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Intertemporal Consumption Smoothing and Capital Mobility: Evidence from Malaysia

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Abstract

Using a simple consumption smoothing model and cointegration tests with a structural break, this paper has re-examined the impact of changes in capital mobility and the current account's capacity to predict external performance in Malaysia. The model views the current account as a buffer through which private agents can smooth consumption over time in response to the temporary disturbances to output, investment, and government expenditure. The findings are as follows. Firstly, a structural break is empirically identified in the relationship between consumption and national cash flow in the year 1996, that is a year prior to the Asian Currency Crisis. Secondly, the most stringent restrictions of the present-value model are strongly rejected over the sample period. However informal tests (via Granger causality, correlation, and variance ratio tests) suggest that the consumption smoothing model is sufficient to predict the dynamic behavior of the Malaysian current account. Lastly, the results also suggest that Malaysia’s current account imbalance was sustainable prior to the 1997 crisis.

Introduction

Perhaps the most significant development in the world economy during the past decade has been the rapid process of globalisation and financial integration (also referred to as the degree of capital mobility). The process has been spurred by the achievements of the third industrial revolution and the impressive increases in capital flows. The general move towards international financial liberalisation by countries has been motivated by the fact that integration of financial markets allows for more efficient use and allocation of investment funds over time. However, with the emerging markets crises in the second half of the 1990s in the Asia-Pacific region, the role of foreign capital as an engine of growth in developing countries has once again come under intense re-examination.

Malaysia provides an interesting case for studying this issue. It has had periods of both liberalised and controlled capital flows and so provides an ideal case study to examine issues concerning financial integration, or the degree of capital mobility, in this region’s financial markets. After a decade of capital market liberalisation and substantial increases in capital flows, Malaysia imposed selective capital controls on 1st of September, 1998, in an effort to minimise the unavoidable deteriorations from the destabilising actions of currency speculators. These controls seem to have reversed the process of financial liberalisation.

Several studies have examined the degree of Malaysia's international financial integration using various estimation techniques. Among the conventional approaches used in these studies are comparisons of onshore-offshore nominal interest rates, and the correlation of saving and investment rates. However, the results from these studies are inconclusive. The studies which involve nominal interest rate comparisons generally indicate a high degree of capital mobility (such as de Brouwer, 1999), while those involving savings-investment relationships show relatively low levels of mobility (such as Mamingi, 1997, Bagnai and Manzocchi, 1996). Apart from the conventional approaches highlighted above, using a consumption smoothing model, Ghosh and Ostry (1995) have examined the degree of capital mobility for a sample of forty-five developing countries, and the hypothesis of full consumption-smoothing was statistically not rejected for about two-thirds of the sampled countries, including Malaysia. They have argued that although the vast majority of developing countries have some form of capital controls these have been largely ineffective, suggesting effective capital mobility has been quite high in developing countries including Malaysia.

This study is motivated by the following concerns. Firstly, conventional approaches for measuring the degree of capital mobility such as the saving-investment correlations, interest parity conditions, and the consumption correlation model often have their shortcomings. Among the major shortcomings are the 'spurious' results which occur from the ordinary least squares (OLS) estimate involving a non-stationary time series (see Engle and Granger, 1987). In the meantime, ignoring a structural break may contribute to the low power of those approaches, if the break date is expected to be significant in the relationships of the candidate models.

Following Ghosh and Ostry (2005), this study using a longer sample period aims to re-investigate the empirical issue relating to the capital mobility in Malaysia by using a consumption smoothing model. More precisely, this study revisits the results of Ghosh and Ostry (1995) by taking into account the possible bias of ignoring a structural break in estimation. Broadly speaking, if a structural break is presented, the conventional tests for cointegration approaches (such as Engle-Granger, 1987; Johansen, 1988) tend to be biased toward favouring the no cointegration null. For example, Cashin and McDermott (2002) have found a structural break in the relationship between consumption and national cash flow and hence the study does suggest that international capital flow acts as a buffer to smooth aggregate consumption after the break occurs. Clearly, this is the case for Malaysia. In its development since independence, Malaysia has experienced a few episodes of obvious changes in the economic environment and its structure, especially during the 1997 Asian Currency Crisis. Hence, it would be useful to re-examine the degree of capital mobility in Malaysia by using estimation methods which allow for structural break, and using a longer sample span.

Secondly, looking at Malaysia in particular, Ghosh and Ostry's (1995) study had several shortcomings. The sample span considered is relatively short, covering annual series from the period 1970 to 1990. In addition, the results are found to be inconclusive. There is no empirical support from the Malaysian data to show that the null hypothesis - that the current account does Granger-cause the subsequent movement in the national cash flow - is true, at a given conventional confidence interval. In other words, the estimated sign on the lag of the current account balance in the regression of the first-differenced of national cash flow and the first-differenced of the current account balance is found to be negative, but they are not jointly statistically different from zero (see Ghosh and Ostry, 1995, Table 2, p.315).

Furthermore, the null hypothesis of equal variances for the actual and optimal current account balances is also not supported by the Malaysian data (see Ghosh and Ostry, 1995, Table 4, p.327). In general, both results suggest that capital flows have not been sufficient to enable agents to fully smooth consumption in Malaysia. Interestingly, the results do not reject the null hypothesis that the coefficient on Δcfn_t, $\Phi_{\Delta cfn}$ should be zero, and the coefficient on *ca*, $\Phi_{\Delta ca}$ should be equal to unity,[1] if the model is valid. This finding implies that full consumption-smoothing could be applied to Malaysia over the sample period under studies (see Ghosh and Ostry, 1995,Table 3, p.326).

Finally, the current account deficits are often blamed for a host of economic problems experienced in many countries with both developed and developing economies. For example, the excessive current account deficits have been treated as one of the causes of the Asia Currency Crisis in 1997 including in Malaysia. Malaysia has recorded deficits in her current account for the periods of 1981-1983, 1988, 1994-1995, 1997, and 2000 (*International Financial Statistics*, International Monetary Fund). The current account deficits were above 5% of GDP in the years 1995 and 1996. The study by Baharumshah et al. (2003) has tested the sustainability of current account deficits for four ASEAN economies including Malaysia by the mean of cointegration between exports and imports variables (goods and services). In contrast, this paper attempts to re-assess the sustainability of the current account deficit against an optimal current account level derived from a consumption smoothing model. If the actual current account balances exceed the optimal current account balances from the consumption smoothing model, then this provides an empirical indication of "over-borrowing" and hence the current account balance position may in fact be a problem – unsustainable.

The remainder of the paper is organized as follows. In Section 2 the theoretical framework is presented. Section 3 describes the data, methods used for analysis, and the empirical results. The final section concludes the study.

The Theoretical Framework

The consumption-smoothing model has gained popularity in recent years because of its robustness and its simplicity. In general, this model combines the assumptions of high capital mobility and the permanent income theory of consumption to a small open economy in order to predict what would happen to capital flows if agents behaved in accordance with the permanent income theory. Another assumption is that the capital is freely mobile. A number of studies have applied this approach in order to assess the degree of capital mobility (Ghosh, 1995; Ghosh and Ostry, 1995; Obstfeld and Rogoff, 1995; Agenor et al., 1999; Cashin and McDermott, 2002).

Principally, the theoretical framework of the consumption-smoothing model can be drawn from the discrete time version of Sachs's (1982) model, which is essentially an extension of the rational expectations permanent income hypothesis of private consumption to an open economy.

By considering a small economy producing a single good, where the representative agent can borrow and lend freely in the international capital markets at a constant world real interest rate, *r*. The preferences of the representative agent are presented as Equation (1):

$$E_t \sum_{i=0}^{\infty} \beta_i U(c_i) \tag{1}$$

where E_t is the expectations operator, β is the subjective discount rate taking a value between 0 and 1, U (.) is the time separable utility function such that $U' > 0$, $U'' < 0$ and c is the consumption. The consumer's budget constraint is:

$$\Delta b_{t+1} = rb_t + q_t - i_t - c_t - \tau_t \tag{2}$$

where b denotes the level of foreign bonds held by the economic agent, q is the level of output or gross domestic output, i is the level of investment and τ is the lump-sum taxes and Δ is the first-difference operator. The government maintains a balanced budget, so that:

$$g_t = \tau_t \tag{3}$$

where g denotes government spending. Substituting Equation (3) into (2) yields:

$$b_{t+1} = (1+r)b_t + q_t - i_t - c_t - g_t \tag{4}$$

The representative consumer maximises Equation (1) subject to Equation (4) while imposing a quadratic utility function, $u(c_t) = c_t - c_t^2 / 2$ and the '*no Ponzi* game'. This yields the optimal level of consumption, c^*_t:

$$c^*_t = \frac{r}{\gamma}\{b_t + (1+r)^{-1} E_t \sum_{i=0}^{\infty} (1+r)^{-i} (cfn_{t+i})\} \tag{5}$$

where $cfn = q_t$-i_t-g_t. *cfn* is defined by Ghosh (1995) as national cash flow, and γ is a tilting parameter. If $\gamma < 1$, the country is tilting consumption toward the present. If $\gamma > 1$, the country is tilting consumption toward the future. For $\gamma = 1$, consumption is equal to the country's permanent cash flow.

Following Ghosh (1995), the current account is defined as:

$$ca_t = cfn_t - c^*_t \tag{6}$$

Substituting Equation (5) into Equation (6) yields the optimal current account, ca^*:

$$ca^*_t = cfn_t - \frac{r}{\gamma}\{b_t + (1+r)^{-1} E_t \sum_{i=0}^{\infty} (1+r)^{-i} (cfn_{t+i})\} \tag{7}$$

by assuming $\gamma = 1$, and simplifying, we obtain:

$$ca^*_t = -E_t \sum_{i=1}^{\infty} (1+r)^{-i} \Delta(cfn_{t+i}) \tag{8}$$

The Equation (8) illustrates that the optimal current account as the expected present discounted value of changes in the national cash flows.

Using the fact that the k-step-ahead expectation is $E_t x_{t+k} = \alpha^k x_t$, where x_t is the vector of Δcfn_{t+1} and $ca_{t+1,}$ and using the vector [1 0] to take out the forecast of cfn_t, then Equation (8) can be re-written as:

$$\begin{aligned} ca^*_t &= -\sum \frac{1}{(1+r)^i} \begin{bmatrix} 1 & 0 \end{bmatrix} \alpha^i x_t \\ &= -[1\ 0] \frac{\alpha}{(1+r)} \sum \frac{1}{(1+r)^i} \alpha^i x_t \\ &= -[1\ 0][\frac{\alpha}{(1+r)}][I - \frac{\alpha}{(1+r)}]^{-1} \begin{bmatrix} \Delta cfn_t \\ ca_t \end{bmatrix} \\ &= \begin{bmatrix} \Phi \Delta cfn_t & \Phi ca \end{bmatrix} \begin{bmatrix} \Delta cfn_t \\ ca_t \end{bmatrix} \end{aligned} \tag{9}$$

where I is the 2x2 identity matrix and x is $\begin{bmatrix} \Delta cfn_t \\ ca_t \end{bmatrix}$. Expression (9) is valid as long as the infinite sum in Equation (8) converges. This requires that the variables appearing in the *x* matrix of the VAR system are stationary, in order to avoid the so-called 'spurious' results (see Engle and Granger, 1987). Since the cfn_t enters as the first difference in the VAR, the concern here is the stationarity of the current account. In principle, under the assumption of high capital mobility, a country's current account might not be stationary. To get around this problem, Ghosh (1995) has defined the consumption-smoothing current account as the residual series from the cointegration regression of cfn_t on c_t, if both the variables are non-stationary, $I(1)$, and the residual series is stationary in levels, $I(0)$. The cointegrating equation between cfn_t and c_t is represented as Equation (10).

$$ca_t = cfn_t - \hat{\gamma} c_t \tag{10}$$

where $\hat{\gamma}$ is the estimated consumption tilting parameter. On the other words, if the non-stationary variables of cfn_t and c_t are cointegrated, the consumption-smoothing current account must be stationary in levels.

A number of tests can be performed once the optimal current account series, ca^*_t has been generated. One can then calculate the variance of ca^*_t to serve as a benchmark against which the variance of the actual consumption smoothing current account can be compared in order to test the joint hypothesis of perfect capital mobility and consumption smoothing behaviour. Under the null hypothesis, the variance of ca^*_t should be equal to the variance of ca_t. If the variance of actual ca_t deviates significantly from the variance of the optimal ca^*_t, this would imply that the economy has not fully exploited the opportunity available from the international capital market to smooth consumption in response to changes in national cash flows.

In addition, there are three testable implications of Equation (9). In other words, informal tests can be derived from Equation (9) in order to test the degree of capital mobility. The first is, to test whether the current account does Granger-cause the subsequent changes in national cash flow. According to Otto (1992, 2002), the significance of a causation relationship from current account balance to national cash flow, in Granger's sense can be seen from the estimated sign and whether the coefficients of the lags of ca_t are jointly significantly different from zero. That is the sum of the coefficients on the lags of ca_t should be negative. The justification is that a current account deficit is a signal of an expected increase in future cash flows, while a current account surplus is a signal of expected decreases in future cash flows.

The second implication is that if the VAR parameters in Equation (9) conform to the non-linear restriction, that is if the model is valid, then the theoretically predicted value of [$\Phi\Delta_{cfn}$, Φ_{ca}] is [0,1]. The standard errors of these coefficients are computed numerically as $\nabla\Gamma V \nabla\Gamma'$ where V is the variance-covariance matrix of the parameter of the VAR, and $\nabla\Gamma$ is the gradient of [$\Phi\Delta_{cfn}$, Φ_{ca}] with respect to the VAR parameters. More formally, this is a Wald statistic for the joint test, that Φ_{ca} is unity and other coefficients are zero, has a χ^2 distribution with a degree of freedom equal to the number of restrictions.[2]

Finally, a slightly weaker version of the model can also be tested that allows for transitory consumption which is uncorrelated to all leads and lags to be compared with other disturbances in the model. If the model is true and there is no transitory consumption, then Z_t ,defined as [ca_t - Δcfn_t - $(1+r)$ ca_{t-1}], is uncorrelated with all past ca_t and Δcfn_t. However, if transitory consumption is allowed for, then Z_{t+1}=[ca_{t+1}–cfn_{t+1}-$(1+r)ca_t$] should be uncorrelated with all past ca_t and cfn_t. Both hypotheses can be tested by constructing Z_t and Z_{t+1} and running regressions with lagged value of ca_t and cfn_t.

In sum, as suggested by Otto (1992), there are three testable implications of the present value test. In doing this, in the following sections, this study has to examine:

(i) the stationarity of the current account balance variable in levels;

(ii) whether ca_t does Granger-cause Δcfn_t;

(iii) the statistical validity of the model's restrictions; and

(iv) a comparison of the actual current account with the optimal current account series.

Data, Methods and Empirical Results

The variables used to estimate the parameters of the model are essentially of annual national accounts for the period 1960 to 2000. The data are obtained from the International Monetary Fund's International Financial Statistics database.[3] All of the data have then been converted into real terms by dividing the nominal value with the price index, Consumer Price Index of Malaysia given that the GDP deflator are not available for earlier years. In addition, the world interest rate is set at 4%.[4]

Here, the estimation and testing of the model involve four steps. The first step is to examine whether the Malaysian current account balance series is stationary or not. This is required as all series in the VAR must be stationary in order to avoid the so-called 'spurious' relationships of OLS estimates (see Engle and Granger, 1987). The current account balance is constructed as per Equation (10). Unit root tests can be performed in order to test the stationarity of current account series via Augmented Dickey-Fuller, ADF (Dickey and Fuller, 1979) and Phillips-Perron (1988) tests. The results reported in Table 1 indicate that the *ca* series is non-stationary and is integrated of order one, or in *I*(1) process. Following Shibata and Shintani (1998), this result suggests that the Malaysian capital mobility is high.

Table 1. Unit Root Tests

Variable	ADF test		PP test
	t-statistics (ρ)	Q(20) (p-value)	t-statistics
ca (c)	-1.14 (1)	12.66 (0.58)	-0.89
cfn (T)	0.15 (0)	14.36 (0.81)	-1.69
c (T)	-1.00 (2)	13.68 (0.66)	-1.09
Δca (c)	-3.91 (1)***	15.40 (0.49)	-5.61***
Δcfn (c)	-2.71 (0)*	8.54 (0.93)	-5.02***
Δc (c)	-4.50 (2)***	8.27 (0.97)	-4.19***

Note: (c) means a constant is included. (T) means a constant and a trend are included. (ρ) means the chosen lag length to include in each series. *Q*(20) refers to the *Q*-statistics with 20 degrees of freedom. The MacKinnon (1991) critical values for the ADF and PP tests for the sample size of 500 are 1% -3.44, 5% -2.87, 10% -2.57. * and *** denotes statistical significance at 10 and 1% respectively.

In order to obtain a stationary current account balance, Ghosh (1995)'s methodology has been used, that is to construct a consumption-smoothing component of the current account by removing the non-stationary component of the actual series associated with consumption tilting. Then, the second step is to obtain an estimate of the tilting parameter, γ. This estimate can be obtained from Equation (10) as a cointegrating parameter between c_t and cfn_t.

Several cointegration tests have been applied on the cointegrating relation between c_t and cfn_t. A visual inspection of Figure 1 suggests that these two series are moving together over the sample period under studied, except between the year of 1996 and 2000. However, the results of Engle-Granger and Johansen tests as illustrated in Table 2 and Table 3 fail to support a cointegration of these two variables.[5]

Figure1. Plot of consumption (c) and national cash flows (cfn)

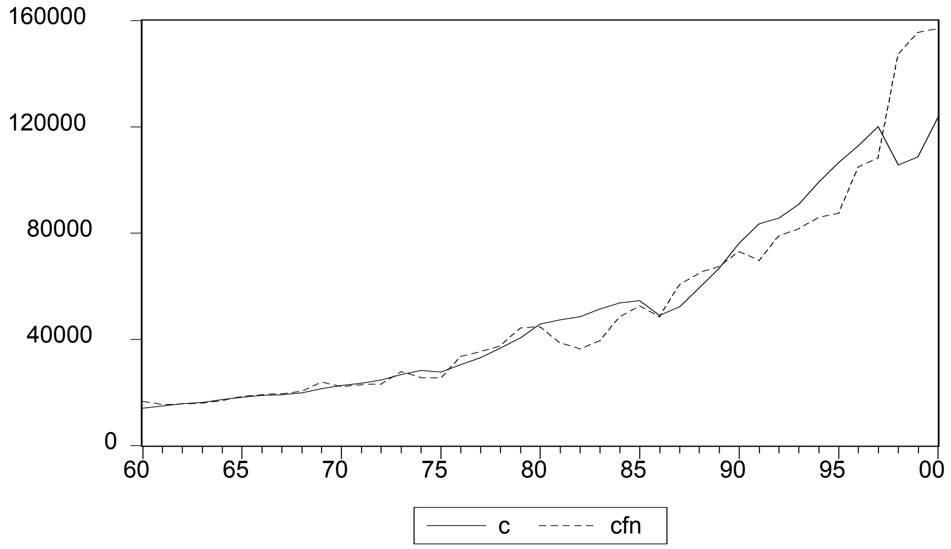

Table 2. Engle-Granger tests for cointegration

Dependant Variable	constant	*c*	*cfn*	$\overline{R}^2$	Residual	ADF test on residuals t-stat (ρ)	Q(20) (p-value)
cfn	-29.78 (-0.81)	1.1 (17.88)	----	0.8	Residcfn	-3.47 (2)**	4.81 (0.997)
c	80.79 (2.68)		0.83 (17.88)	0.9	Residc	-2.75 (0)	8.74 (0.986)

Note : residcfn obtained from regressing *cfn* on *c*, residc obtained from regressing *c* on *cfn*. t statistics are in parentheses column two to four. (ρ) means the chosen lag length to include in each series. *Q*(20) refers to the *Q*-statistics with 20 degrees of freedom . Philips and Ouliaris (1990) t-critical values for the cointegration regression with constant are 1% -3.96, 5% -3.37, 10% -3.07. ** significant at 5% .

Table 3. Johansen cointegration tests

	λ_{max}		λ_{trace}	
Null Hypothesis(Ho) Alternative Hypothesis (H_1)	r=0 r = 1 35.198**	r=1 r = 2 11.412**	r=0 r > 0 46.610**	r≤1 r ≥ 2 11.412**

Note : The second column reports the λ_{max} statistics as the number of observations multiplied by ln(1-$\hat{\lambda}_i$) where $\hat{\lambda}_i$ is the estimated values of the characteristic roots or eigenvalues obtained from the estimated π matrix. The last column reports the λ_{trace} statistics as the summation of λ_{max} statistics. **denotes significance at 5%. The critical value or the λ_{max} at 5% significance level are 15.75 (n-r =2), 9.094(n-r = 1). The Osterwald-Lenum (1992) critical value for the λ_{trace} at 5% significance level are 20.168(n-r = 2), 9.094 (n-r = 1) where n denotes the number of variables in the model, r denote the number of cointegrating vectors.

As discussed earlier, a finding of non-cointegration can be tentatively related to the ignorance of structural break(s), when conventional cointegration tests such as Engle and Granger, and Johansen tests applied. In this context, the next step is to test a cointegration relationship between private consumption c_t and national cash flow cfn_t in the presence of a possible regime shift (or bread date). Based on the visual inspection on Figure 1, the possibility of a regime shift is most likely at the end of 1990s due to the unexpected contagion effect of currency crisis in the region. In fact, before 1997, Malaysia has experienced a period of impressive consecutive years of growth after the economic recession in the year of 1985. The average growth rate is 7.8% per annum over a period of twelve consecutive years. Clearly, the 1997 Asian Currency Crisis dramatically undermined the confidence of the investors in the country; successive depreciation of the Ringgit and major corrections in the equity market; generally lead to weaker investor confidence. In addition, the full effects of the regional financial crisis on the Malaysian economy were felt in 1998. For the year as a whole, the real output declined by 7.5%. With the uncertain economic outlook and employment prospects, the adjustment has been reflected in reduced consumption and investment. Nevertheless, the economic activity in Malaysia has been rebounded from a contraction of 7.5% in 1998 to record a strong positive growth of 5.4%.

This explanation suggests that there is a possibility of a regime shift in behaviour as the private sector adapts to the new economic environment. However, the timing of any such shift is likely to be unknown (or uncertain), so this study has applied the cointegration test proposed by Gregory and Hansen (1996) since this test allows for the timing of any regime shift to be unknown *a priori*. The Gregory and Hansen (1996) test is also an ADF test on the residuals, but it is associated with a cointegrating model with a structural break. The null hypothesis is no cointegration between national cash flows (*cfn*) and private consumption (*c*), while the alternative hypothesis is a one-time regime shift in the cointegration relationship.

More generally, the Gregory and Hansen test, which allows for a shift in the slope, is constructed by first running the regression:[6]

$$cfn_t = \mu_0 + \mu_1 d_t + \beta_1 c_t + \beta_2 d_t c_t + \varepsilon_t \qquad (13)$$

where d_t is a dummy variable define by $d_t = 0$ if $t \leq \lambda T$

$d_t = 1$, otherwise

and λ denotes the timing of the change in terms of a fraction of the sample. In this case, λ takes a value between 0.15 to 0.85 of the full sample size, T.[7]

The Gregory and Hansen's (1996) approach is to compute the usual t-statistics associated with an ADF regression on the residuals obtained from estimating the augmented cointegrating equation over all possible break points and choosing the smallest t-value across all possible break points. The lag length k is selected on the basis of a t-test following a procedure similar to Perron and Vogelsang (1992). In general, this study includes as many lag terms as possible to ensure the error terms series are white noise. Given a small sample study of 41 annual observations, this study initially sets K_{max} to 4, and then pared down insignificant lags by the usual standard critical value approach.

Table 4. GH Test for breakpoints from 1986 to 1997

Breakpoints (year)	ADF t-stats
1986	-3.64
1987	-3.71
1988	-3.91
1989	-3.99
1990	-4.21
1991	-4.53
1992	-4.32
1993	-4.30
1994	-4.23
1995	-4.25
1996	**-5.89**
1997	-3.80

The results of the Gregory and Hansen (1996) tests are presented in Table 4, and the results do suggest there is a one-time shift in the cointegrating relationship in the year of 1996 with a t-value of -5.89 which exceeds the 5 percent critical value of -4.95 (Gregory and Hansen,1996, p.109) suggesting c_t and cfn_t are cointegrated conditional on a structural break in their relationship at 1996.[8]

$$\begin{array}{l} \widehat{cfn}_t = 41.96 + 0.85c_t + 19.6d_t + 0.06d_t c_t \\ \qquad\quad (1.36) \quad (13.9) \quad (2.76) \quad (2.29) \end{array} \qquad (14)$$

The Equation (14) reveals that the tilting parameter is statistically significant and less than unity, both before and after the structural break, implying that the Malaysian has consumed more than its permanent cash flows and has forgone future consumption in favour of present consumption. More importantly, the preference for current consumption over future consumption (consumption tilting) has become more pronounced after year 1996.

Turning to the third step, an unrestricted bivariate VAR model has been estimated via OLS estimator. With the annual data used, the AIC suggests lag-length of order 2. With estimates of the coefficients from the VAR, this study calculates the optimal ca as based on Equation (9). Once the ca^* has been computed, a number of hypothesis tests can be conducted in order to evaluate the degree of capital mobility in Malaysia. The results of these tests are summarised in Table 5: the first two columns give the coefficients and standard errors for the VAR. The next two columns present tests of the restrictions imposed by the theory on the VAR with the information set dated *t* and *t+1*. The last column presents estimates and standard errors in Equation (9). Standard errors for the vector $[\Phi\Delta cfn_t, \Phi ca_t]$ are calculated numerically as explained in Section 2.

Table 5. Statistical tests on consumption-smoothing model without capital controls

	VAR				
	Δcfn_t	Δca_t	Z_t	Z_{t+1}	$\Delta ca^*_{t-1} = KZ_{t-1}$
Δcfn_{t-1}	0.216 (0.163)	-0.024 (0.144)	-0.24 (0.186)	-0.35 (0.175)	-0.73 (0.77)
Δcfn_{t-2}	0.550 (0.152)	0.440 (0.134)	-0.11 (0.173)	-0.21 (0.228)	-0.35 (0.34)
Δca_{t-1}	-0.225 (0.009)	0.947 (0.163)	0.13 (0.21)	0.21 (0.20)	1.32 (1.05)
Δca_{t-2}	-0.254 (0.102)	-0.545 (0.175)	-0.29 (0.23)	-0.54 (0.211)	-0.27 (0.42)
R^2			-0.14	0.03	
F-stat (p-value)			1.93(0.42)	2.83(0.38)	
χ^2 (p-value)					1631.3 (0.00)
p-value of the F-test that ca_t Ganger cause Δcfn_t is 2.0E-05 p-value of the F-test that Δcfn_t does not granger cause ca_t is 0.086 $\sigma(ca_t)/\sigma(\hat{ca}_t) = 0.71 \quad corr(ca_t, \hat{ca}_t) = 0.86$					

Note: parentheses indicate the standard errors. Z_t is constructed as $[ca_t - \Delta cfn_t - (1+r)ca_{t-1}]$. Z_{t+1} is leading Z_t one period forward. *K* is the vector $[\Phi\Delta cfn_t, \Phi ca_t]$ in Equation (9).

It is clear from Equation (9) that if the consumption-smoothing model is valid, then the coefficient on Δcfn should be equal to zero, and the coefficient on ca_t should be equal to unity. These joint restrictions have been tested by a mean of a Wald test. With the results shown in the last column, the Chi square test statistic has a p-value of 0.00 implying that the null hypothesis is strongly rejected. This result suggests that this model is not empirically supported by the Malaysian data. In fact the coefficient on the lagged values of Δcfn_t and ca_t as reported in column 4 and 5 are jointly significantly different from zero. This indicates an inconsistency with the strongest restrictions implied by the present-value model of the current account, even after allowing for the possibility of transitory errors.

Nevertheless, the data fulfilled several informal forms of consumption-smoothing tests. Firstly, this study finds that current account balance does Granger-cause the changes in the national cash flow. As suggested by Otto (1992, 2002), a causality relationship from current account balance to the changes in the national cash flow can be established via the significance of sign and the coefficients of the lags of ca_t. And, the sum of the coefficients on the lags of ca_t should be negative. Notice that in Table 5 the sum of the lags of ca_t is negative and jointly statistically significant at 10 percent level. The hypothesis that ca_t does not Granger-cause Δcfn_t is rejected at the 1 per cent level of significance. Finally, the actual and optimal series are found to be highly correlated. The time series plot of ca^*_t and ca_t variables are illustrated in Figure 2. A visual examination of this graph clearly suggests that the consumption-smoothing model fits the Malaysian data well. The optimal values of the current account variable (dashed line) track the actual values quite well, including turning points. The coefficient of correlation between the two variables is 0.86. This implies that this model can be sufficiently used in predicting the current account fluctuations, such as the run of sizeable deficits in the early 1980s and sharp current account deficit prior the 1997's currency crisis. All of these findings are found to be consistent with the present value model that there is a weak evidence of consumption-smoothing, such as the case of Malaysia.

Figure 2. Actual and optimal values of current account

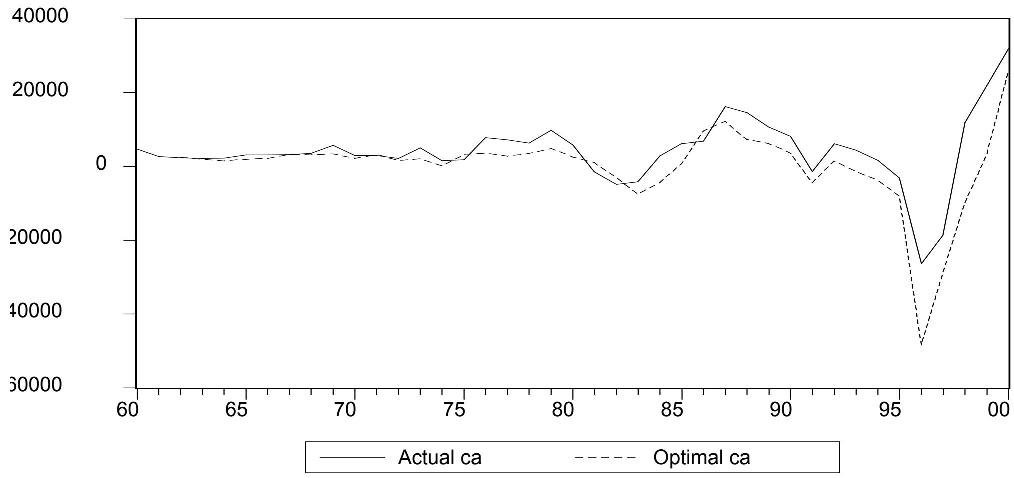

Table 6 reports the sample variance of ca_t and ca^*_t. The sample variance of the actual, in general, is found to be less than the variance of the optimal ca_t. More precisely, the null hypothesis that the variance of ca^*_t equalled the variance of ca_t is tested by using Wald test and Siegel-Tukey test. The results of the F-test and the Siegel-Tukey test fail to reject the null hypothesis that the two sample variances are equal at 10 percent level.

Table 6. Variance Ratio of the actual and optimal current account

Variance (Δca_t)	Variance (Δca^*_t)	Ratio	F-test (p-value)	Siegal-Turkey (p-value)
86837964	122000000	0.71	1.69(0.15)	0.11(0.7)

Note: Ratio = variance (ca_t) / variance (ca^*_t). Figure in parentheses are the p-value for the test of the null hypothesis that the variance of ca^*_t is equal to the variance of ca_t.

Interestingly, Otto (1992) and Ostry (1997) have argued that even though the most stringent time series properties of the model are not exactly met, if ca^*_t tracks ca_t closely, then the model offers potentially useful insights into the behaviour of the current account of the country. Nevertheless, a statistical rejection of the model may be of little economic importance.

In addition, Ostry (1997) has argued that the main element of the behaviour being modelled here is private consumption and savings. If the actual current account deficit exceeds the optimal deficit generated by the model, this provides an indication of 'over-borrowing' for private consumption purposes and hence of a current account position which may in fact be a problem. The plot of both series as seen in Figure 2 implies that Malaysia had been running current account deficits in the mid 1980s and early 1990s. However since the actual current account deficit has been smaller than the deficit predicted by the consumption-smoothing model, it suggests that there is no evidence of excessive borrowing for private consumption. Thus, the current account deficits in Malaysia prior to the 1997 Asian Currency Crisis are found to be sustainable. Our finding is consistent with Baharumshah et al.'s (2003) study. Using the intertemporal budget constraint model applied to ASEAN-4 countries, they have found there is no evidence to indicate that Malaysia's current account deficit is on an unsustainable path prior to the crisis.

Conclusions

The main purpose of this study is to apply the consumption smoothing model for re-investigating the degree of capital mobility in Malaysia. More specifically, this study assesses the behaviour of Malaysia's current account balance against an optimal current account level derived from a consumption smoothing model. This study finds that the model tracks remarkably well the historical data over the period 1960 to 2000. More interestingly, the empirical results suggest that the current account deficits are sustainable prior to the 1997 Asian Currency Crisis. Thus, this finding implies that Malaysia's current account deficit is not at a dangerously high level prior to the 1997 Asian Currency Crisis.

Although it has been found that the Malaysian data fail to pass a battery of stringent tests of the model that is, for the actual current account series to be identically equalled to the optimal current account, this was not surprising. As documented in Bergin and Sheffrin (2000) and Nason and Roger (2002), this is a *typical* finding in the present value model. According to them, although the graphical analysis suggests that the simple inter-temporal model can explain much, the model is routinely rejected by the data. Nevertheless, several less formal tests suggest that the consumption-smoothing models may have some ability to track the dynamic behaviour of the Malaysian current account balances. First, the current account variable does Granger-cause the national cash flow. And second, the actual and optimal current account series are found to be highly correlated, as is apparent from the time series plots. The evidence of consumption-smoothing in Malaysia which in turn implies the existence of sufficiently open channels between Malaysia and the world capital market to allow for a considerable degree of capital mobility to smooth aggregate consumption despite periodic capital controls imposed during the estimation period. However, the study does not suggest that the periodic exchange controls in Malaysia are largely ineffective; rather this suggests that the effective degree of capital mobility in Malaysia may be quite high with regard to the periodic controls.

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[1] The test based on equation 9 in p. 9.

[2] The Wald statistic is also calculated numerically. If we take k=[$\Phi\Delta_{cfn}$, Φ_{ca}] and $\tilde{k}$ as the difference between the actual k and the hypothesis value, then the Wald statistic is computed as $\tilde{k}[\nabla\Gamma V \nabla\Gamma']^{-1}\tilde{k}$.

[3] Private Consumption, *c*, line 96f; Government Consumption, *g*, line91ff; Investment, *i*, line 93ee+93i; GNP, $rb+q$, line 99a; GDP, *q*, line 99b.

[4] An annual world interest rate of 4% has been employed in Sheffrin and Woo (1990), Ghosh (1995), Ghosh and Ostry (1995), Cashin and McDermott (1998, 2002), and Agenor et al. (1999). It is assumed that small open economies can borrow from the rest of the world without inducing changes in the world interest rate.

[5] The two step Engle-Granger procedure showed that one regression supports co-integration at the 5% significance while the reverse regression rejects co-integration. The results of Johansen tests suggest national cash flows (*cfn*) and private consumption (*c*) are cointegrated at rank of two,

which implies that both series are stationary instead of cointegrated. In sum, the results of these two tests for cointegration fail to establish an empirical evidence of a cointegration relationship between national cash flows and private consumption.

[6] There are three type of shifts considered in the tests. The cointegrating equation allowing for a mean-shift, for a mean shift with trend and for a regime shift, i.e. shift in the mean and slope coefficient. All three tests were applied although visual inspection of

Figure1

[7] This is the range of λ suggested by Gregory and Hansen (1996)

[8] t-values are in parentheses.