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Are Australia's Current Account Deficits Excessive?

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Abstract

This paper compares the evolution of the Australian current account balance over the period 1954-94 against an optimal current account derived from a consumption-smoothing model. The findings indicate that the Australian current account was not used to smooth consumption optimally in the period prior to the relaxation of capital controls in the early 1980s. The results also suggest that in the period since the mid-1980s Australia's current account deficits have become excessive, and that the increase in national saving required to satisfy its external borrowing constraint is about 2 to 4 percent of GDP.

JEL Classification Numbers:
F32, F41, F47

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ARE AUSTRALIA'S CURRENT ACCOUNT DEFICITS EXCESSIVE?

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SUMMARY

This paper examines Australia's balance of payments performance over the period 1954-94, using the consumption-smoothing approach to the determination of the current account. The actual evolution of the Australian current account balance is compared to the optimal current account generated from the consumption-smoothing model. This intertemporal approach to the current account is derived from the permanent income theory of consumption and saving. Given a small, open economy with access to international capital markets, the intertemporal approach predicts that temporary shocks to national income should be reflected primarily in fluctuations in national saving (and thus the current account), while aggregate consumption is smoothed.

Estimation results indicate that in the period prior to the relaxation of capital controls in the early-1980s, Australia was credit constrained and unable to borrow optimally from the rest of the world to smooth aggregate consumption. As a result, Australia's actual current account deficit was on average less than the optimal current account deficit predicted by the consumption-smoothing model. After the relaxation of capital controls in 1983, Australia's current account deficit expanded rapidly, while its optimal current account deficit as estimated by the model also expanded (partly due to negative international productivity shocks following the oil crises of the 1970s), but at a slower pace than the actual deficit.

As to the sustainability of the growth in Australia's external liabilities, time series tests indicate that the path of actual net foreign liabilities has risen more steeply than the path of the country's net foreign liabilities as generated by the consumption-smoothing model. These results are consistent with the view that the path of Australia's current account deficits and the consequent accretions to its external indebtedness are excessive, and that a sizeable increase in national saving of between 2 and 4 percent of GDP is necessary to ensure that Australia's stock of net foreign liabilities (as a ratio to GDP) is stabilized and its external borrowing constraint satisfied.

I. INTRODUCTION

The deterioration in Australia's current account position since the mid-1980s, and the associated increase in net foreign liabilities, has been accompanied by a vigorous debate as to the major causes, consequences and potential remedies required (if any). In an influential contribution, Pitchford (1989a, 1989b, 1989c) used the intertemporal approach to argue that Australia's recent current account position should be of little concern, as under the assumption of a virtual absence of market failure (distortions and externalities), which could be viewed as reasonable in the context of Australia's open and competitive credit markets, the current account deficit (which has largely comprised an addition to the external liabilities of the private sector) was merely a result of optimizing behavior by forward-looking firms and individuals, with no implication of a need for corrective policy measures. A similar argument had been made earlier by Pope (1977, 1986) in the context of New Zealand's current account balance. Pitchford argued that because in Australia's case most of the current account deficit could be attributed to the difference between private investment and private saving (where the former is driven by profit opportunities and the latter by intertemporal consumption smoothing), there was little role for government intervention (by such instruments as fiscal tightening) designed to inhibit the creation of private liabilities (debt) by altering the dynamic path of domestic investment and consumption.[1,2]

The Pope-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). 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 (more generally market failures) in the borrowing process which are not amenable to resolution at the source of their incidence. Other more sophisticated 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 they arise from unsound private borrowing, or if public and private borrowers create externalities for one another (country risk) because this additional risk is not wholly internalized by individual borrowers (see Harberger 1986, Corden 1991 and Wells 1992).

Using only a theoretical model to draw the conclusion that the current account does not matter, without examining the actual data, is an unsatisfactory approach to answering this

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[1]Moreover, even if there were market failures, the best option for policymakers would be to correct the source of these distortions directly. Makin (1989) makes a similar argument, and cites Salop and Spitaller (1980) in arguing that the divergence between national saving and investment can persist as long as the economy is growing and net domestic saving is positive.

[2]The Pitchford view is very similar to the "Lawson doctrine", espoused in 1988 when the United Kingdom went into current account deficit in spite of a strong fiscal position (see also Calvo 1995).

important policy question. Similarly, merely examining the data without reference to some objective criteria is also unsatisfactory. The contribution of this paper is to test whether the actual Australian current account has been sustainable, by comparing it to an optimal current account derived from an intertemporal model. The concept of sustainability we use in this paper concerns whether current account balances are "excessive".[1] As noted by Milesi-Ferretti and Razin (1996), the question of whether given current account balances are "excessive" can only be answered in the context of a model that yields predictions about the equilibrium path of external imbalances.

The intertemporal approach views the current account as the outcome of forward looking dynamic saving and investment decisions, and thus has the advantage of yielding more reliable policy conclusions than estimates from ad hoc econometric specifications. Theoretical advances in this area of open economy macroeconomics were provided by Buiter (1981), Obstfeld (1982), Sachs (1981), and Svensson and Razin (1983). Empirical evaluation of these types of present value models of the current account has been undertaken by Agénor et al (1995), Ahmed and Rogers (1996), Ghosh (1995), Milbourne and Otto (1992), Otto (1992), and Sheffrin and Woo (1990), based on the methodology developed by Campbell and Shiller (1987). Milesi-Ferretti and Razin (1995) also explicitly address the issue of current account sustainability, by taking into account willingness to pay and lend using an intertemporal framework.

The remainder of the paper is organized as follows. In Section II we review some general benchmarks of external liabilities and the servicing of these liabilities, such as: the ratio of net external liabilities to exports; the cost of servicing liabilities as a share of exports; and the current account deficit as a share of exports. While these benchmarks are arbitrary, they are useful in placing Australia on the OECD spectrum marked by Mexico and Japan as extreme cases. In Section III we present an intertemporal model that is essential in discussing whether current account deficits are excessive. The econometric methods used to estimate this intertemporal model are summarized in Section IV, and the results of the estimation, as well as an analysis of whether Australia satisfies its external borrowing constraint, are set out in Section V. Section VI includes some concluding comments.

II. Conditions for Sustainable International Indebtedness

The problem of determining a sustainable level for the current account balance is one involving the allocation of real resources over time. For example, if an increment to net foreign liabilities adds more to net investment payments than to the capacity to make such payments, then future net exports must be generated. If they are not, and conditions do not change, then external debt will grow faster than debt service capacity. For this to be avoided, the real interest paid on

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[1]Solvency (the present discounted value of future trade surpluses) and the ability to meet external obligations (in the presence of exogenous shocks which require a change in the policy stance and/or private sector behavior) are two other commonly-used notions of sustainability (Milesi-Ferretti and Razin 1996).

additional debt must grow at a rate less than or equal to the rate of growth of exports. This suggests that a condition of sustainable international indebtedness could be that the real rate of interest on national debt be less than the rate of growth of export receipts. Similar conditions could be based on the rate of output growth or the rate of growth of output per capita. Such conditions imply that running a zero current account balance will yield a declining debt to real resource ratio, and consequently a long-run current account balance given any level of initial indebtedness.[1]

Moore (1990) provides several debt ratios used by international banks in making country risk assessments, to ascertain when a country can be regarded as having overborrowed. He argues that "danger points" are reached when, as a percentage of the exports of goods and services: gross external debt exceeds 200 percent; the cost of servicing gross debt exceeds 20 percent; and when the current account deficit reaches 30 percent. Pitchford (1990) criticizes such conditions on several grounds: ratios to exports are not the complete picture, as current account deficits can be reduced just as readily by a relative increase in the import-competing sector; and he argues that such arbitrary benchmarks for debt ratios do not take into account cross-country heterogeneity and intertemporal variations in any given country's optimal path of aggregate consumption smoothing (as indicated by the path of its current account position).[2]

Table 1 provides various ratios that have been used as indicators of sustainability, both for Australia and other selected OECD countries. The indicators for Australia show a relatively high level of net foreign liabilities. Consequently, Australia has a high servicing requirement, even higher than Mexico's in 1994. Australia's 1994 current account deficit (5 percent of GDP) is significantly larger than most industrial countries during the last decade, but is smaller than Mexico's 1994 deficit-to-GDP ratio of nearly 8 percent. While these indicators are useful in some respects, they fail to convey any information as to whether Australia can repay these debts and whether Australia is using its access to world capital markets to increase its productive capacity. For example, about 30 percent of Australia's foreign liabilities are in equity and other investments, while the remaining 70 percent represent foreign debt that must be repaid (Australian Bureau of Statistics 1995).[3] As mentioned above, fixed benchmarks for debt ratios are unlikely to be useful in determining the riskiness of lending to particular countries, as they do not take account of

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[1]In general, the real ratio of interest calculation for this purpose depends on the terms of trade (see Dornbusch and Fischer 1985).

[2]For a discussion of this point see also McKinnon and Pill (1995), who provide a model of overborrowing.

[3]The interaction of Australia's tax system with relatively high rates of inflation, in conjunction with the relaxation of capital controls, resulted in an increased use of debt finance in the 1980s, and so the stock of net external debt rose more rapidly than the stock of net external liabilities during this period.

Table 1. Selected Countries: Indicators of Prudential International Indebtedness

		Ratios of Net Foreign Liabilities to		Ratio of Net Investment Income to		Ratio of Current Account Balance to	
		Exports	GDP	Exports	GDP	Exports	GDP
Australia	1985	200.15	33.97	-17.17	-2.89	-34.31	-5.77
	1994	291.14	55.18	-18.37	-3.50	-26.57	-5.07
Mexico 1/	1985	325.73	59.86	-28.09	-4.63	2.53	0.42
	1994	266.11	36.58	-16.61	-3.10	-40.70	-7.61
Italy	1985	32.77	7.55	-2.83	-0.64	-4.23	-0.96
	1994	43.66	10.76	-6.12	-1.50	5.85	1.43
Canada	1985	125.68	35.47	-12.92	-3.65	-4.83	-1.36
	1994	133.52	44.39	-11.59	-3.85	-9.53	-3.17
U. K.	1985	-74.92	-21.23	2.18	0.62	2.50	0.71
	1994	-8.40	-2.18	6.05	1.58	-0.90	-0.23
United States	1985	-16.26	-1.16	6.85	0.49	-43.07	-3.08
	1994	111.37	11.59	-1.50	-0.16	-21.53	-2.24
Japan	1985	-65.29	-9.56	3.42	0.50	24.93	3.63
	1994	-154.38	-14.97	9.07	0.88	29.06	2.81

Source: Data for external liabilities are from the OECD Analytical Database, except for Mexico, where the data for external debt are from the International Monetary Fund's World Economic Outlook database. All other data are from the International Monetary Fund's International Financial Statistics database.

1/ The figure reported for Mexico's net foreign liabilities is actually net foreign debt, which excludes equity and other investments.

heterogeneity across countries in the optimal rate of investment and in the optimal extent of intertemporal consumption smoothing. A better way to tackle the question of the appropriate level of Australian indebtedness is to use a model-based approach to determine what Australia can afford to repay, given its macroeconomic fundamentals.

III. THE MODEL

The intertemporal approach to the current account 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 the current account.[1]

Consider an economy composed of a large number of similar-lived consumers, each maximizing

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

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 a fixed real world interest rate r each period. Let b_t be the economy's stock of net foreign liabilities at the beginning of period t, y_t be output or GDP which appears as stochastic returns to exogenously-determined investment under the small open economy assumption, i_t be investment, g_t be government consumption, and Δ the first difference operator. The consumer's budget constraint is then

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

The interpretation of (2) is that the change in net foreign liabilities and thus the current account balance is given by the "national cash flow" ($z_t = y_t - i_t - g_t$) less private consumption and less net foreign investment payments (rb_t).[2] For example, any expansion in government

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[1] Following Campbell and Shiller's (1987) work on consumption smoothing, recent discussions of the theoretical and empirical literature on the intertemporal approach to the current account can be found in Obstfeld and Rogoff (1994), Razin (1995), Ghosh (1995) and Ghosh and Ostry (1995).

[2]The term z_t was referred to as national cash flow by Ghosh (1995), net output by Sheffrin and Woo (1990), and net private noninterest cash flow by Obstfeld and Rogoff (1994).

consumption, other things being equal, will reduce the national cash flow available for foreign investment and increase the inflow of net foreign 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

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

and

$$\theta = \frac{\beta(1+r)r}{[\beta(1+r)^2 - 1]} \tag{4}$$

where c_t^* is the optimal level of consumption at time t and θ is the consumption-tilting parameter, which results from divergences between the world interest rate and the domestic rate of time preference, $(1-\beta)/\beta$. In general, the higher the elasticity of intertemporal substitution, the stronger will be the tilting effect (Obstfeld and Rogoff 1994). When $\theta < 1$ ($\theta > 1$) the economy tilts consumption towards the present (future), creating a secular tendency towards current account deficits (surpluses) and increasing foreign liabilities (assets). Along the optimal path, optimal private consumption (c_t^*) depends on the present value of the expected future stream of the cash flow, and the economy's existing stock of net foreign liabilities.

If we define the optimal, consumption smoothing current account by

$$CA_t^* = z_t - \theta c_t - rb_t \tag{5}$$

then it follows that the consumption-smoothing component of the current account is given by (minus) the expected present discounted value of the changes in the national cash flow variable

$$CA_t^* = -E_t \left[\sum_{j=1}^{\infty} (1+r)^{-j} \Delta z_{t+j} \right]. \tag{6}$$

Equation (6) shows an important distinction between permanent and temporary shocks. Permanent shocks which leave the national cash flow unaffected also leave the current account unaffected. 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 an increase in government expenditure or investment will push the current account into a smaller surplus or larger deficit.[1] 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.

IV. Estimation Method

The estimation and testing procedure proceeded in four steps. The first step was 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.[2] This estimate can be obtained from (5) by estimating a cointegrating relationship between private consumption (c_t) and the national cash flow less payments on the outstanding stock of foreign liabilities ($z_t - rb_t$). This relationship was estimated using the Phillips and 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 subsequent hypothesis tests. The estimated consumption-smoothing component of the current account, $\hat{CA}$, is defined by the residuals of the cointegrating regression. To confirm the regression was indeed cointegrated, the Phillips and Ouliaris (1990) residual-based cointegration test was employed.[3]

The second step was to estimate a first-order unrestricted bivariate vector autoregression (VAR) of the form $W_t = A\, W_{t-1} + \epsilon_t$, where $W_t = (\Delta z_t, \hat{CA})'$, 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 $E_t[W_{t+h}] = A^h\, W_t$, an estimate of the optimal consumption-smoothing component of the current account was computed as

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

where I_2 is the 2×2 identity matrix. Expression (7) is valid as long as the infinite sum in equation

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[1]This will, of course, lower the ratio of the current account balance to output.

[2]Removing the consumption-tilting component of the current account (which is nonstationary) is necessary to ensure the validity of standard inference techniques, which will be used for hypothesis testing in Section V below.

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

(6) converges. This requires that the variables appearing in the W matrix of the VAR system be stationary. Assuming that z_t is I(1), Δz_t will be I(0). Since under the null the actual (consumption-smoothing) current account is a discounted sum of Δz_t, then it will also be I(0). The expression for the optimal (consumption-smoothing) current account derived from (7) can now be compared to the actual (consumption-smoothing) current account to determine, for instance, the extent to which the deficit recorded in the past few years can be explained by consumption smoothing behavior.

The third step was to conduct a number of hypothesis tests to evaluate the model. The first test was to examine whether, as predicted by the model, the current account "Granger-causes" changes in the national cash flow. For example, given a current account deficit exists this should signal that an increase in future cash flow associated with a reduction in future government consumption is expected. The second test was to examine whether the VAR parameters conformed to the nonlinear restriction

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

This restriction implies that movements of the actual (consumption-smoothing) current account reflect those of the optimal (consumption-smoothing) current account. Since (8) is an implication of the intertemporal external budget balance under the assumption of a constant expected real interest rate, failure of this restriction implies that the country is not optimally smoothing its consumption path. The third test was to compare the ratio of the variance of the actual (consumption-smoothing) current account to the variance of the optimal (consumption-smoothing) current account. If this ratio is greater than one (the variance of the actual current account exceeds the variance of the optimal current account), this implies that there has been an inappropriate use of capital flows to smooth consumption in light of the observed fluctuations in national cash flow.

The fourth step was to derive a further test to determine whether any given current account deficit is sustainable. By iterating (2) forward we have

$$b_t = E_t\left[(1+r)^{-T} b_T - \sum_{j=0}^{T-1} (1+r)^{-j} q_{t+j}\right] \tag{9}$$

where the non-interest component of the current account, or the trade balance, is defined as $q_t = z_t - c_t$. If the model is valid (that is, the 'no Ponzi game' constraint holds) we also have

$$b_t^* = E_t\left[-\lim_{T\to\infty} \sum_{j=0}^{T-1} (1+r)^{-j} q_{t+j}^*\right] \tag{10}$$

where $q_t^* = z_t - c_t^*$. Equation (10) says that the present discounted value of future trade deficits (or surpluses) must be matched by initial assets (or net liabilities). Since the model-generated path of net foreign liabilities (b_t^*) is sustainable by construction, the difference between the actual path of net foreign liabilities (b_t) and the model-generated path, $b_t - b_t^*$, must be stationary if the actual current account deficit is to be sustainable.

V. Empirical Results

The data used to estimate the parameters of the model are annual national accounts for the period 1954 to 1994, expressed in billions of 1990 Australian dollars, and were obtained from the *International Financial Statistics* (IFS).[1] All data are converted into real terms by dividing by the implicit GDP deflator.[2]

A. Estimating the Consumption-Tilting Parameter

The estimated consumption-tilting parameter from the cointegrating regression of national cash flow (less interest payments) on consumption is reported in Table 2 for the full sample period 1954-94, and for two sub-samples, 1954-74 and 1975-94. The break at 1974 was used because this is when Australia's GDP growth rate fell below the world interest rate.[3] In all three samples 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 foreign assets or increasing its foreign liabilities. The preference for current consumption over future consumption has become more pronounced in the later part of the sample (1975-94), which 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 results of Phillips-Ouliaris (1990) *Z(t)* residual-based unit root tests for cointegration, and three Hansen (1992) tests of parameter stability (mean-F, sup-F, and Lc), are also shown in

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[1]Private consumption, *c*, line 96f; government consumption, *g*, line 91ff; investment, *i*, line 93ee+93i; GNP, *rb*+*y*, line 99a; GDP, *y*, line 99b.

[2]Milbourne and Otto (1992) note that as Australia always runs a deficit on net foreign interest receipts, its measured current account deficit tends to overstate the true current account deficit. This problem afflicts all users of national-accounts based measures of the current account, as it records nominal (rather than real) interest flows. Only real interest payments represent a loss in real wealth by borrowers; nominal interest payments include both a real component and a component representing the decline in the value of their nominal asset due to the presence of inflation.

[3]Another interesting sub-sample to try would have been the floating exchange rate period 1983-94, but this left too few degrees of freedom.

Table 2.[1] The parameter tests all indicate a stable relationship between national cash flow and consumption at the 5 percent significance level. Cointegration is accepted at the 5 percent significance level in the full sample and in both the two sub-samples. The estimated value of θ is lower in the latter sample, indicating a strong secular tendency towards current account deficits in this period.

Table 2. Australia: Consumption-Tilting Parameter

Sample	θ	se(θ)	Z(t)	mean-F	sup-F	Lc
1954-94	0.939	0.011	-3.162	2.273	5.725	0.162
1954-74	0.987	0.008	-2.917	3.255	5.948	0.327
1975-94	0.932	0.004	-2.909	5.938	7.725	0.686

Source: Authors' calculations.

Notes: θ is the Fully Modified estimate from the cointegrating regression of national cash flow (less interest payments) on consumption (Phillips and Hansen 1990). se(θ) is the asymptotically correct standard error of this estimate. The 5 percent critical value for the residual based unit root test Z(t) is -2.76 (Phillips and Ouliaris 1990). The 5 percent critical values for the stability tests mean-F, sup-F, and Lc are 4.47, 12.40, and 0.58 respectively (Hansen 1992).

B. Hypothesis Tests

The standard F-test for the absence of "Granger-causality" from the current account to national cash flow is rejected at the 5 percent significance level for the full sample, implying that the current account "Granger-causes" national cash flow (Table 3). The 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 full sample and the later sample, but was rejected in the early sample. The rejection in the early part of the sample indicates the model is more suitable for Australia in the later period, which includes the sub-period when restrictions on capital flows had been reduced. In the early part of the sample capital controls were in place, restricting the use of international borrowing and lending to smooth consumption over time.

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[1]Phillips-Perron unit root tests reveal that both c_t and $z_t - rb_t$ are integrated of order one and so the possibility of cointegration exists.

Table 3. Australia: Tests of the Intertemporal Model

Sample	Granger Causality		Nonlinear Restriction		Variance Ratio
	F	p-value	Wald	p-value	
1954-94	21.133	0.001	1.944	0.378	2.277
1954-74	17.001	0.001	17.002	0.002	3.499
1975-94	10.384	0.006	3.062	0.216	2.965

Source: Authors' calculations.

Notes: The Granger-causality test is an F-test to determine if the current account causes changes in the national cash flow. The nonlinear restriction test is a Wald test to determine whether the estimated VAR coefficients satisfy a restriction of the intertemporal model. The variance ratio compares the variance of the actual (consumption-smoothing) current account with that of the optimal (consumption-smoothing) current account.

The most telling result that indicates the improved performance of the intertemporal model is the reduction in the variance ratio of the actual (CA_t) and estimated optimal consumption-smoothing ($\hat{CA}_t^*$) current accounts between the early and later sample period (from 3.499 to 2.965).[1] This "excess volatility" implies that capital flows to and from Australia have been more volatile than would be justified by expected changes in national cash flows. Figure 1 shows that in the early sub-sample, when the excess volatility in the current account is the greatest, the actual current account balance is consistently higher than the optimal current account. The excess volatility in the early sub-sample seems to stem from the need for the actual current account deficit to return to a zero balance, due to the presence of credit constraints. In the later sub-sample, the actual current account path criss-crosses the optimal current account path (Figure 1). The same data are presented in ratio-to-GDP form in Figure 2.[2]

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[1]An estimate of the optimal 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). The optimal current account was also computed with a constant world real interest rate equal to 2, 3, 5, and 6 percent, and, similar to Milbourne and Otto (1992), the results differed only marginally from those reported below.

[2]The current account measures presented in Figures 1 and 2 are for the actual and optimal current account, after adding back their respective consumption-tilting components.

Figure 1. Australia: Actual and Ex-post Optimal Current Account
(In billions of 1990 Australian dollars)

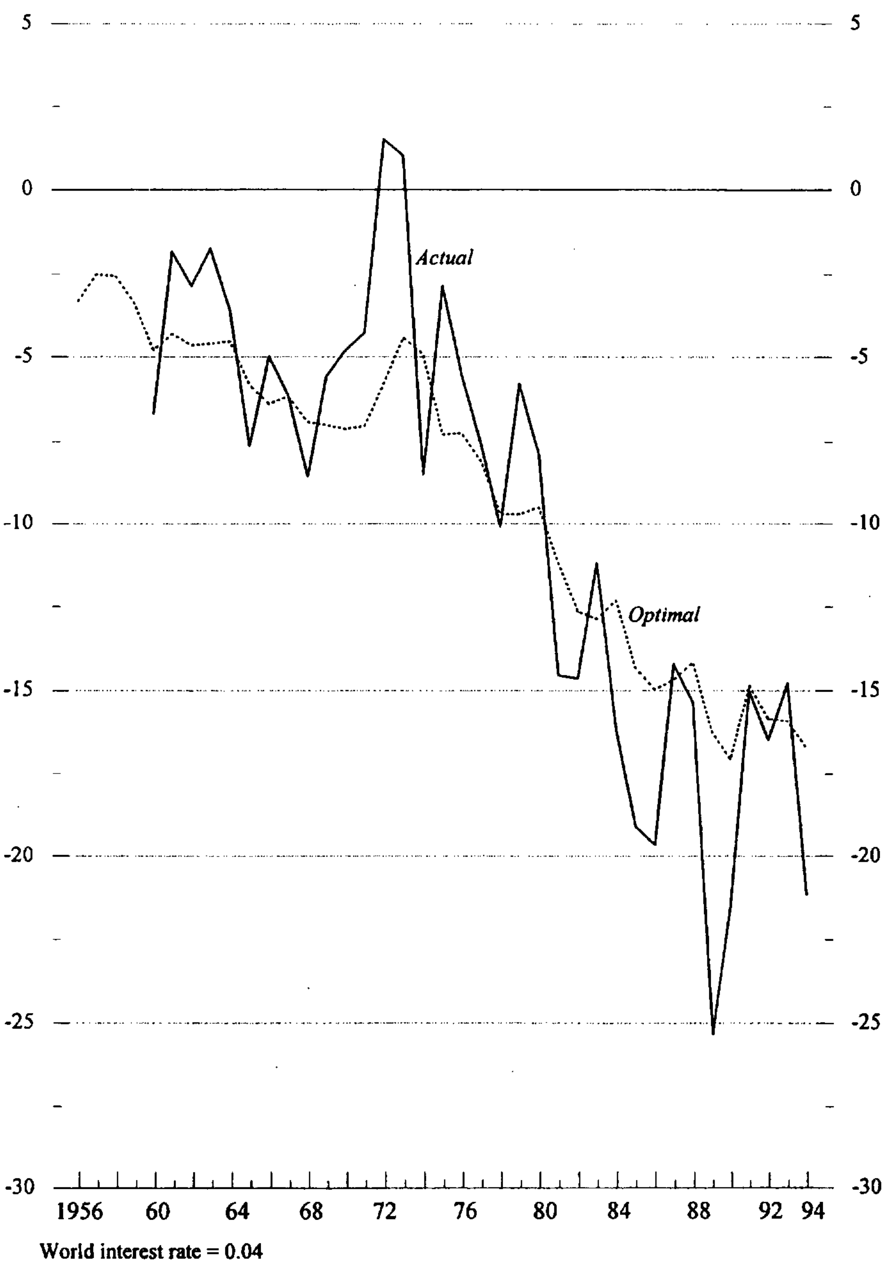
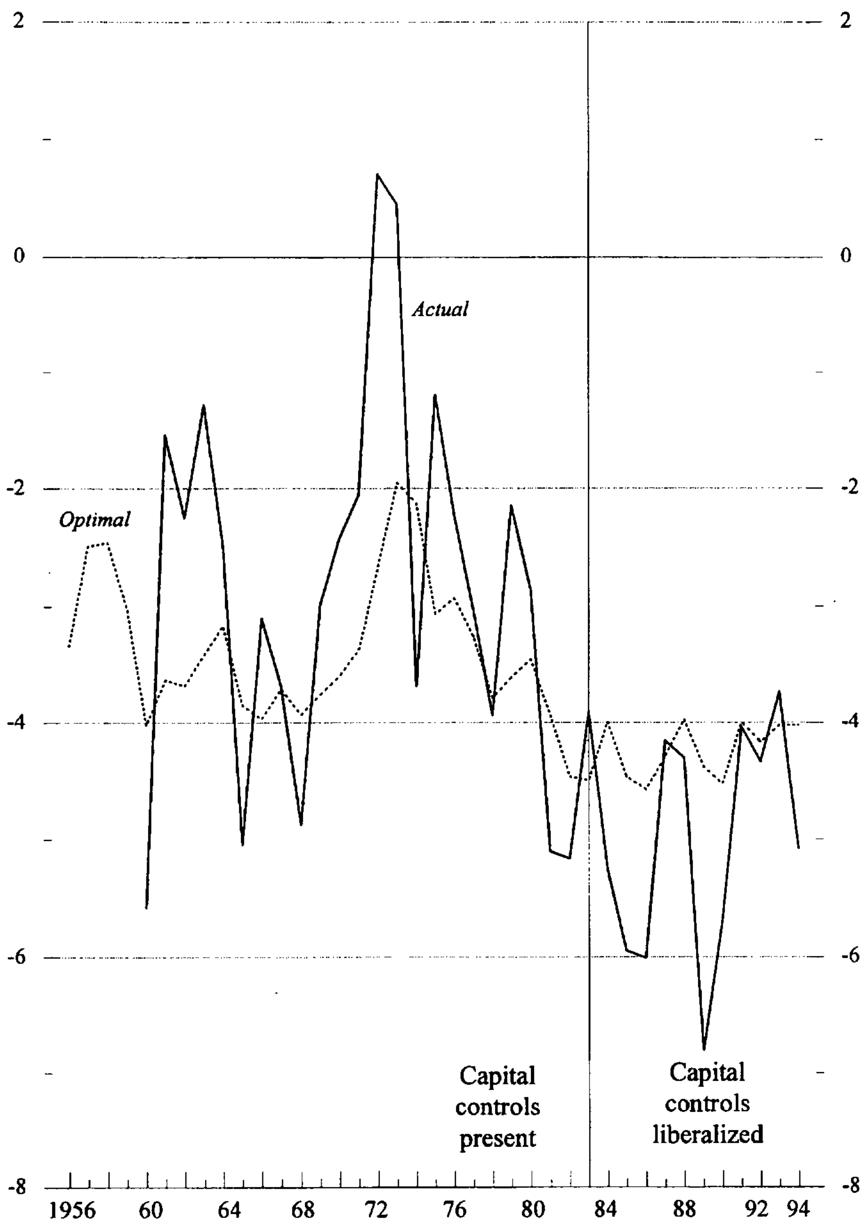


Figure 2. Australia: Actual and Ex-post Optimal Current Account
(In percent of GDP)



World interest rate = 0.04

The consumption-smoothing model is unable to explain several large and sustained movements in Australia's actual current account deficit, particularly the large surpluses of the late-1950s and early-1970s and the large deficits of the early- and mid-1980s. As noted earlier, the failure of the consumption-smoothing model in the early years of the sample most likely reflects the effects of capital controls. While this general picture replicates the findings of Milbourne and Otto (1992), who examined the Australian current account over the period 1961-89, our other results differ from theirs in that we are unable to reject the following hypotheses: (a) national cash flows and consumption were cointegrated in the full sample and both the sub-samples; (b) the current account "Granger causes" national cash flow for the full sample and both sub-samples; and (c) the nonlinear restriction that movements in the actual (consumption-smoothing) current account reflect those in the optimal (consumption-smoothing) current account is still valid for both the full sample and the later sub-sample (1975-94).

C. Stationarity Tests of Sustainability

The final test considers the sustainability of Australia's net foreign liabilities (NFL), to determine whether the optimal path of NFL generated by the model evolves in tandem with actual NFL.[1] This test was conducted by examining whether $(b_t - b_t^*)$ is stationary. To formally test for the presence of nonstationarity, we employ the Dickey-Fuller (*DF*) and Phillips-Perron $Z(\alpha)$ unit root tests.[2] Table 4 contains the results of these unit root tests of sustainability. They indicate that over the full sample and the two sub-samples the difference between the optimal and actual NFL paths contains a unit root, implying that the two series deviate and have no tendency to follow each other.

The result from the unit root tests of the sub-samples should be treated with caution, however, owing to the small sample size that reduces the power of the unit root tests. The estimated autoregressive coefficient of 0.8 suggests that the series may be stationary. However, a problem with utilizing unit root tests is that the estimated value of the root α is downwardly biased, because of the non-standard distribution of estimators in the presence of unit roots. To correct for this bias we used a simulation method outlined in McDermott (1994). This bias was calculated by Monte Carlo simulation of 10,000 estimates of α, for a range of known values of α. The median function $m(\alpha)$ is then calculated from this simulation. The median-bias is given by $\alpha - m^{-1}(\alpha)$, where $m^{-1}(.)$ is the inverse median function. It was found that in a time series with a

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[1]The model yields conditions under which NFL can be repaid. If actual NFL are rising faster than implied by the model, then the current path under unchanged policies is unsustainable.

[2]The Phillips-Perron unit root test was computed using, as above, a Fejer kernel and the automatic bandwidth selector developed by Andrews (1991).

unit root and 20 observations the median bias is 0.21. Thus any estimate greater than 0.79 in the sub-samples can be considered a unit root.[1]

Table 4. Australia: Tests for the Sustainability of International Indebtedness

	Value of root	Unit root statistics		Critical values	
	α	*DF*	$Z(\alpha)$	5%	10%
1954-94	0.935	-2.519	-2.586	-13.1	-10.6
1954-74	0.803	-3.743	-4.761	-12.0	-9.8
1975-94	0.813	-3.333	-4.281	-11.9	-9.8

Source: Authors' calculations.

Notes: The test for sustainability of the NFL path is based on the stationarity of the difference between the optimal NFL path and the actual NFL path, $(b_t - b_t^*)$. The stationarity tests used are the Dickey-Fuller (*DF*) and Phillips-Perron ($Z(\alpha)$) unit root tests, based on the normalized autoregressive coefficient. The critical values are calculated using a response surface regression of the form $C(p,T) = \mu + \beta(1/T)$, where $C(p,T)$ is the critical value for a test of size p and sample size T (see Davidson and MacKinnon 1993).

D. Satisfying Australia's External Borrowing Constraint

The above econometric analysis formally rejects the intertemporal model of the current account for Australia. The rejection comes from two sources. The first is restrictions on capital flows in the early part of the sample and the second is the build-up of NFL following the relaxation of capital controls in the 1980s. The first source of model rejection implies that the intertemporal model is an inappropriate tool to study Australia's current account in the earlier period, and is to be expected, given that the model assumes no capital controls. The rejection of the model in the later period is somewhat unexpected. There are two possible reasons the model fails in the period of capital control liberalization. The first is that private agents are not consumption smoothing and the second is that the private agents are failing to forecast the path of

[1]The difference between the optimal and actual NFL series appears stationary for the post-capital controls period of 1983-94, which indicates that the two series tend to move together. In contrast, the difference between the series grows rapidly around the time of the first oil shock in the early 1970s.

national cash flow sufficiently well. However, we can use the path of optimal current account deficits from the second part of the sample to determine what increase in net national savings is required to eliminate the excess of the actual current account deficit over the optimal. We observe from Figure 2 that over the last decade net national savings should have been about one percent of GDP higher on average, to ensure there was no excess current account deficit. However, given Australia was running an excess current account deficit, its stock of NFL will have risen above what it would otherwise have been.[1] Consequently, the servicing costs of this larger stock of NFL will also be greater. As a result, this will require a greater increase in net national savings to both remove the excess current account deficit and service the larger stock of NFL.

Below we calculate how Australia may satisfy its external borrowing constraint, given that it has run excessive current account deficits over the last decade. In particular, we calculate the extent of the required increase in net national savings under two objectives: (i) stabilizing the NFL-to-GDP ratio at its current level, taking as given any previous excess current account deficits; and (ii) achieving the NFL-to-GDP ratio Australia would have attained in the absence of excess deficits.

Accordingly, we can manipulate equation (2) assuming that the 'no Ponzi game' constraint is valid, and so derive the required increase in net national savings. Dividing (2) by y_t, allowing for any change in the real value of NFL held in foreign currency, and assuming that the economy's GDP grows at a given rate of γ, the NFL dynamics are given by

$$\Delta b'_{t+1} = \left(\frac{r-\gamma-\lambda\epsilon-\gamma\lambda\epsilon}{(1+\gamma)(1+\lambda\epsilon)} \right) b'_t - q'_t \tag{11}$$

where $'$ indicates that the variable is a ratio to GDP, λ is the fraction of NFL denominated in foreign currency, ϵ is the rate of real appreciation of the domestic currency, the trade balance is defined as $q_t = y_t - c_t - i_t - g_t$ and the current account (trade balance less interest payments) is $q_t - rb_t$. Using (11) and maintaining our assumption that $r = 0.04$, we can calculate the adjustment in q_t' required to stabilize b_t'. The average GDP growth rate between 1954 and 1974 was 4.91 percent per year and the average rate of real domestic currency appreciation was 2.5 percent, so Australia could support a trade deficit without increasing the ratio of NFL to GDP.[2] With the decline in the GDP growth rate to 3 percent per year over the period 1975 to 1994, an average

[1]Australia's NFL-to-GDP ratio has risen dramatically in recent years, from 33 percent in 1985 to 55 percent in 1994 (Table 1).

[2]The real exchange rate was calculated as the nominal exchange rate in terms of US dollars per Australian dollar, multiplied by the Australian CPI (1990=100), and divided by the US CPI (1990=100).

annual rate of depreciation in the real domestic currency of 1.3 percent, and an initial NFL level of 8 percent of GDP, the required trade balance surplus that would have stabilized the NFL-to-GDP ratio was about 0.14 percent.[1]

Table 5 reports the current account balances required to meet the above specific objectives, under different assumptions about real exchange rates, real interest rates, and GDP growth rates. For example, assuming that Australia's long-run GDP growth rate remains at about 3 percent per year and its real interest rate at about 4 percent from 1994 onwards, then to keep the ratio of NFL to GDP from rising from its 1994 level (Scenario 1) there will have to be an average trade surplus of 0.5 percent of GDP. Assuming net interest servicing of 2.2 percent of GDP, this results in a current account deficit of 1.67 percent of GDP, which is somewhat lower than the actual 1994 level of 5 percent of GDP. For each one percentage point increase in the world interest rate, the required increase in the trade surplus to keep the ratio of NFL to GDP constant is 0.55 percent. For each two percentage points increase in the GDP growth rate, the current account deficit can increase by about 1 percent of GDP without the ratio of NFL to GDP increasing. However, the required adjustment in national savings necessary to meet the objective of stabilizing the NFL-to-GDP ratio (at 55 percent of GDP) is at least 2 percent of GDP, even with the most favorable growth assumption.

If the goal was to reduce the NFL-to-GDP ratio to its 1980 level of about 25 percent of GDP by the year 2010 (Scenario 2), this would require a greater adjustment to national savings and imply, under most growth assumptions, a current account surplus for the next fifteen years. Some easing of this pressure to boost savings would arise if the currency appreciated (Scenario 3). Suppose the real exchange rate appreciated at an average of 1.25 percent per year--returning to its early 1980s level by 2010--then even with a growth rate of 5 percent a year, national savings in Australia would need to increase by a still sizable 1.6 percent of GDP to change the current account deficit from its 1994 level of 5 percent of GDP to a level that would stabilize the NFL-to-GDP ratio at 55 percent. Of course an ever greater saving effort would be required in the case of a real depreciation.

[1]Following Milesi-Ferretti and Razin (1995), it was assumed that the fraction of Australian net foreign liabilities held in foreign currency, and thus subject to exchange rate risk, was 60 percent.

Table 5. Australia: Current Account Targets
(In percent of GDP)

		Scenario 1			Scenario 2			Scenario 3		
		γ			γ			γ		
r	*-rb*	1.00	3.00	5.00	1.00	3.00	5.00	1.00	3.00	5.00
2	-1.10	-0.56	-1.63	-2.67	1.44	0.37	-0.67	-1.21	-2.28	-3.30
3	-1.65	-0.56	-1.65	-2.70	1.44	0.35	-0.70	-1.23	-2.30	-3.34
4	-2.20	-0.57	-1.67	-2.72	1.43	0.33	-0.72	-1.24	-2.32	-3.37
5	-2.75	-0.57	-1.68	-2.75	1.43	0.32	-0.75	-1.25	-2.35	-3.40
6	-3.30	-0.58	-1.70	-2.78	1.42	0.30	-0.78	-1.26	-2.37	-3.43

Source: Authors' calculations.

Note: The entries in the table are the minimum current account balances required to meet certain objectives. The objective under Scenario 1 is to stabilize the NFL-to-GDP ratio at 55 percent, under the assumption of a constant real exchange rate. The objective under Scenario 2 is to reduce the NFL-to-GDP ratio to 25 percent by the year 2010, under the assumption of a constant real exchange rate. The objective under Scenario 3 is to stabilize the NFL-to-GDP ratio at 55 percent, under the assumption of a real exchange rate appreciation at the rate of 1.25 percent per year. The world real interest rate is denoted by *r*, *-rb* denotes net foreign investment payments (net interest servicing) as a share of GDP, and γ is the rate of GDP growth.

VI. Conclusion

We have undertaken tests of whether Australian macroeconomic data is consistent with the intertemporal external borrowing constraint being satisfied in expected value terms. These tests are based on an intertemporal model that provides a benchmark to evaluate sustainability issues. If the external borrowing constraint is not satisfied in the historical data, then we know that the path of the current account is excessive. This is what we find for Australia's stock of NFL. In one sense this finding is not very dramatic: since Australia's export base is large and diversified, it is able to reallocate real resources to satisfy this constraint without a major disruption. On the other hand, it indicates that some adjustment will be necessary, and that the longer the delay, the bigger the required adjustment.

The econometric analysis leads to two main findings. In the early part of the sample it appears national consumption smoothing behavior was restricted, possibly due to the existence of capital controls. Thus in the early part of the sample the use of an intertemporal model to evaluate sustainability issues is inappropriate. In the later part of the sample, Australia attained the ability to smooth consumption intertemporally, at broadly the same time as a slowdown in world economic growth. These events led to a build up of net foreign liabilities that was in excess of what the macroeconomic fundamentals would suggest is sustainable. In short, Australia's external borrowing constraint is not being satisfied, and its current account deficits are excessive.

Pitchford's claim that the current account deficit does not matter if it is derived from the actions of the private sector (in the presence of undistorted factor prices) is not consistent with the data. This occurred even in the period following the liberalization of capital controls, when the intertemporal model's assumption of greater international capital mobility is more likely to have been satisfied. Given Australia's large investment opportunities relative to its level of national savings, the intertemporal model suggests that it is clearly optimal for Australia to run current account deficits. However, our findings imply that the size of the deficits recorded recently is in excess of the optimum, and overborrowing may have arisen in the 1980s due to the distorted domestic price of capital (arising from the interaction of the tax system, relatively high rates of inflation and ready access to credit). Accordingly, national saving must increase for the external borrowing constraint to be met. Using a simple analysis based on this constraint, we calculate that the adjustment to national saving required to stabilize the ratio of net foreign liabilities to GDP is in the order of 2 to 4 percent of GDP, given real GDP growth rates in the range of 1 to 5 percent, and world real interest rates in the range 2 to 6 percent, and real exchange rate appreciation limited to an average of 1.25 percent per year. Of course, if there is a country risk premium on interest payments that Australia has to make, then our model estimates will understate the required trade surplus necessary to stabilize the stock of net foreign liabilities.

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