumption implied by the path of current account imbalances raise doubts as to the willingness of a country to meet its external obligations.[37] In short: (i) insolvency implies nonsustainabilty; (ii) solvency and sustainability imply nothing about optimality—both can occur in either an optimal or a suboptimal borrowing environment; (iii) the presence or absence of optimality implies nothing about the willingness of foreigners to lend, which is typically a function of solvency; (iv) notwithstanding (iii), even in the presence of intertemporal solvency, questions as to sustainability of current account imbalances may arise if lenders have doubts about the borrowing country's continued creditworthiness.

Where does Australia stand with respect to the solvency, sustainability and optimality of its international capital flows? Our analysis of the experience of Australian capital inflows between 1984:1-1998:2 has found that in the early subperiod (1984:1-1990:4) Australia's external borrowing: did not breach its intertemporal budget constraint; was not consistent with consumption-smoothing in the presence of shocks to national cash flow; yet was sustainable, as evidenced by the continuing willingness of foreigners to lend. As to the later subperiod (1991:1-1998:2), our analysis found that Australia's external borrowing: did not breach its intertemporal budget constraint; was consistent with consumption-smoothing, as it did not involve avoidable welfare losses (apart from the shocks of the mid- and late-1990s); and the sustainability of foreign capital flows has probably been enhanced, due to the removal of many distortions and externalities affecting saving and investment decisions. Accordingly, international capital flows to Australia during the 1990s were consistent with intertemporal solvency and intertemporal optimality. Moreover, when assessed against relevant sustainability indicators, Australia's flexible exchange rate regime, high rate of economic growth, rising openness to international trade and sound financial system are key factors which clearly point to the sustainability of its current account position, by enhancing its capacity to service its stock of foreign liabilities.

---

[37] Even when the debtor country is willing to meet its external obligations if provided with the necessary liquidity, creditworthy sovereign borrowers may be denied liquidity by lenders fearful of default. This outcome is more likely to occur when there is a multiplicity of small lenders. The presence of such pessimistic beliefs can then result in uncoordinated lending strategies, and self-fulfilling liquidity crises (Detragiache (1996)).

VI. Conclusion

Given the structure and assumptions of the consumption-smoothing model, foreign capital flows which deviate from the optimum generated by the model reflect a level of private consumption expenditure which deviates from the level which maximizes expected utility. Such behavior would indicate an inappropriate domestic use of foreign capital, but would convey little information to international lenders as to the sustainability of current account imbalances. As long as intertemporal solvency is satisfied, a greater than optimal volatility of the path of private consumption should be of little concern to foreign providers of capital. However, questions as to sustainability of current account imbalances may arise even in the presence of intertemporal solvency, if lenders perceive that the intertemporal falls in consumption implied by the path of current account imbalances raise doubts as to the willingness of a country to meet its external obligations.

In this paper we examined whether international capital flows in the particular case of Australia have been consistent with the permanent-income theory of consumption, in the period since the removal of its capital and exchange controls in late 1983. This examination was based on a consumption-smoothing model of the current account that predicts the optimal path of international capital flows, which are used in this model to buffer consumption against temporary changes in certain economic fundamentals (output, investment and government spending). Accordingly, the model's predicted optimal path of the current account provides a benchmark against which to evaluate whether actual flows of international capital have been too large or not. Given the extent of changes in Australia's financial, fiscal and real sectors since the early 1980s, we also undertook tests to determine whether there had been a structural break in the relationship between consumption and output net of investment and government spending. We find evidence that such a break did occur in 1990:4, probably reflecting the reduction of macroeconomic distortions and externalities affecting saving and investment.

Importantly, our findings indicate that Australia's intertemporal budget constraint was clearly satisfied over the full sample period (1984:1-1998:2), and so its external borrowings have not breached the solvency condition requiring the present discounted value of future trade surpluses be equal to the value of net external liabilities. The extent of international capital flows during an early subperiod (1984:1-1990:4) implied that the consumption path was not consistent with a path that would maximize expected utility. In contrast, international capital flows in a later subperiod (1991:1-1998:2) implied a path for consumption which was consistent with expected-utility maximization under the consumption-smoothing model of the current account. Accordingly, it appears that over time Australia's international borrowing decisions have been increasingly determined by changes in its economic fundamentals.

Residual-Based Test for Cointegration in the Presence of a Regime Shift

Gregory and Hansen (1996) develop several single-equation regression models which allow for cointegration with structural change. They commence with the standard model for cointegration in the presence of no structural change, which in the context of this paper is

$$(z_t - rb_t) = \mu + \theta c_t + \epsilon_t \qquad t = 1,...,T, \tag{9}$$

where $(z_t - rb_t)$ is I(1) and ϵ_t is I(0). In this typical application, the parameters μ and θ are time invariant, but Gregory and Hansen note that in certain applications it is useful to think of a cointegrated relationship as holding over some period of time, and then shifting to a new 'long-run' relationship. While the timing of this shift is unknown, the structural change would be reflected in changes in either the intercept (μ) and/or the slope (θ), which is the consumption-tilting parameter in our application.

As an alternative, they present several models illustrating various types of structural change, one being the regime shift model, where structural change can occur with a level shift and/or with a shift in the slope vector in the cointegrating relationship

$$(z_t - rb_t) = \mu_1 + \mu_2 \varphi_{t\tau} + \theta_1 c_t + \theta_2 c_t \varphi_{t\tau} + \epsilon_t, \qquad t = 1,...,T, \tag{10}$$

where μ_1 represents the intercept prior to the shift, μ_2 represents the change in the intercept at the time of the shift, θ_1 denotes the cointegrating slope coefficients before the shift, θ_2 denotes the change in the slope coefficients, and c_t and ϵ_t are as described above. Importantly, they model structural change using the following dummy variable

$$\varphi_{t\tau} = \begin{cases} 0 \ \textit{if} \ t \leq [T\tau] \\ 1 \ \textit{if} \ t > [T\tau], \end{cases} \tag{11}$$

where the unknown parameter $\tau \in (0,1)$ denotes the timing of the change point in terms of a fraction of the sample and [] denotes integer part. The timing of regime shifts (τ) in the relationship between macroeconomic series is unlikely to be known *a priori*, and so the Gregory-Hansen test for regime shifts in cointegrated models is useful as it does not require information on the timing of the such events.

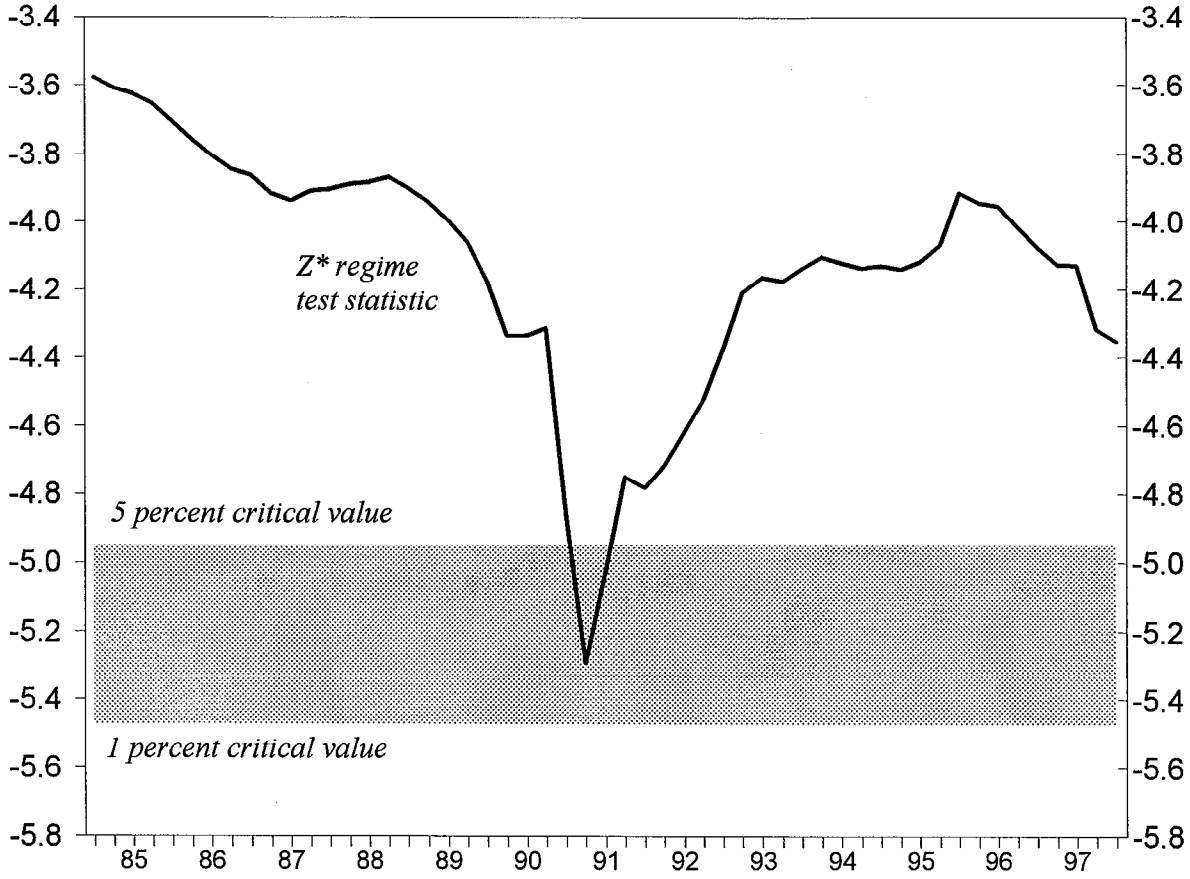
The advantage of the Gregory and Hansen (1996) test for cointegration over standard tests is that, in the presence of a regime shift, standard tests have low power (against the possibility of cointegration with a regime shift) and are therefore likely to falsely conclude there is no long-run relationship. The disadvantage of the Gregory and Hansen (1996) test is that when it is used where there is no regime shift, the estimated regression is not identified,

resulting in statistical problems in the construction of valid critical values. It is important to note that the Gregory and Hansen (1996) test does not provide direct evidence of whether or not there was a regime shift. If both the standard cointegration test and the Gregory and Hansen (1996) test reject the null of no cointegration (i.e. find evidence in favor of cointegration), then it may be that the estimated cointegrating regression with regime shift is not identified. To avoid this problem it is important to determine whether the parameter φ in equation (10) is statistically significant from zero.

However, this is a nonstandard testing problem since some of the parameters are present only when a regime shift has taken place. The usual classical asymptotic optimality results do not apply in this case. Instead, it is necessary to use an alternative test such as that proposed by Andrews and Ploberger (1994). The simplest of such tests is $Exp\text{-}W_T = \ln\int \exp(W_T(\tau)/2)\, d\tau$, where $W_T(\tau)$ is the standard Wald test of $\varphi=0$ versus $\varphi\neq 0$ given the break point location parameter, τ. The computed $Exp\text{-}W_T$ statistic was 5.34, compared with a critical value of 1.97 (see Andrews and Ploberger, 1994, Table 1, page 1399), indicating that φ is statistically significant from zero, and that there has been a regime shift.

A test of the null hypothesis of no cointegration (equation (9) holds with $\epsilon_t \equiv I(1)$) is run, against the alternative hypothesis given by equation (10). The usual cointegration test statistic $Z(\tau)$ is computed for each possible regime shift $\tau\in\Upsilon$, using the residuals from the cointegrating regression of equation (10). The τ is chosen so that $Z(\tau)$ takes the smallest value (largest negative value) across all possible break points, where Υ is any compact subset of (0,1) since the smallest $Z(\tau)$ gives the least favorable result for the null hypothesis. The sequence of $\{Z(\tau): \tau = 2/T,..., (T-1)/T\}$ generated by estimating (10) over all possible break points is shown in Figure A1. Cointegration with a regime shift is rejected for all possible break points except 1990:4.

Figure A1. Australia: Regime Shift Test Results, 1984-98



Sources: Gregory and Hansen (1996); and authors' calculations.

Construction of Standard Error Bands for the Optimal Current Account

This appendix details the approach used to construct standard error bands for the optimal current account. The bootstrap method, introduced by Efron (1979), was used to compute the standard error bands as well as the median estimate of the optimal current account. An algorithm for the bootstrap is

i. For the VAR compute the predicted residuals $\hat{\epsilon}_t = W_t - \hat{A}W_{t-1}$, $t=2,...,T$.
ii. Estimate a smoothed empirical distribution of $\hat{\epsilon}_t$ using the Bartlett kernel density estimator.
iii. Resample $\hat{\epsilon}_t$ from its empirical distribution to obtain ϵ_t^* by drawing T times at random with replacement.
iv. Construct pseudo data W_t^* using the formula $W_t^* = \hat{A}W_{t-1} + \epsilon_t^*$.
v. Reestimate $\hat{CA}_t^*$ using pseudo data.
vi. Repeat (iii)-(v) 10,000 times.
vii. For each $t=2,...,T$ sort the generated $\hat{CA}_t^*$ into ascending order to produce a distribution of CA_t^*.
viii. The 95 percent bootstrap confidence interval is given by taking the 2.5 and 97.5 percentiles from this distribution for each t. A median unbiased estimate of CA_t^* is given by taking the 50th percentile from this distribution.

References

Agénor, Pierre R., Claude Bismut, Paul Cashin, and C. John McDermott, 1999, "Consumption Smoothing and the Current Account: Evidence for France, 1970-96," *Journal of International Money and Finance*, No. 18, forthcoming.

Andrews, Donald W.K., 1991, "Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimation," *Econometrica,* No. 59, pp. 817-88.

_____, and Werner Ploberger, 1994, "Optimal Tests When a Nuisance Parameter is Present Only Under the Alternative," *Econometrica*, No. 62, pp. 1383-1414.

Arndt, Heinz W., 1989, "Australia's Current Account and Debt Problem: A Sceptical View of the Pitchford Thesis," CEPR Discussion Paper No. 219 (Canberra: Centre for Economic Policy Research).

Australian Bureau of Statistics, 1997, *Balance of Payments and International Investment Position, September Quarter 1997*, No. 5302.0, Government Printer, Canberra.

———, 1998, *National Income, Expenditure and Product, June Quarter 1998*, No. 5206.0, Government Printer, Canberra.

Blanchard, Olivier J., 1983, "Debt and the Current Account Deficit in Brazil," in Pedro Aspe Armella, Rudiger Dornbusch and Maurice Obstfeld (eds), *Financial Policies and the World Capital Market, The Problem of Latin American Countries*, (Chicago: Chicago University Press), pp. 187-97.

Bullock, Michelle, Stephen Grenville, and Geoffrey Heenan, 1993, "The Exchange Rate and the Current Account," in Adrian Blundell-Wignall (ed.), *The Exchange Rate, International Trade and the Balance of Payments*, (Sydney: Reserve Bank of Australia), pp.84-141.

Campbell, John, 1987, "Does Saving Anticipate Declining Labor Income? An Alternative Test of the Permanent Income Hypothesis," *Econometrica,* No. 55, pp. 1249-73.

———, and Robert Shiller, 1987, "Cointegration and Tests of Present Value Models," *Journal of Political Economy,* No. 95, pp. 1062-88.

Cashin, Paul, and C. John McDermott, 1998, "Are Australia's Current Account Deficits Excessive?," *Economic Record,* No.74, pp. 72-87.

Commonwealth of Australia, 1998, "Budget Statement 3" in *1998-99 Budget Paper No.1*, (Canberra: Australian Government Publishing Service), pp. 3-1 - 3-18.

Cooper, Russell, and Jeffrey Sachs, 1985, "Borrowing Abroad: The Debtor's Perspective," in John Cuddington and Gordon Smith (eds), *International Debt and Developing Countries*, (Washington: World Bank), pp. 21-60.

Corden, W. Max, 1977, *Inflation, Exchange Rates and the World Economy*, (Chicago: Chicago University Press).

———, 1997, "The Current Account Issue Revisited," Chapter 18 of W.M. Corden, *The Road to Reform: Essays on Australian Economic Policy*, (Melbourne: Addison Wesley), pp. 270-84.

Detragiache, Enrica, 1996, "Rational Liquidity Crises in the Sovereign Debt Market: In Search of a Theory," *IMF Staff Papers*, No. 43, pp. 545-70.

Edey, Malcolm, and Mark Britten-Jones, 1990, "Saving and Investment in the 1980s," Research Discussion Paper 9004, Research Department, Reserve Bank of Australia, Sydney.

Efron, Bradley, 1979, "Bootstrap Methods: Another Look at the Jackknife," *Annals of Statistics*, No. 72, pp. 339-44.

The Economist, 1995, "How Lucky Can You Get?," November 4, pp. 18-19.

Ghosh, Atish R., 1995, "International Capital Mobility Amongst the Major Industrialized Countries: Too Little or Too Much?," *Economic Journal*, No. 105, pp. 107-28.

Gregory, Allan W., and Bruce E. Hansen, 1996, "Residual-Based Tests for Cointegration in Models with Regime Shifts," *Journal of Econometrics*, No. 70, pp. 99-126.

Hakkio, Craig S., and Mark Rush, 1991, "Is the Budget Deficit 'Too Large'?," *Economic Inquiry* No. 29, pp. 429-45.

Harberger, Arnold C., 1986, "Welfare Consequences of Capital Flows," in Armeane M. Choksi and Demetris Papageorgio (eds.), *Economic Liberalization in Developing Countries*, Basil Blackwell, Oxford, pp.157-78.

International Monetary Fund, 1998a, *World Economic Outlook*, (Washington: International Monetary Fund), April.

———, 1998b, *Australia: Benefiting from Economic Reform*, Anoop Singh (ed.), Occasional Paper, forthcoming, (Washington: International Monetary Fund).

Kaminsky, Graciela, Saul Lizondo, and Carmen M. Reinhart, 1998, "Leading Indicators of Currency Crises," *IMF Staff Papers* No. 45, pp. 1-48.

Kent, Christopher, 1997, *Essays on the Current Account, Consumption Smoothing, and the Real Exchange Rate*, unpublished PhD dissertation, Department of Economics, Massachusetts Institute of Technology.

Lowe, Philip, 1995, "Financial Liberalisation: The Australian Experience," in Rudiger Dornbusch and Yung Chul Park (eds.), *Financial Opening, Policy Lessons for Korea*, (Seoul: Korea Institute of Finance).

Macfarlane, Ian J., 1989, "Money, Credit and the Demand for Debt," Reserve Bank of Australia *Bulletin*, May, (Sydney: Reserve Bank of Australia), pp. 21-31.

———, 1992, "The Lessons for Monetary Policy," in Proceedings of a Reserve Bank of Australia Conference on the Deregulation of Financial Intermediaries (Sydney: Reserve Bank of Australia).

McKinnon, Ronald I., and Huw Pill, 1996, "Credible Liberalizations and International Capital Flows: 'The Overborrowing Syndrome'," in Takatoshi Ito and Anne O. Krueger (eds.), *Financial Deregulation and Integration in East Asia*, NBER-East Asia Seminar on Economics, Vol. 5 (Chicago: University of Chicago Press), pp. 7-42.

Milbourne, Ross, and Glenn Otto, 1992, "Consumption Smoothing and the Current Account," *Australian Economic Papers*, No. 31, pp. 369-83.

Milesi-Ferretti, Gian-Maria, and Assaf Razin, 1996, *Current Account Sustainability*, Princeton Studies in International Finance No. 81, International Finance Section, Department of Economics, Princeton University, October.

———, and ———, 1998, "Sharp Reductions in Current Account Deficits: An Empirical Analysis," *European Economic Review*, No. 42, pp. 897-908.

Otto, Glenn, 1992, "Testing a Present-Value Model of the Current Account: Evidence from U.S. and Canadian Time Series", *Journal of International Money and Finance*, No. 11, pp. 414-30.

Phillips, Peter C. B., and Bruce Hansen, 1990, "Statistical Inference in Instrumental Variable Regression with I(1) Processes," *Review of Economic Studies*, No. 57, pp. 99-125.

———, and Samuel Ouliaris, 1990, "Asymptotic Properties of Residual Based Tests for Cointegration,"*Econometrica*, No. 58, pp. 165-93.

———, and Pierre Perron, 1988, "Testing for a Unit Root in Time Series Regression," *Biometrika*, No. 75, pp. 335-46.

Pitchford, John D., 1992, "Current Account Deficits, External Liabilities and Economic Policy," IMF Working Paper 92/54, (Washington: International Monetary Fund).

———, 1995, *The Current Account and Foreign Debt*, (London: Routledge).

Sachs, Jeffrey, 1982, "The Current Account in the Macroeconomic Adjustment Process," *Scandinavian Journal of Economics*, No. 84, pp. 147-59.

Svensson, Lars E. O., and Assaf Razin, 1983, "The Terms of Trade and the Current Account: The Harberger-Laursen-Metzler Effect," *Journal of Political Economy*, No. 91, pp. 97-125.