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The sustainability of Australia's current account deficits—A reappraisal after the global financial crisis☆

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Abstract

The heated debate over the sustainability of Australia's high current account deficit that raged over most of the fixed and floating exchange period was due to the failure of policymakers to shift from the Keynesian Mundell Fleming (KMF) paradigm which has been rendered obsolete by the floating of the Australian in 1983q4 to the Intertemporal Optimization (ITO) paradigm which was more appropriate under the floating exchange rate as advocated by a number of Australian economists in the Pitchford thesis. The Pitchford thesis contended that after the floating of the exchange rate the current account deficit was the residual outcome of rational optimizing decisions of private agents and if there was fiscal balance then the policy of targeting the reduction of the current account deficit based on the KMF paradigm was misconceived. Empirical tests based on the application of the net present value criterion using vector autoregressions, unit root and cointegration econometrics reveals that Australia's current account deficit revealed that the current account deficits were unsustainable during the fixed exchange period and over the whole study period 1960q3–2007q4, but not during the floating exchange rate period post-1983q4. Therefore the empirical results gave credibility to the Pitchford thesis but Australian policymakers continued to target the reduction of the current account deficit because their failure to make the paradigm shift from KMF to ITO to be consistent with the regime shift from a fixed to a floating exchange rate. However, in 2004 after more than two decades feuding Australian policymakers accepted the Pitchford thesis and abandon the policy of targeting the reduction of the current account deficit. But the global financial crisis and global recession has delivered a death blow to the Pitchford thesis by undermining the key assumptions of fiscal balance and rationality that underpins it. The fiscal stimulus package that has been implemented to combat the fall in aggregate demand and restore consumer confidence due to the global recession has resulted in massive fiscal imbalance and the credit crunch has undermined rational behavior and consumer confidence. Therefore, the Pitchford thesis no longer rules the

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policy roost after the global financial crisis. In this study we draw on the conflicting policy perspectives on the unsustainability of high US current account deficits that tender a malign prognosis based on Salvatore's twin deficit hypothesis and a benign prognosis based on Bernanke's global savings glut hypothesis to identify some key policy challenges that confront Australian policymakers to navigate the Australian economy out of the global financial crisis and recession into a robust recovery phase in the near future.

JEL classification: C32; E13; E21; E60; F32; N10

Keywords: Current account sustainability; Paradigm and regime shifts; Pitchford thesis; Vector autoregressions (VAR); Unit root and cointegaration econometrics; Global financial crisis; Salvatore twin deficits hypothesis; Bernanke global savings glut hypothesis; Australia

1. Introduction

The global economy is in the throes of the greatest financial crisis in 2009 since the Great Depression of the 1930s, and most of the major industrial economies have plunged into recession and the projected stellar growth rates of emerging market economies have been slashed by more than half. The current downturn in the global economy is the outcome of the synchronization of business cycle slumps aggravated by the superimposition of a banking and financial crisis in all the major economies of the world. The global financial crisis has called for a reappraisal of the Pitchford thesis which was postulated by Australian economists (Makin, 1989; Pitchford, 1990; Corden, 1997) to debunk the policy of targeting the reduction of the current deficit as misconceived. The Pitchford thesis contended that the current account deficit was the residual of rational optimizing decisions of private sector agents, which made it unnecessary for policy action if there was fiscal balance. The Pitchford thesis also resonated in the Lawson doctrine in UK which compared the current account deficit to private agreement among consenting adults that required no policy intervention (Debelle, 2006). The Pitchford thesis based on the Intertemporal Optimization (ITO) under a floating exchange rate regime became the subject of heated controversy between policymakers who targeted the reduction of the current account deficits based on the twin deficits hypothesis derived from the Keynesian–Mundell–Fleming paradigm. Empirical results based on the validation of the net present value criterion using vector autoregressions, unit root and cointegration econometrics indicated that the Australian current account deficits were unsustainable during the fixed exchange rate regime period and sustainable during the floating exchange rate period and over the whole study period 1960q3–2007q4. The empirical test results indicate that the heated controversy surrounding the policy of targeting the reduction of the current account deficit was the result of policymakers' failure to shift from the KMF paradigm had been rendered obsolete by the regime shift from fixed to a floating exchange rate in 1983q4 making the ITO paradigm more relevant as enunciated in the Pitchford thesis. A widely accepted benchmark of current account deficit unsustainability was the current account deficit as a ratio GDP in excess of 5%. Then it flashed a "red light" warning of imminent explosive debt dynamics that would culminate insolvency due to current account unsustainability (Milesi-Ferretti & Razin, 1996). In Australia in mid-1985 the current account deficit as a ratio of GDP hit the 5% benchmark, which was more than double the historical average. This caused panic in policy circles. The then Treasurer warned that Australia was in danger in turning into a 'banana republic' and directed that all policy levers should be pulled to rein in the current account deficit to a sustainable level (Keating,

1994). Accordingly policymakers drawing on the 'twin deficits' hypothesis distilled from KMF paradigm relied on the policy of targeting the reduction of the government budget deficit to reduce the current account deficit. By 1990 the government budgets had been returned to surplus, but the current account deficit as a ratio of GDP, persisted in the unsustainable 5% 'red light' zone. It was only in 2004 that policymakers finally acknowledged the validity of the Pitchford thesis and abandoned the policy targeting the reduction of the high current account deficits in the pursuit of sustainability (Stevens, 2004). The global financial crisis that has been unraveling since September 2008 has undermined the central assumptions of private sector rational optimization and fiscal balance that underpin the Pitchford thesis, due to erosion of rational consumer confidence behavior as a result of the credit crunch and the 'fiscal stimulus package' implemented to prop up the flagging aggregate demand caused by the global recession, respectively. The demise of the Pitchford thesis has posed new challenges to policymakers in their endeavors to navigate the Australian economy out of the global financial crisis and recession to a recovery phase.

The rest of the paper is structured as follows: Section 2 selectively reviews the conflicting malign and benign hypotheses proffered to achieve sustainability by reducing the high US current account deficits in order to provide insights to formulate policies to face the challenges posed by the global financial crisis that has caused the demise of the Pitchford thesis. Section 3 reports the empirical test results from the application of the net present value criterion which reveals that the current account deficits were unsustainable during the fixed and the whole study period and sustainable during the post-float period lending support to the Pitchford thesis. Section 7 discusses some of the policy challenges that confront the Australian policymakers in steering the Australian economy out of the global recession into a robust recovery drawing on the conflicting insights provided by the Salvatore twin deficits hypothesis and the benign prognosis of the Bernanke global savings glut hypothesis, after the demise of the Pitchford thesis. Section 8 provides some concluding observations.

2. Conflicting perspectives on the sustainability of high current account deficits

The present controversy surrounding the sustainability of the high US current account deficit, after allowing for the fact that US is a large open economy, is reminiscent of the policy debate relating to the reduction of the high current account deficit of the small open economy of Australia 1980s that manifested in the Pitchford thesis (Debelle, 2006). The polarization of views on the malign and benign macroeconomic effects posed by the US high current account deficits offer insights that facilitate a reappraisal of the Pitchford thesis that argues that policy to reduce current account deficits is misconceived under a floating exchange rate regime where rational optimizing agents create the current account deficits when there is fiscal balance. Below, I present three perspectives on each of the malign and benign effects of the sustainability of the high US current account deficits with the aim of providing insights for formulating policies to combat the adverse feedback effects of the global recession and put the economy on the path to recovery. The first malign perspective on the unsustainable of the US high current account deficit is articulated in the Salvatore twin deficits hypothesis that predicts that if the US high current deficits which as a ratio of GDP is hovering around 6% is unsustainable and requires gradual adjustment downwards by reducing fiscal deficits to prevent interest rate hikes and exchange rate depreciation which could precipitate a domestic recession which could spillover into a global recession (Salvatore, 2006). The Salvatore hypothesis has received wide support from many other economists (Edwards, 2006; Obstfeld & Rogoff, 1995). The second, malign perspective on the US high current account deficit is proffered by the Krugman hypothesis which draws on the portfolio-balance model to assert

that the US high current account deficit will require a plunge in the value of the dollar. However, investors in dollar assets suffer from a myopia and do not seek compensation for the risk premium associated with an impending dollar plunge. Krugman compares investors in the dollar assets to the Coyote chasing the roadrunner in the Warner Brothers cartoon over a precipice defying gravity momentarily before landing in panic with a thud. The Krugman Coyote analytics predict that in the short-run the rapid compression of world demand for dollar assets can be disruptive but in the long run the slow increase in net exports will restore macroeconomic stability. Therefore, the dollar plunge whilst disruptive in the short-run is shrouded ambiguous macroeconomic outcomes in the long run (Krugman, 2007). The third malign hypothesis predicts that the rebalancing of the high US current account deficit to sustainable level would require a sizeable exchange rate realignment through a reduction of global surpluses, 2/3 of which are accounted for emerging Asia and oil producing economies, if it is not inflict massive economic disruption of the US economy (Rogoff, 2006). The first benign perspective, is tendered by the Bernanke 'global savings glut' that attributes the high US current account deficit to the pursuit of deliberate policies to increase domestic savings by emerging market economies to build a buffer against financial crises due to the collapse of the currency peg as that occurred under the Asian financial crisis in mid-1997. The 'global savings glut' was caused not only by high savings policies of emerging market economies, but also by the vast petrodollar earnings by oil producing countries and the ageing demographics of countries like Germany and Japan. The Bernanke hypothesis blames the emergence of the 'global savings' glut for reducing real interest rates and making it attractive for the US private sector to borrow to finance the housing boom by increasing the US current account deficit (Bernanke, 2005). As long as the US borrowing reflected in the high current account deficit was invested productively in the US the current account deficit would be mutually beneficial to both the US and high saving emerging market economies (Cooper, 2006). The second benign perspective on the US high current account deficit is contained in the "dark matter" hypothesis which asserts that just as the cosmos appears to be prevented from exploding into infinity by gravity attraction by the pull of invisible 'dark matter', the stability of the global financial system is ensured by forces of unmeasured benefits of US assets in foreign countries, which when capitalized at constant interest rate yields positive net interest income from abroad implying that the US is not running a current account deficit as reported in the published balance payments accounts, but rather a surpluses (Hausmann & Sturtzenegger, 2007). The 'dark matter' hypothesis implies that the US exports have under recorded benefits from seignorage arising from the provision of liquidity services, insurance and knowledge services to emerging market economies (Eichengreen, 2006). The third, benign perspective contends that US enjoys and "exorbitant privilege" which enables it to earn its way to current account sustainability because of savvy US investors that earn a higher rate of return on their investments abroad than foreigners' investment in the US. This positive return differential relaxes the US budget constraint and allows US to run a larger current account deficit with impunity (Gourinchas & Rey, 2007). The third benign perspective could be attributes that irrational exuberance that has caused the US economy to traverse from the internet bubble to the real estate and an energy bubble has released Schumpeterian forces of creative destruction propelling the economy over forward growth path (Gros, 2007). We could identify the Salvatore hypothesis and the Bernanake hypothesis as the two polar hypotheses representing malign and benign perspectives on the sustainability of high US current account deficits as offering insights for the reappraisal of the sustainability of Australian high current account deficits after the demise of the Pitchford thesis due to the credit crunch that erodes rational consumer behavior and the fiscal stimulus package that has been implemented to combat the adverse feedback loops from the global financial crisis of 2007. Before embarking on the task of reappraisal of the Pitchford

thesis in the aftermath of the global financial crisis in the next section we revisit the empirics on the sustainability of Australia's current account deficit during the fixed and floating exchange rate regimes that advocated conflicting policy prescriptions based on rival paradigms during the study period 1960q3–2007q4.

3. Empirical tests of rival paradigms on the sustainability of Australian current account deficits

The Keynesian–Mundell–Fleming (KMF) paradigm provided policymakers the framework for evaluating the sustainability of the Australian current account deficits under the pegged exchange rate regime. However, with the floating of the Australian dollar there occurred a regime shift and KMF paradigm was rendered obsolete and the Intertemporal Optimization paradigm subsumed in the 'Pitchford thesis' became relevant for assessing policies relating to external balance. The new paradigm or the Intertemporal Optimization Model (IOM) was based on an extension of the permanent income hypothesis (Friedman, 1957) to the open economy by a number of researchers and it postulated that consumption expenditure depended upon expected permanent income rather than on current disposable income. In the context of an open economy when current income deviates from its permanent level the economy will find it optimal to borrow and lend in the global capital market resulting in current account deficits and surpluses in order to smooth out fluctuations in consumption. The validity of the consumption-smoothing hypothesis implicit in the IOM has been tested using the net present value (NPV) approach suggested by Campbell and Shiller (1987). NPV tests of the consumption-smoothing hypothesis have been tested for both advanced countries and developing countries with mixed results. In the Australian context the tests on the validity of the consumption-smoothing hypothesis have given conflicting results with variations of the sample period, frequency, definitions of variables and concepts of sustainability. The results of tests of the consumption smoothing in the Australian context are reported in Table 1.

The new paradigm or the IOM asserts that important two motives drive fluctuations in current account imbalances (Sachs, 1982): First, the *consumption-smoothing motive* demonstrates how the current account acts as a buffer against shocks to macroeconomic fundamentals and achieves an optimal consumption path that maximizes open economies welfare. Second, the *consumption-tilting motive* drives the current account imbalances by responding to preference for current consumption over future consumption or vice versa. If the subjective discount rate facing an open economy is less than the world discount rate then it could find it rewarding to borrow in the global market and boost current consumption by trading off future consumption and vice versa. The theoretical framework that underpins the new paradigm that advocates that high current account deficits should not be a matter for policy action can be outlined in algebraic terms using the IOM

Table 1
Tests of the consumption-smoothing hypothesis in the Australian context.

Authors	Year	Study period	Frequency	Conclusion
1. Milbourne and Otto	1992	1959q3–1989q1	Quarterly	Reject
2. Cashin and McDermott	1998	1961–1989	Annual	Reject
3. Guest and McDonald	1998	1961–1995	Annual	Reject
3. Bergin and Sheffrin	2000	1961q4–1996q2	Quarterly	Do not reject
4. Otto	2003	1960–200	Annual	Do not reject
5. Belkar et al.	2007	1984–2005	Annual	Do not reject

model of a small open economy, where a representative agent that maximize expected lifetime utility over an infinite time horizon as defined by the utility function given below:

$$\sum_{s=0}^{\infty} \beta E_t[u(C_{t+s})], \quad \text{where } 0 < \beta < 1 \text{ is the subjective discount factor} \tag{1}$$

C_t is the private consumption. E_t is the conditional expectations operator based on the information set available at time t. $u(C_{t+s})$ is the time separable utility function that is twice differentiable and is strictly concave.

The small open economy or the representative agent maximizes lifetime utility (1) subject to the expected value of the intertemporal budget constraint that can be derived from the one-period current account identity specified below:

$$CA_t = \Delta B_{t+1} = B_{t+1} - B_t = Y_t + rB_t - C_t - I_t - G_t = TB_t + rB_t \tag{2}$$

where Y_t is the GDP. B_t is the net stock of foreign assets or foreign debt if negative. I_t is the private investment. G_t is the government spending. $TB_t = Y_t - C_t - I_t - G_t$ is the trade balance.

$CA_t = TB_t + rB_t$ is the current account balance. r is the fixed world real interest rate. In the empirical validation of the model all the variables are converted to per capita real terms as explained in the database (see Appendix A).

Eq. (2) postulates that the current account imbalance is equal to the change in the value of the economy's foreign debt, which in turn is equal the national cash flow plus net interest payments on the outstanding stock of debt defined by:

$$Z_t = Y_t - C_t - I_t + rB_t \tag{3}$$

This is also equal to the trade balance plus net factor payments: $TB_t + rB_t$.

We assume a small open economy and therefore it is an interest rate taker in the global capital market. The assumption of the small open economy allows for the Fisherian separability and the analysis of consumption independently of investment. After re-arranging the above intertemporal budget Eq. (2) we obtain:

$$\frac{CA_t}{Y_t} = \frac{TB_t + rB_t}{Y_t} = g_t \frac{B_t}{Y_t} \tag{4}$$

Based on the above equation, solvency or sustainability of the current account deficit can be achieved if the foreign debt to GDP ratio (CA_t/Y_t) = 5%, and growth rate of GDP, $g = 2.5\%$, the required foreign debt to GDP to achieve sustainability $B_t/Y_t = 200\%$. Furthermore if the capital output ratio for the country is 3, this implies the foreign ownership of the capital stock would be approximately 67%. These solvency ratios are static measures and do not provide the size of adjustment costs required to reduce debt. Therefore, more informative measures of intertemporal solvency can be derived from the intertemporal budget constraint (2) based on the cointegration of consumption expenditure (C_t) and available resources ($Z_t + rB_t$) that exhibit the existence of a long-run equilibrium relationship between expenditure and revenue (Trehan & Walsh, 1991). Nonetheless, the above solvency or sustainability measure of the current account deficit provides a useful preliminary indicator that accords with malign macroeconomic repercussions as postulated by the Salvatore hypothesis or the standard view on the subject. Of course, more rigorous measure of solvency and sustainability of current account imbalances can be derived from the intertemporal budget constraint (2), through recursive substitution for foreign debt, after imposing the no-Ponzi-

game (NPG) to yield the following equation:

$$\sum_{s=t}^{\infty}(1+r)^{-(s-t)}E_tTB_s = -(1+r)B_t, \tag{5}$$

The above Eq. (5) asserts that a small open economy is intertemporally solvent if the expected present value of future trade balances can repay the economy's initial foreign debt and interest dues. The derivation of the above intertemporal solvency condition is based on the satisfaction of the NPG condition, which precludes the economy from playing the Ponzi-game of borrowing just to rollover its foreign debts without ever repaying its creditors. The NPG condition is satisfied when the, the discounted present value of expected future stock of foreign debt converges to zero as the time horizon T, converges to infinity as indicated in Eq. (6) below:

$$\lim_{T\to\infty}(1+r)_t^{-T}B_{t+T+1} = 0 \tag{6}$$

For the empirical validation of the IOM we assume that utility function (1) is linear quadratic in consumption as defined below:

$$u(C_t) = C_t - \frac{a_0C_t^2}{2}, \qquad \text{where } a_0 > 0, \tag{7}$$

Substituting the above utility function in the intertemporal budget constraint, based on the first order condition we obtain the Euler equation: $u'(C_t) = (1+r)\beta E_t[u'(C_{t+1})]$ which yield that consumption follows a random walk (Hall, 1978)giving the subjective discount rate equal to the world interest rate $\beta = 1/(1+r)$ in Eq. (7). After taking account of the substitution effect Eq. (7) yields:

$$E_tC_{t+1} = C_t \tag{8}$$

When the above random walk equation holds the expected value of the intertemporal budget constraint holds with probability one and after rearrangement we can obtain:

$$E_t\sum_{s=t}^{\infty}(1+r)^{-(s-t)}C_s = E_t\left[(1+r)B_t + \sum_{s=t}^{\infty}(1+r)^{-(s-t)}Z_t\right] \tag{9}$$

where the national cash flow: $Z_t = (Y_t - C_t - G_t)$. After manipulating the above Eq. (9) we derive the optimal path of consumption path as:

$$C_t^* = \frac{r}{\theta}\left[B_t + \sum_{s=t}^{\infty}E_t(1+r)^{-(s-t)}Z_t\right] \tag{10}$$

where the consumption-tilt parameter $\theta = [\beta(1+r)r]/[\beta(1+r)^2 - 1]$.

The optimal path of consumption C_t^* occurs when the subjective discount rate equals the market discount rate, $\beta = 1/(1+r)$ which filters out the consumption-tilting effects when $\theta = 1$ giving the optimal consumption-smoothing current account CA_t^S in Eq. (11) It is equal to the residuals of the cointegration regression of $Z_t + rB_t$ and C_t as given by Eq. (11):

$$C_t = Z_t + rB_t - \theta C_t^* \tag{11}$$

By substituting Eq. (10) in Eq. (11), after re-arranging we obtain a stochastic version of the Intertemporal Optimization Model in Eq. (12). It states that the optimal consumption-smoothing

current account balance is linked to the changes in the expected present value of national cash flow is postulated below:

$$CA_t^s = -\sum_{s=t+1}^{\infty}(1+r) - (s-t)E_s\ \Delta Z_s), \qquad \text{where } \Delta Z_s = Z_s - Z_{s-1} \tag{12}$$

where r is the real interest rate, $Z_s = Y_s - I_s - G_s$: national cash flow, where Y_s is the GDP, I_s is the investment, G_s is the government spending.

The consumption-smoothing hypothesis implicit in the IOM given in Eq. (12) can be tested using the VAR (vector autoregression) methodology proposed by (Campbell & Shiller, 1987). We construct a VAR which postulates that the changes in the national cash flow ΔZ_t can be predicted better not only by using it past history (lagged values) but also information the present and past current account balances (CA_t) as indicated below:

$$\begin{bmatrix} \Delta Z_t \\ CA_t^S \end{bmatrix} = \begin{bmatrix} \varphi_{11} & \varphi_{22} \\ \varphi_{21} & \varphi_{22} \end{bmatrix} \begin{bmatrix} \Delta Z_{t-1} \\ CA_{t-1}^S \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{13}$$

In (13) above, ε_{1s} and ε_2 are stochastic error terms and ΔZ and CA_s^s are expressed as deviations from their unconditional means.

We can obtain two empirical tests of the consumption-smoothing hypothesis from the above VAR by estimating the future expected changes in the net cash flow from the following VAR:

$$E_t\ \Delta Z_t = -\begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} \varphi & \varphi \\ \varphi & \varphi \end{bmatrix}^{s-t} \begin{bmatrix} \Delta Z_t \\ CA_t^S \end{bmatrix} \tag{14}$$

where φ is the transition matrix $[\varphi_{ij}]$ and I is 2×2 identity matrix. The optimal consumption-smoothing current account can be estimated by substituting Eq. (14) into Eq. (10) yielding:

$$C\hat{A}_t^S = -\begin{bmatrix} 1 & 0 \end{bmatrix} \left(\frac{1}{1+r}\varphi\right)^{-1} \begin{bmatrix} \Delta Z_t \\ CA_t^S \end{bmatrix} \equiv \begin{bmatrix} \varphi_{\Delta Z} & \varphi_{CA} \end{bmatrix} \begin{bmatrix} \Delta Z_t \\ CA_t^S \end{bmatrix} \tag{15}$$

The above specification of the optimal current account series $C\hat{A}_t^S$ can be used to perform a number of tests to determine whether a given economy is engaged in consumption-smoothing or not. First, we can perform a Granger causality test to determine whether current account predicts or Granger causes changes in the national cash flow using the VAR equation (15). Rejection of the no causality null hypothesis favors the consumption-smoothing hypothesis. The second test of the consumption-smoothing null hypothesis is obtained from Eq. (15) through the joint test of the nonlinear restrictions embodied in the null hypothesis H_0: $\varphi_Z = 0$, $\varphi_{CA} = 1$. The non-rejection of the null hypothesis based on a Wald χ^2-test on nonlinear restrictions at a specified level of significance α favors the consumption-smoothing hypothesis. However, the reliability of the above Wald-test has been challenged because of the near-singularity problem that makes the delta method for testing NPV model unreliable (Kasa, 2003; Mercereau & Miniane, 2004).

4. Results of the empirical validation of the Intertemporal Optimization Model

The database used to test the Intertemporal Optimization Model in the Australian context for the study period 1959q3–2007q1 has been sourced from the International Monetary Fund online database and the Australian Bureau of Statistics. The database comprises of seasonally adjusted

Table 2
ADF unit root tests on C_t (tests on other series are not reported).

Sample	Level AIC(k)	Difference AIC(k)	McKinnon CV (%)
Sub-sample I	−3.84(0)	−6.91(9)	−3.46(1%)
Sub-sample II	−3.34(0)	−11.07(0)	−2.87(5%)
Full-sample	−2.46(0)	−10.47(0)	−2.57(10%)

Full results of unit root tests are not reported only results for C_t are reported above.

quarterly variables expressed in per capita real terms in billions of Australian dollars after diving by the implicit GDP price deflator and population (see Appendix A).

The database for the full-sample period was dichotomized into the sub-sample I covering the pre-float period and sub-sample II covering the post-float period based on the floating date 1983q4. This dichotomization has also been supported subsequently by the detection of a structural break in the presence of cointegration, after performing the appropriate cointegration test (Gregory & Hansen, 1996). A battery of unit root tests (ADF, Phillips-Perron, KPSS) indicated that all the series of interest were nonstationary processes. Only the ADF unit root tests for C_t are reported in Table 2.

Since, the forces of globalization could result in structural breaks in the series of interest and render nonstationary series stationary as suggested by (Perron, 1989). It was worthwhile to check whether the structural breaks converted the nonstationary series to stationary series or $I(0)$ series to $I(1)$ series by applying the AZ breakpoint test (Zivot & Andrews, 1992). The AZ-test identifies the presence of the mean and slope breakpoints in a given DGP that is used to testing Intertemporal Optimization Model). The ZA-tests fail to reject the nonstationarity null for both ZRB_t and C_t, despite the presence of mean and slope breakpoints during the full-sample period and during both pre and post-float sub-sample periods I and II, respectively (see Table 3).

The mean and slope breakpoints in the DGPs of interest have been caused by the various reform processes triggered by globalization that gathered momentum during the study period. These breakpoints could be caused by the processed of trade liberalization, financial deregulation, microeconomic reform, prudential regulation of the banking system, etc. No attempt has been made here to link the breakpoints to the globalization forces that may act on a standalone basis or in a symbiotic fashion to bring about the breakpoints in C_t and $Z_t + rB_t$ as reported above. We note that the above DGPs have remained nonstationary despite the structural breaks.

Table 3
Zivot–Andrews (ZA) breakpoint test results.

Variable Intercept	Full-sample Mean(k) t-test	Quarter	Sub-sample I Mean(k) t-test	Quarter	Sub-sample II Mean(k) t-test	Quarter	CV 5%	CV 1%
C_t	3.15(3)	1984:4	−2.13(0)	1971:4	−1.99(0)	2000:3	−4.80	−5.34
ZRB_t	−2.44(2)	1995:1	−5.21	1969:1	−4.52(0)	2000:3	−4.80	−5.34
Slope	Trend(k)		Trend(k)					
C_t	0.15(3)	1967:1	−2.41	1972:2	−2.55(3)	1972:2	−4.93	−4.42
ZRB_t	−4.60 (0)	1989:3	−4.94	1975:2	−4.53	1972:2	−4.93	−4.42

Notes: CV, the critical value. k that is shown in brackets denotes the optimal number of lags determined by the modified unit root tests selected on the basis of the minimum AIC. See Appendix A for explanatory notes on the Zivot–Andrew methodology.

Table 4
Johansen LR cointegration tests on the cointegaration between $Z_t + rB_t$ and C_t.

Null H_o	Sub-I, λ-max	Sub-II, λ-max	CV 95%	CV 90%	Full-sample, λ-max	CV 95%
$R=0$	20.94	28.73	15.87	13.81	14.92	14.88
$R\leq 1$	10.42	4.93	9.16	7.53	1.65	8.07
	λ-trace	λ-trace			λ-trace	
$R=0$	31.36	33.66	20.18	17.88	16.7	17.86
$R\leq 1$	10.41	4.93	9.16	7.53	1.65	8.07

λ-max: maximal Eigen Value and λ-trace: stochastic Trace Matrix.
(restricted intercepts and no trends) Var = 2. n: sample size. R: number of cointegrating vectors. CV: critical values.

Table 5
Engle–Granger two-step cointegration test procedure.

Sample	Period	Parameter θ	$se(\theta)$	ADF (k)	%CV(k)	Order integration
Sub-sample I	1959q3–1983q4	0.8971	0.0043	−3.27(0)	−3.50(1)	$I(1)$
Sub-sample II	1984q1–2007q1	0.8936	0.0116	−2.91(2)	−2.89(5)	$I(0)$
Full-sample	1959q3–2007q1	0.9248	0.0109	−2.79(2)	−2.58(10)	$I(0)$

ADF tests on residuals of cointegration regression between ZRB_t and C_t.
ADF: Augmented Dickey Fuller test on residuals. k: optimal lag length for determining minimum AIC. CV: critical values.

Next we report the results of the Johansen–Juselius LR tests (Johansen & Juselius, 1990) which identify the presence of cointegration between the major series of interest during the full-sample period and the sub-periods relating to pre and post-float eras, respectively. The Johansen–Juselius maximum likelihood ratio tests for cointegration between ZRB_t and C_t are reported in Table 4.

The Johansen–Juselius λ-max and λ-trace statistics fail to reject the null of no cointegration between ZRB_t and C_t for the pre-float sub-sample I, but rejects the null of no cointegration null for the post-float sub-sample II and the full-sample at both 95% and 90% level critical values. The above ML cointegration tets are re-confirmed by the Engle–Granger two-step cointegration test procedure, which confirms the stationarity of the residuals from the cointegration regression of ZRB_t on C_t. The residuals for pre-float sub-period I were $I(1)$, while for the post-float sub-period II and the full period they were $I(0)$ (see Table 5). These results are consistent with the Johansen–Juselius ML test results reported above in Table 4.

5. Granger causality tests of the consumption-smoothing hypothesis

The consumption-smoothing hypothesis implicit in the Intertemporal Optimization Model (IOM) embodied in Eq. (10) can be tested using Granger causality F-tests and Wald χ^2-tests on nonlinear restrictions on the VAR parameters as explained in Section 3. The Granger non-causality null hypothesis tests whether the current account Granger causes changes in national cash flow for VAR(k), where the lag length $k = 1, 2, 3$ for the pre-float sub-sample I, post-float sub-sample II and the full-sample. Therefore, the null for reverse non-causality of the current account by changes in national cash flow is tested for VAR(k) and same sub-samples indicated above.

The Granger non-causality null for the current account on changes in national cash flow is rejected for the pre-float sub-sample I, the post-float sub-sample II and the full-sample at 1% level of significance for VARs of different lag lengths indicating that consumption-smoothing

Table 6
Granger non-causality F-tests and nonlinear restriction Wald-F tests.

Test	Sub-sample I	Var(1)		Var(2)		Var(3)	
		ΔZ_t	CA_t^S	ΔZ_t	CA_t^S	ΔZ_t	CA_t^S
Causality F	$CA_{t-i}^S \forall_I \geq 1$	18.93**		9.48**		8.94**	
Causality F	$\Delta Z_{t-i} \forall_i \geq 1$		1.09		1.23		2.39*
Wald-stat	H_o:$\Phi_i = 0$ for $\forall_i$ except H_o:$\Phi_I = 1$	9.76**		12.34*		14.12*	
Test	Sub-sample II	ΔZ_t	CA_t^S	ΔZ_t	CA_t^S	ΔZ_t	CA_t^S
Causality F	$CA_{t-i}^S \forall_I \geq 1$	19.24**		6.40**		3.76**	
Causality F	$\Delta Z_{t-i} \forall_i \geq 1$		2.07		1.90		1.58
Wald-stat	H_o:$\Phi_i = 0$ for $\forall_i$ except H_o:$\Phi_I = 1$	5.50		5.25		5.44	
Test	Full-sample	ΔZ_t	CA_t^S	ΔZ_t	CA_t^S	ΔZ_t	CA_t^S
Causality F	$CA_{t-i}^S \forall_I \geq 1$	33.75**		11.14**		7.14**	
Causality F	$\Delta Z_{t-i} \forall_i \geq 1$		3.60*		2.83*		2.23*
Wald-stat	H_o:$\Phi_i = 0$ for $\forall_i$ except H_o:$\Phi_I = 1$	9.54**		16.86**		8.00*	

Granger causality F-test including the error correction mechanism (ecm).
Nonlinear restrictions on VAR: Wald-stat χ^2_α (df) H_o:$\varphi_i = 0$ for $\forall_i$ except $\varphi_{CA} = 1$ (after Whites' correction for heteroscedasticity).
* Level of significance α Wald-stat χ^2_α (2df): $\chi^2_{0.05}$ (5.99).
** Level of significance α Wald-stat χ^2_α (2df): $\chi^2_{0.01}$ (9.21).

hypothesis is supported in both pre and post-float eras and over the full-sample period. Furthermore, there is no reverse causality from the national cash flow to the current account in the pre- and post-float sub-samples. But there is evidence of two-way causation during the full-sample period (see Table 6).

The Wald χ^2-test rejects the nonlinear restrictions for sub-sample I or the pre-float period and the full-sample period for VARs with different lag lengths. But for sub-sample II covering the post-float period the null hypothesis related to nonlinear restrictions consistent with consumption smoothing is not rejected (see Table 6).

The overall picture that we conjure from the juxta-positioning of the Granger causality F-tests and the Wald χ^2-tests are that there is evidence supporting Intertemporal Optimization and consumption-smoothing during the post-float sub-sample II period when capital controls had been removed and financial deregulation, trade liberalization and other microeconomic reforms had linked the Australian economy firmly with the global economy. The above results of consumption smoothing during the post-float period are supported by some important empirical studies (Bergin & Sheffrin, 2000; Otto, 2003; Belkar, Cockerell, & Kent, 2007) and not by other studies (see Table 1).

6. Perspectives on the regime shifts

Next we use the (Gregory & Hansen, 1996) cointegration methodology to determine the presence of cointegration under possible regime shifts. The Gregory–Hansen (GH) methodology provides for the possibility of a general type of cointegration, when the cointegration vector is allowed to change at a single unknown time during the study period. A structural change would be reflected in the changes in the intercept μ and the slope coefficient α as modeled below:

Table 7
Gregory–Hansen cointegration tests (minimum ADF(t)-statistics).

Model	Full-sample	Breakpoint	CV 5%	CV 1%
C	−4.63*	1983q4	−4.61	−5.13
C/T	−4.67	1971q3	−4.99	−5.45
C/S	−4.61	1983q4	−4.95	−5.47

* Significant at 5% level.

GH Model I: Level shift (C)

$$y_{1t} = \mu_1 + \mu_2\varphi_T + \alpha^T y_{2t} + \varepsilon_{1t}, \qquad t = 1, \ldots, \mathrm{T}$$

In the above equation the intercept μ_1 represents the intercept before the shift, and μ_2 represents the change in the intercept at the time of the shift. The values $y_{1t} = ZRB_t$ national cash flow plus net factor payments and $y_{2t} = C_t$: consumption spending. The dummy variable ϕ_{tT} takes values 0 and 1 as specified below:

$$\varphi_{tT} = 0 \text{ if } t \leq [\eta T] \text{ and } \varphi_{tT} = 1 \text{ if } t > [\eta T], \qquad \text{where the unknown parameter}$$

$T \in (0,1)$ denotes the relative timing of the change point, and [] denote the integer part.

The empirical analysis reported in this paper is based on Gregory–Hansen (GH) Model I and the GH Model II and GH Model III have not been examined at this stage.

Model II: Level shift with trend (C/T) $y_{1t} = \mu_1 + \mu_2\varphi_{tT} + \beta_t + \alpha^T y_{2t} + \varepsilon_{lt}, \qquad t = 1, \ldots, Tt$ denotes the time trend.

Model III: Regime shift with trend (C/S) $y_{1t} = \mu_1 + \mu_2\varphi_{tT} + \alpha_1{}^T y_{2t} + \alpha_2{}^T y_{2t}\varphi_{2t} + \varepsilon_{lt} \qquad t = 1, \ldots, T\alpha_1$ denotes the cointegrating slope coefficients before the regime shift and α_1 denotes the change in the slope coefficients (Table 7).

The no cointegration null is rejected for the full-sample as the minimum ADF(t) (Dickey & Fuller, 1979) statistic exceeds the 5% critical value of −4.61. The endogenously determined breakpoint in the cointegration vector between *ZRB* and *C* according to the Gregory–Hansen (GH) test occurred at 1983q4. It is noteworthy that this breakpoint coincides with quarter in which the Australian dollar was floated. Therefore, we expect that the consumption-tilting parameter to differ in the sub-sample before and after the breakpoint in 1983q4. The cointegration between the national cash flow plus net factor payments ZRB_t and consumption C_t, allowing for a structural break is validated to examine whether there has been a one-time shift in the cointegrating relationship. The OLS results with a shift dummy variable ϕ_{tT} at the structural break corresponding to a regime shift occur at the point 1983q4. The OLS results for the cointegration regression incorporating a one time shift dummy for the full-sample period 1959q3–2007q1, with standard errors reported in parenthesis below:

Full-sample

$$\underset{(se)}{ZRB_t} = \underset{(0.001)}{0.00} + \underset{(0.002)}{0.92}C_t + \underset{(0.001)}{0.01}\theta_t$$

The above equation indicates that that the consumption-tilting parameter θ is significantly less than unity, both before and after the regime shift or the structural break in 1983q4. These empirics indicate that Australia was consuming more than its permanent cash flow thereby increasing its foreign debt by either increasing its external liabilities or reducing its external assets. Hence, it is noteworthy, the preference for current consumption over future consumption has become

less pronounced after 1983q4. The tilting parameter has increased by nearly 0.01 or 1% of GDP after the structural break and it was 0.92 before the break or regime shift. The upward shift in the tilting parameter by about 1% of GDP in 1983q4, after the removal of capital controls and floating of the exchange rate appears to have increased Australia's appetite for current over future consumption. Arguably, the increase in the preference for current consumption over future consumption furthermore, appears to have been encouraged by the switch from bond to equity financing of the high current account deficits in the 1990s.

7. Challenges facing Australian policymakers after the demise of the Pitchford thesis

The fiscal stimulus package implemented to combat the fall in aggregate demand due to the global recession and the loss of consumer confidence and rationality due to the effects of the 'credit crunch' undermined the key assumptions of fiscal balance underpinning the Pitchford hypothesis and caused its demise. The adverse feedback effects of the global recession witnessed Australia's budget deficit as a ratio of GDP converting from a surplus of 1.5% in the fiscal year 2007 to an estimated deficit of 2.5% in fiscal year 2008, a massive turnaround of 4% in 1 year! The massive deficit had to be financed by government borrowing to implement the fiscal stimulus package to prop up the flagging aggregated demand caused by the global recession.

The Keynesian type 'fiscal stimulus package' had both short-term and long-term components aimed at increasing aggregate demand and restoring consumer confidence. All eligible tax-payers were given A$900 cash-splash, and government guarantees on debt incurred by the major four Australian banks covering a debt A$100 billion. Furthermore, A$10.4 billion was earmarked to finance the first home buyer grants. The centerpiece of the long-term fiscal stimulus package was the job-creating infrastructure expenditure of A$22 billion to improve roads, railways, ports and telecommunications, develop clean energy by investing A$4.5 billion (Commonwealth Budget, 2009–2010). The 'fiscal stimulus package' resulted in a budget deficit of A$55 billion or 5% as a ratio of GDP in 2008 was estimated to result in a peak debt burden of A$300 billion 5 years down the track. Although, the short-term cash-splash has helped Australia to dodge the technical recession bullet in 2009q2 that has mowed down most of the industrial countries, it has increased the long-term public debt burden jeopardizing the country's credit rating, thereby increasing the cost of borrowing and incubating the virus of future inflationary pressures.

In order to combat the fall in aggregate demand Australia like most other industrial economies implemented a mix of expansionary fiscal and monetary policy. The overnight cash rate was reduced from 7.25% in September 2008 to 3% in May 2009 a reduction of 425 basis points. The Reserve Bank of Australia (RBA) has retained the scope to reduce the policy rate further as it is not bogged down in a liquidity trap that has affected central banks of most other industrial countries after cutting the policy rate to zero and jamming the operation of the monetary policy transmission mechanism. Therefore, unlike the RBA has been spared the need to resort to the implementation of unconventional monetary policy measures such as 'quantitative easing' or 'printing money' aimed at increasing the supply of bank reserves by the central bank purchase of securities from the market and crediting the banks' reserve balances held at the central bank. Central banks have also resorted to 'credit easing' which increases the range of collateral the central bank will accept in their repo operations. There is considerable dissent about the effectiveness of these unconventional monetary policy measures as some critics based on the experience of the Bank of Japan over the past decade contend that these unconventional monetary policy measures have failed to deliver any stimulatory effects but have reinforced latent threats of unleashing future inflation. Because

Australia has pursued more prudential regulation of bank lending it has been spared the need to engage in unconventional monetary policy measures as the monetary transmission mechanism still has clout.

Nonetheless, the fiscal stimulus package that has been implemented to combat the effects of the global recession spawned by the global financial crisis has contributed to the demise of the Pitchford thesis and Australian policymakers face the challenge of formulating exit strategies to wind down the high government debt and return to fiscal balance while maintaining the current account deficit at a sustainable level. The Salvatore twin deficits hypothesis for the US warns that if government expenditure is not reeled back and budget is returned to balance it could cause unsustainable current account deficits by triggering off explosive debt dynamics in order to a achieve robust recovery in the near future. Therefore exit strategies should contain policy measures for the gradual reduction of the twin deficits.

In reducing the current account deficit to sustainable levels during a recession policymakers have to face challenges to the free trade and free investment environment due the rise of protectionist pressures in the form of tariff and non tariff barriers or buy Australia campaigns to reduce competing imports and improve the current account balance. The current account deficit is also equal to net foreign investment flows. Therefore, reduction of the current account deficit could be achieved by reducing net foreign investment flow. But in the Australian context pandering to capital xenophobia on the grounds of nebulous concepts of national and strategic interest can be inimical to long-term growth and needs to be contained. The recent scuttling of the Chinalco (Chinese Aluminum Co.) Rio Tinto deal of US$ 19.5 billion on strategic and national interest grounds and Rio Tinto subsequently striking a deal with BHP Billiton has caused much consternation in China as it is also the Australia's largest trading partner. Australia's current account deficit reflects the existence of huge saving investment gap and therefore especially foreign direct investment by multinational corporations that also brings the much needed magic package of technology, managerial and marketing skills should be encouraged and not thwarted by populist policies that will result in reduction of national and global welfare. The policy challenge that face Australian policymakers in the current environment of a global recession to preserve the free trade and investment policies also extends to a number of offshoring activities in relation to aviation, banking, telecommunications, garments, auto components industries so that Australia can retain its competitive edge and market share in the global market place. Policymakers in Australia face a formidable task to preserve the free trade and investment environment from the mounting political pressures for trade and investment restrictions unleashed by special interest groups, trade unions and manufacturing lobbies.

The global financial crisis has been blamed on the 'global savings glut' by the Bernanke hypothesis. It attributes the high US current account deficits to the policies of high saving by emerging market economies of Asia, oil producing countries and ageing demographics of Germany and China. The global savings glut has lowered real interest rates thereby stimulating the high borrowing to finance the US housing boom, while simultaneously increasing the US current account deficits to high levels. Some analysts argue that global current account imbalances are the root cause of high US and Australian current account deficits and that their reduction to sustainable levels should be promoted by reducing the imbalances of the surplus countries gradually without causing disruptive exchange realignments in deficit countries such as the US and Australia (Rogoff, 2006; Stevens, 2009). However, a contrarian perspective argues that current account deficits in countries like US and Australia can persist as long as the foreign borrowings are invested productively in a manner that is mutually beneficial. Furthermore, the revaluation of the domestic currency (rmb) of a current account surplus econ-

omy like China which has fragile banking and financial system may trigger a financial crisis will have adverse repercussions not only on the domestic economy but also on its the major trading partners in the industrial world. Therefore, the current configuration of global imbalances as manifest in the 'global savings glut' is mutually beneficial to industrial countries like US and Australia and emerging market economies such as China as long as the industrial countries invest the borrowings implicit in the high current account deficits productively (Cooper, 2006).

8. Concluding observations

The global financial crisis has invalidated the Pitchford thesis that advocated that high current deficits were not a matter for policy concern as long as there was fiscal balance. The massive fiscal stimulus and the resulting high fiscal imbalances that have racked up government debt recasting the unsustainability of Australia's high current account deficit in a new perspective, requiring adjustment policy action. One relevant new perspective derived from the Salvatore hypothesis would recommend that the gradual adjustment of the high current account deficits as a ratio of GDP to half the current 6% level observed in US and Australia would avoid the triggering of explosive debt dynamics that would erupt in domestic as well as global economic turmoil. A second relevant policy challenge that faces Australian policy makers relates to the safeguarding of the free trade and investment environment without caving into the protectionist trade pressures and capital xenophobia that will discourage much needed investment by multinational corporations in Australia's resource sectors. The pure theory of international trade underscores that free trade is first best and that any restrictions of free trade or also free capital flows will not only reduce national welfare but also global welfare. Therefore, the promotion of the open trade and investment environment that has contributed to Australia's growth and prosperity over the post-War II era should be preserved as Australia as Australian policymakers face the challenging of navigating the economy through the rocky rapid of the global financial crisis on to robust path of recovery.

Appendix A. Database

Variables, Transformations, Sources

Variable	Transformation	Unit	Source	
C_t: consumption	$C_t = C_t/P_t \times N_t$	AUD bn.	IFS	c line 96f
Y_t: GDP	$Y_t = Y_t/P_t \times N_t$	AUD bn.	IFS	g line 99b
YRB_t: GNP	$(Y_t + rB_t)/P \times N$	AUD bn.	IFS	Gnp: line 99a
G_t govt. spending	$G_t/P_t \times N_t$	AUD bn.	IFS	g line 9
I_t: investment	$I_t = (I_t + S_t)/P_t \times N_t$	AUD bn.	IFS	i lines 93e + 93i
RB_t: net factor payments	$Y_t - YRB_t$	AUD bn	IFS	
CA_t:current a/c balance	$(Y_t - C_t - I_t - G_t)/P_t \times N_t$	AUD bn.	IFS	
P_t:implicit price deflator	2000 = 100	2000 = 100	IFS	p line 99bi
r: world interest rate	5%	$r = 1.05$	Model	Assumption
N_t: population	N_t	no bn.	ABS	Cat.3105.0

Notes: All variables are seasonally adjusted quarterly data expressed in billions of Australian dollars (AUD). The variables are converted to real per capita terms by dividing by the GDP price deflator × population.
N: population is given in billions of persons and sourced from ABS sources. *P*: Implicit price deflator a price index, base 100–2000. IFS: International Financial Statistics online published by IMF. ABS: Australian Bureau Statistics.

Appendix B. Notes on econometric tests

Zivot–Andrews (1992) breakpoint tests

The Zivot–Andrews unit root tests uses endogenous methods to determine structural breaks rather than imposing subjective procedure to determine the breakpoints as in the case of Perron unit root tests (Perron, 1989). The Zivot–Andrews tests aim to detect the presence of structural mean and slope structural breaks using the following equations, where Y refers to ZRB and C, respectively.:

$$Y_t = m + aDU_t(\lambda) + b\text{Time} + cY_{t-1} + \sum_{i=1}^{q} d_i\,\Delta Y_{t-i} + v_t \qquad (1) \quad \text{mean break}$$

where $DU_t(\lambda) = 1$ if $t > T\lambda$, 0 otherwise.$Y_t = m + aDU_t(\lambda) + b\text{Time} + cY_{t-1} + \sum_{i=1}^{q} d_{\text{i}}\,\Delta Y_{t-i} +$ v_t (2) slope breakwhere $DU_t(\lambda) = t - T\lambda$ if $t > \lambda$, 0 otherwise, and λ is defined as the fraction.

T_B/T, with T_B being the breakpoint.

Eq. (1) detects the presence of a possible mean break and Eq. (2) the presence of a slope break.

The above equations are estimated by the OLS method over the period covering $t = 2$ to $t = T - 1$. For each value of λ the t-statistic was derived for testing the null hypothesis that $c = 1$. The break quarter corresponds to the minimum t-statistic over all $T - 2$ regressions.

The above equations were estimated for the full-sample and sub-samples I and II each time using appropriate dummy variable DU or DT. The results reported in Table 3, indicate the minimum t-statistic and the corresponding time breaks. These minimum t-statistics indicate the occurrence of mean breaks and slope breaks. The above results confirm that despite the existence of endogenously determined structural breaks in the series of interest the tests do not reject the results of the unit root null in favor of trend stationary alternatives as predicted by Perron (1989).

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