Revista de Análisis Económico, Vol. 17, Nº 2, pp. 95-121 (Diciembre 2002)

THE INTERTEMPORAL APPROACH TO THE CURRENT ACCOUNT: EVIDENCE FOR CHILE

SERGIO A. SALAS LANDEAU*
Universidad de Chile

Abstract

This paper studies the existence of "excess" current-account imbalances in Chile in the 1960-1999 period. This phenomenon is modelled using present value tests that allow for variable interest rates and exchange rate fluctuations. Despite its simplicity, most of the observed imbalances in the current account are accounted for by the model. Results suggest that using models where agents behave as forward-looking rational agents, is a valid framework. Moreover, the analysis highlights the relevance of variable interest rates and exchange rates. Results also imply that capital controls, that were widely used in the period under study, were not effective.

I. Introduction

In the intertemporal approach of the current account, we view imbalances as a result of forward looking, dynamic saving and investment decisions. "Consumption smoothing" plays a central role in determining the magnitudes of current account imbalances. Theory has emphasized the Permanent Income Hypothesis, which suggests that changes in consumption are explained by revisions in expected discounted future incomes. When an agent with rational expectations gathers more information which leads him to expect a rise in future income, he would

* I would like to thank to Rómulo Chumacero for helpful suggestions and discussions. Also, I would like to thank to the seminar participants at the Department of Economics of the University of Chile and to the participants of the "Encuentro de Economistas Punta de Tralca 2002" for their comments.

use the credit market to rise consumption before the actual change in income. This is the notion of "consumption smoothing" which requires non borrowing constraints. Under the representative agent paradigm, a country use international markets to borrow (capital inflows and outflows) and smooth consumption, and this would explain current account imbalances.

In this intertemporal approach, it is also possible to measure the external sustainability of the current account, an issue that has major importance for many countries. Evaluating whether the current account deficit of a country is sustainable is, however, a hard task as discussed in Milesi-Ferreti and Razin (1996). Sustainability is related with solvency. An economy is solvent if the present discounted value of future trade surpluses equals current external indebtedness; this is satisfied when the country meets its intertemporal budget constraint. The practical applicability of this theoretical definition is reduced by the fact that it relies on future events and policies.[1] Hence the relevance of the notion of sustainability; a deficit would be sustainable if the continuation of current account imbalances in the future under no changes in the main features of the macroeconomic environment does not violate solvency.

Another approach towards measuring the ability of countries to meet their obligations is to study the notion of "excessiveness". Excessiveness can be measured by finding what current account balance would be predicated by a model consistent with intertemporal optimization subject to a budget constraint and comparing it with actual data. This kind of approach relies heavily on the Rational Expectations Permanent Income Hypothesis discussed at the beginning of this section.

The concept of "excessiveness" imposes a more rigid test in finding evidence of the inability of countries to meet their obligations, because this measure is based on deviations from an "optimal" benchmark, derived under the assumption of perfect capital mobility and efficient markets.

This paper follows an approach originally devised by Campbell (1987) to derive the optimal current account balance of an optimizing agent and find evidence of the Permanent Income Hypothesis, and test whether Chile's current account imbalances are excessive.

Previous simple intertemporal models imply that the current account surplus of a country should be equal to the present value of expected future declines in output, net of investment and government purchases. A VAR involving current account and output is usually estimated to compute what the optimal current account should be according to the model.[2] This can be compared and tested formally to check if it is equal to the actual current account. This simple model has as a main ingredient the notion of consumption smoothing.

Further extensions of this model deal with incorporating certain features that characterize small open economies.[3] Specifically, the role of external shocks is analyzed in this kind of model. It is expected that these shocks affect the economy mainly through interest rate movements or changes in the exchange rate. Interest rate movements would have the role of "unsmoothing" consumption. Moreover an anticipated rise in the relative price of internationally traded goods can increase the cost of borrowing from the rest of the world, when interest is paid in units of these goods. This can cause intertemporal substitution as well. Moreover, anticipated changes in this relative price can have intratemporal effects by inducing substitution toward nontraded goods. In this paper these extensions are taken into account when analyzing the excessiveness of current account imbalances in Chile.

During the period analyzed (1960: 1999), several factors influence the behavior of current account imbalances (see Figure 1(a)). Underneath the movements in the series there are not only the "consumption smoothing" (or unsmoothing) forces but also structural factors that impinge in the decision of saving and investment.

According to Morandé (1998), Chile made an early attempt to get into a sustained growth path by means of liberalizing and restructuring the economy, in 1976-1981, after a deep depression in 1975. Growth improved in 1976 and beyond but the financing of investment were primarily made with credit from abroad (given the liberalization policy that included opening the current account). This being the main cause of the recession in 1982 since there was an abrupt cut in foreign inflows after the current account deficit reached a record in 1981.

In the 1985-1991 period, the increase in investment that followed economic recovery was financed mainly through domestic saving, which grew as a result of the reform of the pension system. This being potentially a part in the explanation of current account surplus until 1993.

II. The Model and Estimation Techniques

This section describes a model presented in Obstfeld and Rogoff (1996) and extended further in Bergin and Sheffrin (2000). The model describes the behavior of a representative agent with rational expectations. This agent aims to maximize utility taking not only intertemporal optimization but also intratemporal optimization. The reason of the intratemporal concern is that the model considers two goods, traded and nontraded goods. So, in each period, the agent must choose optimally to allocate consumption expenditure between the two goods. Of course, as usual, the agent must choose consumption, or real consumption (an index that aggregates both type of goods) so as to maximize intertemporal utility as well, using external assets to this end. Specifically, the agent maximizes:

$$\max_{C_t^*} E_0\left[\sum_{t=0}^{\infty} \beta^t U\left(C_t^*\right)\right] \tag{1}$$

subject to:

$$Yt - (C_{T,t} + P_t C_{N,t}) - I_t - G_t + r_t B_{t-1} = B_t - B_{t-1} \tag{2}$$

where C_T and C_N are consumption of traded and nontraded goods, respectively. Y_t denotes the value of current output, I_t is investment expenditure, and G_t is government spending on goods and services. Since there is no money in this model, all variables are measured in terms of traded goods. The relative price of nontraded goods in terms of traded goods is P_t, B_t is the stock of external assets at the beginning of the period t, r_t is the net world real interest rate in terms of traded goods. By convention r_t is the interest rate calculated over external assets, from period t–1 to period t. The left side of the budget constraint (2) is by definition the current account. Also we can express total consumption expenditure in terms of traded goods as $C_t = C_{T,t} + P_t C_{N,t}$. $C^* = \Theta(C_T, C_N)$ is a linear homogeneous function of C_T and C_N. This function is interpreted as an index of total consumption, which is called real consumption. We specialize this function to a Cobb-Douglas function: $C^* = C_T^a C_N^{1-a}$. Assuming further a CES specification for the utility function $U(\bullet)$, we can rewrite (1) as:

$$\max_{C_{T,t}, C_{N,t}} E_0\left[\sum_{t=0}^{\infty} \beta^t \frac{1}{1-\sigma}\left(C_{T,t}^a C_{N,t}^{1-a}\right)^{1-\sigma}\right]$$

$$\sigma > 0, \qquad 0 < a < 1.$$

where σ is the coefficient of relative risk aversion, and a is the share of traded consumption in the real consumption index.

In the Appendix A, we show the derivation of the following Euler equation related with the consumption optimization:

$$1 = E_t\left[\beta(1 + r_{t+1})\left(\frac{C_1}{C_{t+1}}\right)^{\sigma}\left(\frac{P_t}{P_{t+1}}\right)^{(1-\sigma)(1-a)}\right] \tag{3}$$

where $\gamma = 1/\sigma$ is the intertemporal elasticity of substitution. Assuming joint log normality for C_t and P_t and constant variances and covariances, equation (3) may be written as[4]:

$$E_t \Delta c_{t+1} = \gamma E_t r_{t+1}^* \tag{4}$$

where r_{t+1}^* is a *consumption based real interest rate* defined by:

$$r_t^* = r_t + \left[\frac{1-\gamma}{\gamma}(1-a)\right]\Delta p_t + \textit{constant terms} \tag{5}$$

Also, we define $\Delta c_{t+1} = LnC_{t+1} - LnC_t, \Delta p_{t+1} = LnP_{t+1} - LnP_t$, and $(1/\sigma) = \gamma$ equals to the intertemporal elasticity of substitution. The constant terms will be irrelevant for the estimation since we demean the series later.

Equation (4) shows the main ingredients in the optimal behavior of the representative agent. For example if it is expected that the real interest rate will rise, then current consumption is more expensive, so this leads to lower current consumption relative to the future with elasticity γ. It is possible to find another intertemporal effect concerning a change in the relative price of the nontraded goods. If the price of traded goods is currently low and expected to rise (this means that Δp_t is negative), then the future repayment of a loan is relatively high. The consumption based interest rate r^*_{t+1} rises above the conventional interest rate, and lowers the current total consumption expenditure relative to the future with elasticity $\gamma\,(1-a)$. There is also an intratemporal effect that arise from the expected change in the relative price of nontraded goods. Again, if the price of traded goods is temporarily low relative to nontraded goods, the representative agent will substitute toward traded goods by the intratemporal elasticity (unity under the Cobb-Douglas specification). This rises total current consumption expenditure by elasticity $(1-a)$. This intratemporal effect will be dominated by the intertemporal effect if the intertemporal elasticity γ is grater than unity.

Equation (4) also tells something important. If we do not consider the consumption based real interest rate, unexpected temporal shocks changes the current account because of the desire to “smooth” consumption, to this end, the agent would trade external assets. Once changes in the terms of such borrowing or lending are allowed as equation (4) expressed, the agent could be willing to “unsmooth” consumption as described in the last paragraph.

To derive a testable implication of the model, some work must be done in the intertemporal budget constraint. We can write the dynamic constraint (2) as follows:

$$CA_t = Y_t - (C_{T,t} + P_t C_{N,t}) - I_t - G_t + r_t B_{t-1} \tag{6}$$

$$= NO_t - C_t + r_t B_{t-1} \tag{7}$$

where net output is defined as: $NO_t \equiv Y_t - I_t - G_t$. We also define a market discount factor for date s consumption, so that:

$$R_s = \frac{1}{\prod_{j=1}^{s}\left(1+r_j\right)}$$

Now summing over all periods of the infinite horizon, and imposing the following transversality condition:

$$\lim_{t\to\infty} E_0\left(R_t B_t\right) = 0$$

we çan write an intertemporal budget constraint:

$$\sum_{t=0}^{\infty} E_0\left(R_t C_t\right) = \sum_{t=0}^{\infty} E_0\left(R_t NO_t\right) + B_0 \tag{8}$$

where B_0 is initial net foreign assets. This last equation can be log linearized as follows[5]:

$$-\sum_{t=1}^{\infty}\beta^{t}\left[\Delta no_t-\Delta c_t\right]=no_0-c_0 \tag{9}$$

where lower case letters represent the logs of upper case counterparts. The procedure of linearisation necessarily implies the assumption that the steady state (around which to linearise) of the net foreign assets is zero (see Appendix B for the derivation).

Now we can take expectations in (9) and combine it with the Euler equation (4) to obtain (using the law of iterated expectations):

$$-E_t\left[\sum_{s=t+1}^{\infty}\beta^{s}\left(\Delta no_s-\gamma r_s^{*}\right)\right]=no_t-c_t \tag{10}$$

Notice that the right hand side of this equation is approximately the same as the right hand side of (7), which in turn is equal to the current account. Then we label this transformed current account as CA_t^{*}, which is the current account derived from the postulated model:

$$CA_t^{*}=-E_t\left[\sum_{s=t+1}^{\infty}\beta^{s}\left(\Delta no_s-\gamma r_s^{*}\right)\right],\qquad CA_t^{*}\equiv no_t-c_t \tag{11}$$

This last equation tells us the dynamics of the current account. If net output is expected to fall, the current account will rise because the representative agent wants to smooth consumption. However, he could also “unsmooth” consumption, because of changes in the consumption based real interest rate. If the consumption based real interest rate is expected to rise, the current account will rise also. So, if for example the agent has expectations of lower future output, this would lead him to “save for rainy days”, but if the consumption based real interest rate falls, this can temper the agent desire to lend because of the low opportunity cost of present consumption.

Equation (11) characterizes the “optimal” current account. The problem with estimating (11), is that we do not know how the agent forms expectations of future realizations of net output and consumption based real interest rate. Campbell (1987) first address this issue by noticing that under the null hypothesis of (11), the current account itself should incorporate all of the consumer’s information on future values of the linear combination of consumption based interest rate and net output changes specified in that equation. Also because empirically there could be some persistence in the macroeconomic series, lagged values of net output and the consumption based real interest rate can be useful in predicting that combination. All of this leads us to estimate a VAR for representing consumers forecasts:

$$\begin{bmatrix} \Delta no \\ CA^{*} \\ r^{*} \end{bmatrix}_t = \begin{bmatrix} \phi_{11} & \phi_{12} & \phi_{13} \\ \phi_{21} & \phi_{22} & \phi_{23} \\ \phi_{31} & \phi_{32} & \phi_{33} \end{bmatrix} + \begin{bmatrix} \Delta no \\ CA^{*} \\ r^{*} \end{bmatrix}_{t-1} + \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}_t$$

This VAR can also be written more compactly as $y_t = Fy_{t\text{-}1} + u_t$. Also it would be the case that: $E_t[y_{t+i}] = F^i y_t$. Of course this can be generalized for a higher order VAR. Notice that equation (11) can be written using the VAR as:

$$CA_t^{*} = -\sum_{i=1}^{\infty} \beta^i \left(g_1 - \gamma g_2\right) F^i y_t \tag{12}$$

where g_1 = [1 0 0] and g_2 = [0 0 1] (this can also be generalized for a higher order VAR).

Now if the VAR is stationary, it is possible to write (12) as:

$$CA_t^{*} = \left[-\left(g_1 - \gamma g_2\right)\beta F\left(I - \beta F\right)^{-1}\right] y_t \tag{13}$$

With the estimated parameters of the VAR and some values for the parameters β, γ and a, it is possible to find the estimated optimal current account[6]:

$$\widehat{CA_t^{*}} = k y_t \tag{14}$$

where

$$k = -(g_1 - \gamma g_2)\beta \hat{F}(I - \beta \hat{F})^{-1} \tag{15}$$

and $\hat{F}$ is the matrix of estimated parameters from the VAR.

$\widehat{CA_t^{*}}$ can be compared with the actual (modified) data on current account (equation 11), as an indication of how well the restrictions of the theory (and method of forecasting) are satisfied. Moreover, formal test of this equality can be conducted by calculating a χ^2 statistic for the null hypothesis that [0 1 0] = k, under this null: $CA_t^{*} = \widehat{CA_t^{*}}$. Let $\tilde{k}$, be the difference between the actual k and the hypothesized value, then the following test:

$$\tilde{k}'\left[\left(\partial k / \partial F\right) V \left(\partial k / \partial F\right)'\right]^{-1} \tilde{k} \tag{16}$$

will be distributed chi-squared with three degrees of freedom (or the number of restrictions in a higher order VAR). Where V is the variance-covariance matrix of the estimated parameters in the VAR, and $\partial k / F$ is the matrix of derivatives of the k vector with respect to the parameters of the VAR.

III. Data Description

The availability of data for Chile allows us to use quarterly data from 1960:1 to 1999:4. All data are taken from the Central Bank databases. A measure of the world real interest rate has been computed following the method of Barro and Sala-i-Martin (1990). First, we collected short term nominal interest rates, T-bill rates or equivalent, on the G-7 economies from the IFS (International Financial Statistics). We need to adjust this rate for inflation expectations which are more reliable forecasts for short periods of time, hence the reason to use short term nominal rates. Inflation in each country is measured using that country's consumer price index, and expected inflation is constructed by estimating first an appropriate ARMA(p, q) process for each country, and then calculating a one step ahead forecast.[7] The nominal interest rate in each country then is adjusted by inflation expectations to compute an ex-ante real interest rate. Finally, an average ex-ante real interest rate was computed using time varying weights for each country based on its share of real GDP in the G-7 total, this gives us the series r_t.

The net output series, NO_t was constructed by subtracting investment and government purchases from GDP, adjusted by population. We use this in log and difference form Δno_t. The series for the current account variable CA_t^*, were constructed for each country by subtracting the log of consumption, adjusted for population from the log of net output.

We use as a proxy for P_t the real exchange rate of Chile, as computed in the database of the Central Bank. We follow Rogoff (1992) and Bergin and Sheffrin (2000) in this approach. An ex-ante expected exchange rate appreciation is computed, using again an appropriate ARMA process, and calculating a one step ahead forecast.[8] Finally, we compute the consumption based real interest rate r_t^* using the calculated world real interest rate and the exchange rate appreciation as expressed in (5). Because we are interested in the dynamic implications of the intertemporal model, the three series, Δno_t, CA_t^* and r_t^* are all demeaned.

We also need values for the parameters β, a and γ. For the first of these parameters the model itself might be useful to find out its value. In the steady state, the Euler equation (3) implies that $\beta = 1/(1+\bar{r})$, where $\bar{r}$ represents the steady state value of the world interest rate. Taking the mean of this variable in our data set, we find that β 0.95.[9] Regarding the share of traded goods in private final consumption we follow the strategy of trying different values of the parameters, and we also take as a guide some empirical estimations for United States. We choose to take two different values: $a = 1/2$ and $a = 2/3$. We show that there is a slight variation in the results from using this two values.

The intertemporal elasticity γ was traditionally the most complicated parameter. The literature seems to assign a value of 0.5 or bigger for this parameter, so we use this value. Also, we use a value of this parameter chosen so as the optimal current account match the variance of the actual series, this value turns out to be grater than 0.5, but not so different.

IV. Results

In order to evaluate the performance of the model, we are going to rely mainly in two measures: as a guidance, a visual comparison of the predicted optimal current account with the actual current account, to seek for matching turning points and volatility of the series. We also calculate confidence intervals for the optimal current account to check if the actual current account falls in it. The other measure comprehends more formal tests to asses whether the estimated optimal current account is different from the actual. First the chi squared test was computed as expressed in (16). In all of the estimations the optimal lag of the VAR was defined to be 2, according to usual tests.[10] Under the null ($\widehat{CA_t = CA_t}$) this test is distributed asymptotically as a χ^2 with six degrees of freedom. This result tough, hold under the hypothesis of normality. We perform then a normality test on VAR's residuals which yields to strongly reject normality raising doubts on the accuracy of the tests for all the estimations.[11] We then resort to bootstrapping to find critical chi squared values for rejection of the null hypothesis. Furthermore, we calculate a more accurate measure of bootstrap for the tests using block bootstrap which bootstraps the series itself (and not the residuals of the VAR) to correct for possible bias raising from omission of auto correlations in the traditional bootstrap.[12] Given our finding of non-normality, the confidence intervals for the optimal current account were also computed by bootstrap and block bootstrap (though main results does not change, so we do not show confidence intervals based on block bootstrap, but we report the correspondent failure measure, see Table 1).

Moreover, we have computed sign tests for the model. In the context of the current account is important to check the match between the sign of the optimal current account and the actual series, since a divergence in signs would imply that our theoretical model says that for example the country borrows to finance consumption, and the actual series is saying that the country is lending resources abroad. The test sign computes the probability that both, the model and actual series, share the same current account sign. It is also possible to compute conditional probabilities that the optimal current account is positive when the actual series is positive and conditional probabilities that the optimal current account is negative, given that the actual series is negative respectively. The null hypothesis of this this test is that the probability is 0.5. This would imply that there is no useful structure in the theoretical model to explain the current account in signs and matches just happen by coincidences (the probability estimations can be done by Maximum Likelihood Estimation). Finally, we also compute the variance ratio of the optimal current account to the actual one. If the model predicts actual current account fluctuations, this ratio should be close to one.

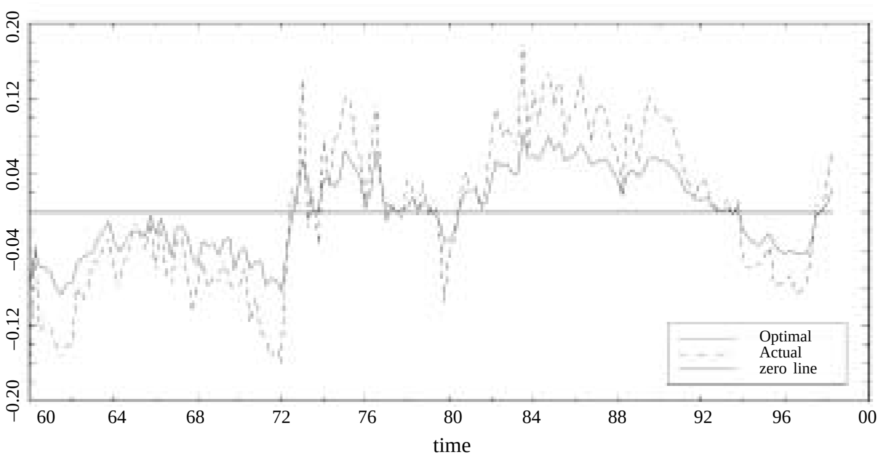
All this information is summarized in Figures 1 to 5 and in Table 1 for several estimations of the "optimal" current account (labelled case 1, case 2, etc.). The reason of having several estimations is that our aim is not only to find the correct model that best explains current account imbalances, but also, by taking full advantage of the variables included in the theoretical model, to check the relevance of some variables in explaining current account movements. Moreover, all the tests (formal and informal) can help us to assign values to some parameters the theoretical model use, for example the intertemporal elasticity of substitution γ, and the share of consumption of traded goods a.

We begin therefore, to calculate a predicted current account not considering the consumption based real interest rate r^* (see equations 5 and 11). In this case the current account in the theoretical model should be equal to the negative of the expected present value of changes in net output. That is, the possibility of "unsmooth" consumption, is not considered here.

We also calculate the eigenvalues for the matrix F, and check that all of them lies outside the unit circle.[13] Then the VAR is stationary and we proceed to calculate the matrix k in (15) and find, using this vector, what current account the model implies as postulated in (14). In Figure 1(a) we present the optimal current account along with the actual current account.

FIGURE 1(a)

CASE 1 (WITHOUT r^*)
OPTIMAL CURRENT ACCOUNT VS. ACTUAL CURRENT ACCOUNT

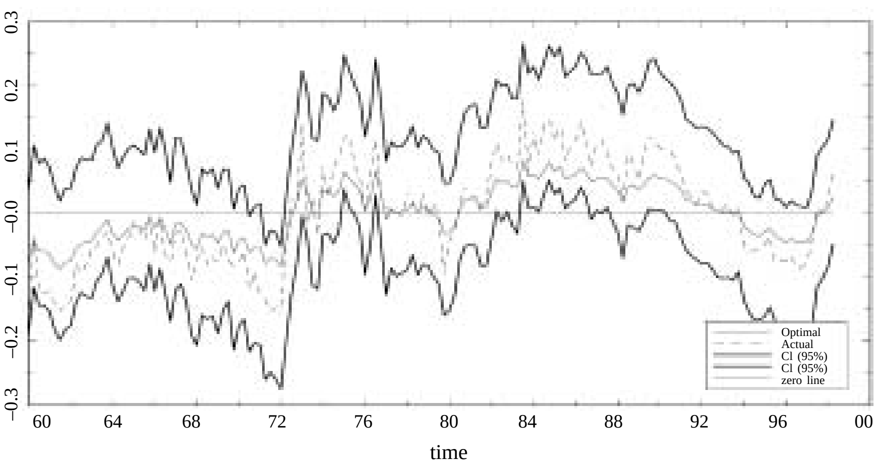


The graphical performance of this simple model is surprisingly remarkable, considering that the consumption based real interest r^* has not been taken into account. Remember that by not including the consumption based real interest rate we are precluding this country of consumption unsmoothing by disregarding the effects of changes in the world interest rate and expected changes in the exchange rate. Also, as it can be seen in the first panel of Table 1, the overall performance of the model is not bad. Both Failure and Failure (BB) are zero and the formal χ^2 test cannot reject the null hypothesis that the vector k is [0 0 1 0], so the restrictions of the theory are satisfied. Also, both the conditional and unconditional probabilities of success are approximately 0.94, different from 0.5. But we should be cautious in this case because it appears that confidence intervals are too wide, as can be seen in Figure 1(b), so that the accuracy of them is not appropriate. Moreover, the ratio of variances is only 0.28 in Table 1, and this is also something that is evident from the figure. In this case the "optimal" current account is underestimating the magnitude of the actual current account fluctuations.

With regard to the overall fluctuations of the actual series of the current account, two periods in the recent history of the current account draws attention. The periods of 1972 and 1980 where the deficit in the current account is high, the imbalances anticipate deep recessions in Chile in the years 1975 and 1982.

FIGURE 1(b)

CASE 1 (WITHOUT *r**)
CONFIDENCE INTERVALS BY BOOTSTRAP



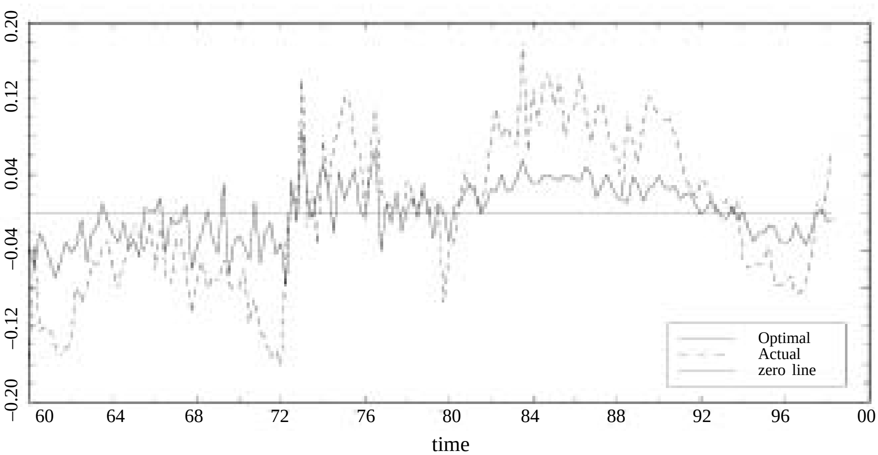
We can verify in Figure 1(b), that all of the observations lie within the interval, but the interval itself is too wide. Moreover, the confidence interval includes zero in most of the time as well as a wide range of positive and negative values for the current account.

It is very likely that the model improves a lot with the incorporation of the consumption based real interest rate.

We take then into account the consumption based real interest rate. Notice that the effects from changes in this rate may come from two sources, changes in the world real interest rate, or expected changes in the exchange rate. In order to identify which one is the source that mainly explains current account movements, we first estimate the model without world interest rate (and including exchange rate) in Figure 2, and without exchange rate (and including world real interest rate) in Figure 3. In both cases the vector *k* should not be statistically different from [0 0 1 0 0 0], for the model not to be rejected.

FIGURE 2(a)

CASE 2 (WITHOUT WORLD INTEREST RATE, γ = 0.5, *a* = 2/3)
OPTIMAL CURRENT ACCOUNT VS. ACTUAL CURRENT ACCOUNT



From this figure it is possible to see that little improvement has been made. In general, the optimal current account changes little, there is more volatility but the same underestimation of variance is observed. In fact the variance ratio has lowered to 0.14 compared with the first estimation as can be seen in the second panel of Table 1. Moreover, the probabilities of success have also fallen to the range of 0.79-0.82, far from 0.5 though. Some improvement is observed however in some periods of the sample. The volatility and magnitude of the model match better actual series in the seventies, suggesting the importance of the expected appreciation in the current account.

In Figure 2(b) it is possible to see that there has been some improvement in the estimation of confidence intervals. Now, some observations lie outside the interval but this is precisely because this last result. Both confidence intervals leads to similar results, according to the bootstrap, 0.17 observations lie outside the interval, and 0.08 according the block bootstrap which can be seen in Table 1. Also, the formal χ^2 test does not reject the null hypothesis. Notice that in this case the value chosen for the parameters in the estimation were $\gamma = 0.5$ and $a = 2/3$, which turn out to be in the range of reasonable values according to estimations in the complete model as we are going to see later.

We turn now to the estimation that considers the world interest rate and not the expected exchange appreciation. The series can be seen in Figure 3(a).

FIGURE 2(b)

CASE 2 (WITHOUT WORLD INTEREST RATE, $\gamma = 0.5$, $a = 2/3$)
CONFIDENCE INTERVALS BY BOOTSTRAP

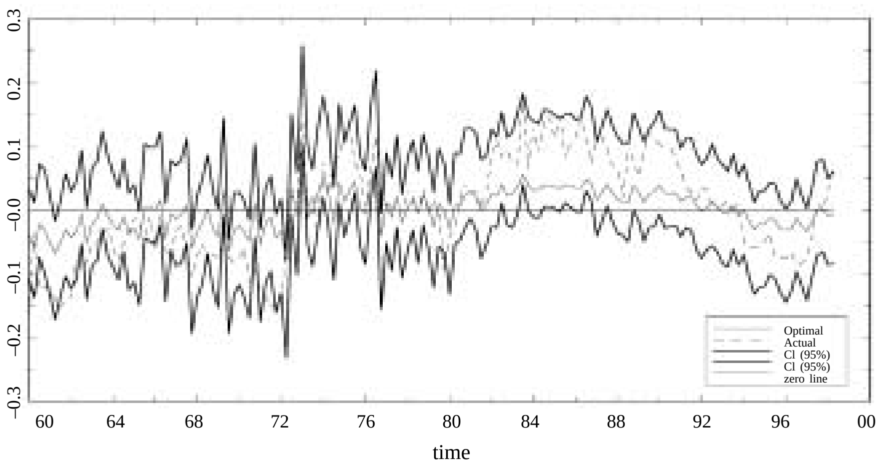
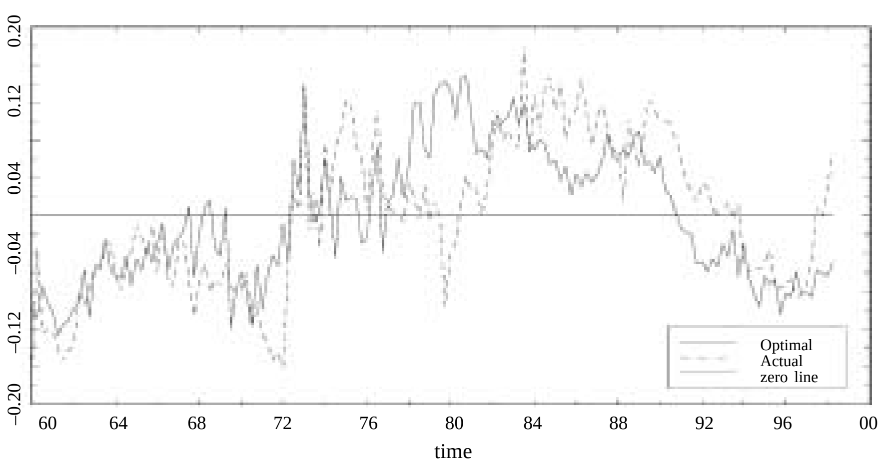


FIGURE 3(a)

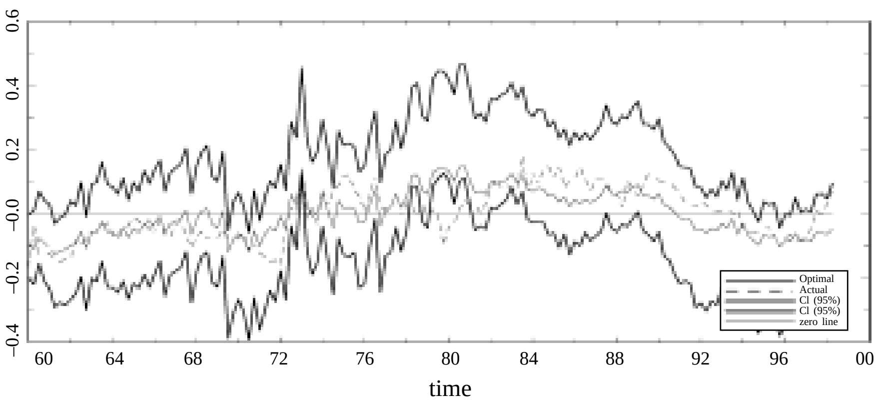
CASE 3 (WITHOUT EXCHANGE RATE, $\gamma = 0.5$, $a = 1$)
OPTIMAL CURRENT ACCOUNT VS. ACTUAL CURRENT ACCOUNT



It is clear that the variable that most explain current account imbalances is the world real interest rate. This is an expected result since we are considering a case where the country is small. Notwithstanding, the model performs worse for the late seventies and early eighties. Table 1 also give some useful measures for comparison with the previous case (that not incorporate this variable). Again neither model is rejected given the bootstrap chi squared critical values. But the variance ratio is much better for the case of considering only the world interest rate: 0.78. Moreover the percentage of failure in bootstrap confidence intervals gives more reliability for the model that considers the real interest rate (0.07 and 0.06 for the bootstrap and block bootstrap respectively). Although confidence intervals are a little bigger for this model than the previous case, this is corroborated in Table 1, since both measures of failure, by bootstrap and block bootstrap leads to fewer observations outside the intervals. The probabilities of success have not changed much either. However, one period where exchange rate variations seems to be quite important is in 1980, when the model including just exchange rate variations is capable of explaining to some extent, the deep imbalance of that period.

FIGURE 3(b)

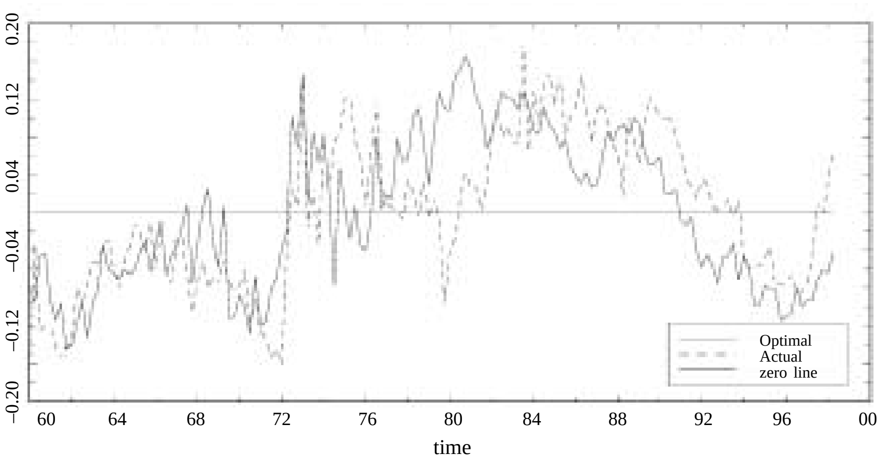
CASE 3 (WITHOUT EXCHANGE RATE, $\gamma = 0.5$, $a = 1$)
CONFIDENCE INTERVALS BY BOOTSTRAP



Finally we considered two models, both fully take into account all the variables detailed in Section II. That is the consumption based real interest rate was included as defined in (5). For the value of parameters, we tried two different specifications. In Figure 4 we take $\beta = 0.95$, $a = 2/3$, and we chose γ, so as to match the variance of the actual series. This gives $\gamma = 0.604$. In Figure 5, we take $\beta = 0.98$, $a = 1/2$, and $\gamma = 0.5$.[14] The reason to try a different value for the parameter β is that we think that this value is more appropriate for quarterly data. Details in the several measures of comparison can be observed in the fourth and fifth panels of Table 1. Again, given that the order of the VAR is 2, the vector k should not be statistically different from [0 0 1 0 0 0] for the model not to be rejected.

FIGURE 4(a)

CASE 4 (γ = 0.604, a = 2/3)
OPTIMAL CURRENT ACCOUNT VS. ACTUAL CURRENT ACCOUNT



With the inclusion of both the world real interest rate and the expected appreciation of the exchange rate the performance of the model improves a lot. In this figure we are considering a traded goods share of a = 2/3 and the intertemporal elasticity that match the variance of actual series that is g = 0.604. Still, there is some problem in matching some imbalances of the current account. In general the signs are correct, as it can be verified in the fourth panel of Table 1. Besides, the probabilities of success ranges from 0.76 to 0.82 different from 0.5. Furthermore, the percentage of failure are again low, close to 0.08. But it is not easy to replicate the magnitude of the imbalances, because even in this case where the intertemporal parameter has chosen to match the variance, observation of the series implies that some movements of the actual series be unexplained by the theoretical model.

Confidence intervals are wide and the percentage of failure is low as expressed in Table 1. However, in the period of a deep imbalance of the current account, 1980-1982, the model is unable to match the sign of the actual current account. Furthermore, confidence intervals do not include the actual observation in that date. The formal tests leads us to not reject the model as it happened in every model we have analyzed.

FIGURE 4(b)

CASE 4 (γ = 0.604, a = 2/3)
CONFIDENCE INTERVALS BY BOOTSTRAP

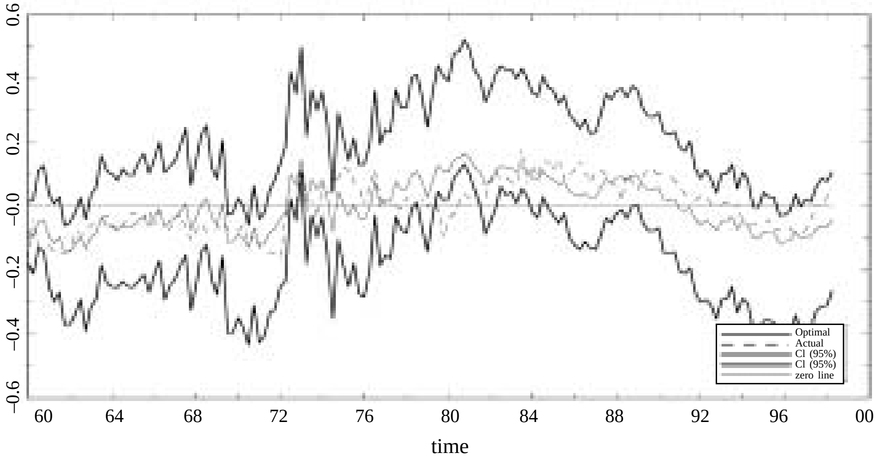
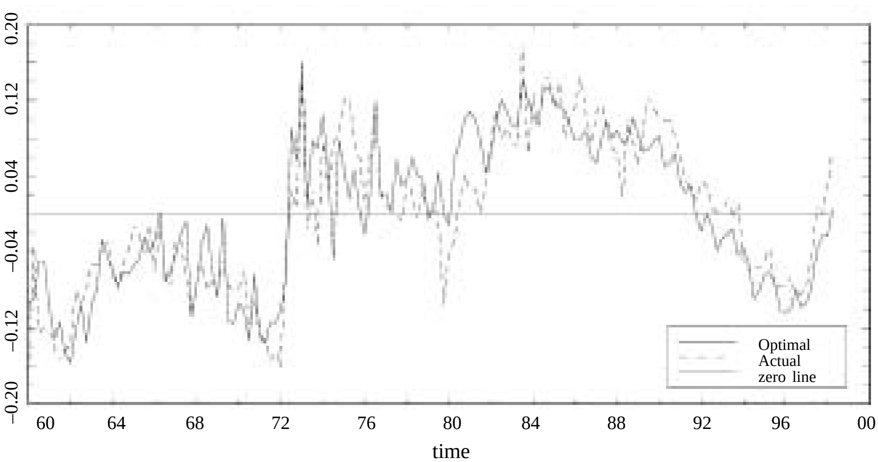


FIGURE 5(a)

CASE 5 (β = 0.98, γ = 0.5 AND a = 1/2)
OPTIMAL CURRENT ACCOUNT VS. ACTUAL CURRENT ACCOUNT

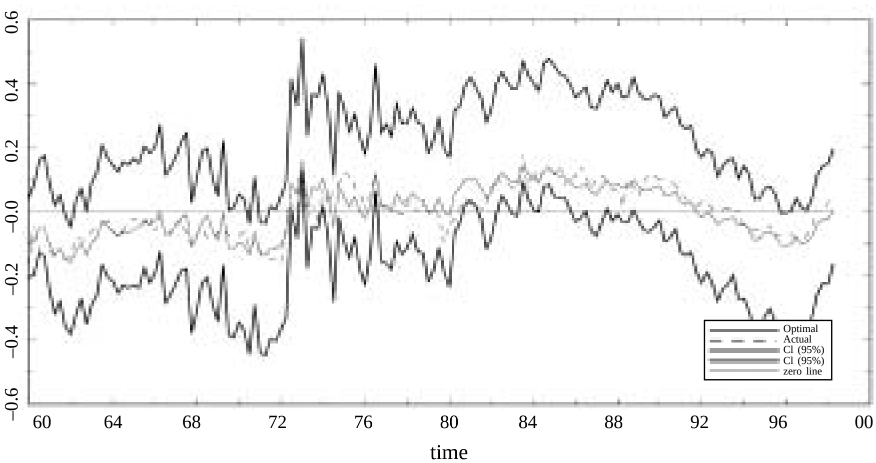


The series improves a lot with respect to the previous figure. Moreover, now the model captures the sign of the current account in the troubled period of the beginning of the eighties. Also by looking at the fifth panel of Table 1, it is possible to see improvements in different ways, both the failure measure and the probability of success improve, again the model cannot be rejected. The problem of variance is absent in this case since the variance ratio is 0.96, statistically not different from unity. The probabilities of success are far grater than 0.5.

The variance of the actual current account in this series is not statistically different from the optimal one. This would imply that capital controls were not effective. According to the literature,[15] there were two periods in the sample where capital controls were widely used in Chile: 1978-82 and 1991-98, with the more stringent policy in the former period. We calculate the variance ratio in these sub-periods for this last specification (Figure 5), and find that they were 1.18 and 1.05 respectively, giving some support about the effectiveness of this control in the period 1978-82, but not in the latter period.

FIGURE 5(b)

CASE 5 (β = 0.98, γ = 0.5 AND a = 1/2)
CONFIDENCE INTERVALS BY BOOTSTRAP



In this case we can see that the confidence intervals includes the imbalance of the beginning of the eighties, besides that confidence intervals are about the same width of the previous figure. As the fifth panel of Table 1 indicates, probabilities of success are beyond 0.86 and the percentage of failure below 0.00065.

Observation of the Figures 4 and 5, lead us to conclude that there is an improvement over past specifications, many changes in current account are matched in time by both models and specially in the last estimation.

Comparison of Figures 1 and 5, leads to asses the importance of the incorporation of the consumption based real interest rate in this kind of models of present value. Usually the evidence that the optimal variance was less volatile that the actual variance of the current account was interpreted in the light of the "excess smoothness" of consumption (see for example Deaton, 1992). Results suggest that explanations of this fact has to do with the possibility of "unsmooothing" consumption.

The general conclusion with regard of the behavior of the theoretical model is that it is quite successful in explaining most of the imbalances. The variance of the actual series is also matched once we take into account the world real interest rate and exchange rates.

It is not possible to state that imbalances in the current account of Chile for the period investigated were excessive. By implication, capital controls imposed through the period analyzed were not effective according to our results.

TABLE 1†

CASE 1 (WITHOUT r*)

Vector k:

$$\begin{bmatrix} no_t & no_{t-1} & CA_t^* & CA_{t-1}^* & r_t^* & r_{t-1}^* \end{bmatrix}$$

[–0.05 0.37 –0.11 0.18 – – – –]

Failure	Chi squared test
0	666
Failure (BB)	Critical Chi
0	905
Unconditional probability of success	Critical Chi (BB)
0.94*	888
Conditional probability of success (+)	Variance ratio
0.94*	0.28
Conditional probability of success (-)	
0.93*	

CASE 2 (WITHOUT WORLD INTEREST RATE, $\gamma = 0.5$, $a = 2/3$)

Vector k:

$$\begin{bmatrix} no_t & no_{t-1} & CA_t^* & CA_{t-1}^* & r_t^* & r_{t-1}^* \end{bmatrix}$$

[–0.37 0.22 –0.22 –0.08 0.11 –0.03]

Failure	Chi squared test
0.17	140
Failure (BB)	Critical Chi
0.08	242
Unconditional probability of success	Critical Chi (BB)
0.80*	196
Conditional probability of success (+)	Variance ratio
0.82*	0.14
Conditional probability of success (-)	
0.79*	

CASE 3 (WITHOUT EXCHANGE RATE, $\gamma = 0.5$, $a = 1$)

Vector k:

$$\begin{bmatrix} no_t & no_{t-1} & CA_t^* & CA_{t-1}^* & r_t^* & r_{t-1}^* \end{bmatrix}$$

[–0.35 0.27 2.91 –0.1 0.15 –0.47]

Failure	Chi squared test
0.07	55
Failure (BB)	Critical Chi
0.06	113
Unconditional probability of success	Critical Chi (BB)
0.79*	116
Conditional probability of success (+)	Variance ratio
0.76*	0.78
Conditional probability of success (-)	
0.83*	

CASE 4 ($\gamma = 0.604$, $a = 2/3$)

Vector k:

$$\begin{bmatrix} no_t & no_{t-1} & CA_t^* & CA_{t-1}^* & r_t^* & r_{t-1}^* \end{bmatrix}$$

[–0.37 0.25 1.86 –0.13 0.25 0.74]

Failure	Chi squared test
0.07	50
Failure (BB)	Critical Chi
0.09	106
Unconditional probability of success	Critical Chi (BB)
0.79*	107
Conditional probability of success (+)	Variance ratio
0.76*	1
Conditional probability of success (-)	
0.82*	

CASE 5 ($\beta = 0.98$, $\gamma = 0.5$, $a = 1/2$)

Vector k:

$$\begin{bmatrix} no_t & no_{t-1} & CA_t^* & CA_{t-1}^* & r_t^* & r_{t-1}^* \end{bmatrix}$$

[–0.4 0.49 0.73 –0.15 0.34 0.38]

Failure	Chi squared test
0.006	76
Failure (BB)	Critical Chi
0.006	168
Unconditional probability of success	Critical Chi (BB)
0.88*	165
Conditional probability of success (+)	Variance ratio
0.86*	0.96
Conditional probability of success (–)	
0.90*	

† **Failure** measures the proportion of observations of the actual current account balance that lies outside the confidence intervals. **Failure (BB)**, is the same measure but using the confidence intervals from the block bootstrap. **Unconditional probability of success** is the probability that the model follows actual current account in sign. **Conditional probability of success** (+) and (–), is the probability that the model leads to a positive current account when the actual series of the current account is positive, and leads to a negative current account when the actual series of the current account is negative respectively. **Critical chi** and **Critical chi (BB)** is the critical chi squared calculated from bootstrap and block bootstrap respectively. **Variance ratio** is the ratio of the optimal variance of the current account over the actual series.

* Statistically different from 0.5.

V. Conclusions

Our search of a model that captures movements of the current account has led us to a specification where the importance of consumption "unsmoothing" has prevailed. We have shown that as a small country Chile's current account is greatly influenced by external shocks such as variations in the world interest rate and changes in exchange rate.

The model captures major current account imbalances in most of the time. Moreover, given that we find no statistical evidence that the current account predicted by the model differs from the actual current account, is not possible to say that there is "excessiveness" of current account imbalances. When considering the model without incorporating the consumption based interest rate, the variance of the optimal current account is smaller than the actual one, a result previously related in the literature with "excess smoothness" of consumption. Once the consumption based real interest rate is introduced, there is no difference between variances of the series.

Results of this paper also suggests that in general, capital controls, widely used in Chile's history, were not effective.

Finally, it would be desirable in future work to take into account some additional considerations such as investment dynamics or liquidity constraints, which are not incorporated in our model, or many other aspects such as the modelling of labor decisions.

APPENDIX A

DERIVING THE EULER EQUATION

For the derivation of the Euler equation (3), we must first solve the intratemporal optimization of the agent. Recall that we have defined real consumption as an index with the following specification: $C_t^* = C_{T,t}^a C_{N,t}^{1-a}$. It is possible to interpret this index as a (intratemporal) utility function which can be maximized under the restriction: $C_t = C_{T,t} + P_t C_{N,t}$. Doing so, we can easily find the optimal consumption of traded and nontraded goods:

$$C_{T,t} = aC_t \quad C_{N,t} = \frac{(1-a)}{P_t} C_t$$

That is, we have found the Marshallian demands for traded and nontraded goods.

In this point, we need to define the *consumption-based price index* P_t^*, which is defined as the minimum consumption expenditure $C_t = C_{T,t} + P_t C_{N,t}$ such that $C_t^* = 1$ given P_t.

Substituting the Marshallian demands in the real consumption index we get:

$$\left(aC_t\right)^a \left[(1-a)\frac{C_t}{P_t}\right]^{1-a} = C_t^*$$

by the definition of the consumption-based price index we can write this last expression as:

$$\left(aP_t^*\right)^a \left[(1-a)\frac{P_t^*}{P_t}\right]^{1-a} = 1$$

From which the solution:

$$P_t^* = P_t^{1-a}\left[a^{-a}(1-a)^{-(1-a)}\right]$$

follows.

This last expression allows us to rewrite the budget constraint (2) as[16]

$$Y_t - P_t^* C_t^* - I_t - G_t + r_t B_{t-1} = B_t - B_{t-1}$$

and the utility function as: $U(C_t^*) = [1/(1-\sigma)](C_t^*)^{1-\sigma}$. Following well known methods of optimization we get the Euler equation:

$$1 = E_t\left[\beta(1+r_{t+1})\left(\frac{P_t^*}{P_{t+1}^*}\right)\left(\frac{C_t^*}{C_{t+1}^*}\right)^{\sigma}\right]$$

For empirical estimation purposes we can rewrite this last equation in terms of consumption expenditure and the relative price of nontraded goods:

$$1 = E_t\left[\beta\left(1+r_{t+1}\right)\left(\frac{C_t}{C_{t+1}}\right)^{\sigma}\left(\frac{P_t}{P_{t+1}}\right)^{(1-\gamma)(1-a)}\right]$$

Which is the Euler equation (3).

We can also express the Euler equation (3) as[17]

$$\frac{C_t^{-\sigma}P_t^{(\sigma-1)(1-a)}}{1+r_{t+1}} = \beta E_t\left[C_{t+1}^{-\sigma}P_{t+1}^{(\sigma-1)(1-a)}\right]$$

Next, we can assume joint log normal distribution between the variables:

$$\begin{bmatrix} -\sigma LnC_{t+1} \\ -\left[(1-\sigma)(1-a)\right]LnP_{t+1} \end{bmatrix} \sim N\left\{\begin{bmatrix} -\sigma E_t\left[LnC_{t+1}\right] \\ -\left[(1-\sigma)(1-a)\right]E_t\left[LnP_{t+1}\right] \end{bmatrix}, \begin{bmatrix} \sigma^2\sigma_c^2 & \sigma\left[(\sigma-1)(1-a)\right]\sigma_{cp}^2 \\ \sigma\left[(\sigma-1)(1-a)\right]\sigma_{cp}^2 & \left[(\sigma-1)(1-a)\right]^2\sigma_p^2 \end{bmatrix}\right\}$$

We can state that:

$$e^{-\sigma LnC_t}e^{(\sigma-1)(1-a)LnP_t}e^{-Ln(1+r_{t+1})} = \beta e^{-\sigma E_t[LnC_{t+1}]+[(\sigma-1)(1-a)]E_t[LnP_{t+1}]}$$

$$e^{\frac{1}{2}[\sigma^2\sigma_c^2+[(\sigma-1)(1-a)]^2\sigma_p^2+2\sigma[(\sigma-1)(1-a)]\sigma_{cp}}$$

Taking logs and rearranging:

$$\sigma E_t\left[LnC_{t+1} - LnC_t\right] = E_t\left[Ln\left(1+r_{t+1}\right)\right] + \left[(\sigma-1)(1-a)\right]E_t\left[LnP_{t+1} - LnP_t\right]$$

$$+\frac{1}{2}\left[\sigma^2\sigma_c^2 + \left[(\sigma-1)(1-a)\right]^2\sigma_p^2\right.$$

$$\left. +2\sigma\left[(\sigma-1)(1-a)\right]\sigma_{cp}\right] + Ln\beta$$

And defining $\Delta c_{t+1} = LnC_{t+1} - LnC_t$, $\Delta p_{t+1} = LnP_{t+1} - LnP_t$, and $(1/\sigma) = \gamma$, we find that:[18]

$$E_t\Delta c_{t+1} = \gamma E_t\left[r_{t+1} + \frac{1-\gamma}{\gamma}(1-a)\Delta p_{t+1}\right] + \textit{constant terms}$$

Defining the terms in brackets, as the *consumption based real interest rate*: r_{t+1}^{*}, we finally arrived to equation (4).

APPENDIX B

LOG-LINEARISATION OF THE BUDGET CONSTRAINT

Given the budget constraint (8), it is possible to show that: $\sum_{t=0}^{\infty} R_t C_t = \Phi_0$, and $\sum_{t=0}^{\infty} R_t NO_t = \psi_0$, where Φ_0 and ψ_0 come from a difference equation such as: $\Phi_{t+1} = (1 + r_{t+1})(\Phi_t - C_t)$, and $\psi_{t+1} = (1 + r_{t+1})(\psi t - NO_t)$. We are going to show this for the case of consumption expenditure:

We can write the former equation as: $\Phi_t = C_t + \frac{\Phi_{t+1}}{1+r_{t+1}}$, iterating forward this equation from period 0, we find that:

$$\Phi_0 = \sum_{t=0}^{T} R_t C_t + R_{T+1}\Phi_{T+1}$$

Now, when T goes to infinity, we find that this equation is:

$$\Phi_0 = \sum_{t=0}^{\infty} R_t C_t$$

as claimed.

We need also to work with the difference equation, notice that it can be written as:

$$\frac{\Phi_{t+1}}{\Phi_t} = (1 + r_{t+1})\left[1 - \frac{C_t}{\Phi_t}\right]$$

Takings logs this equation becomes:

$$\phi_{t+1} - \phi_t = r_{t+1} + Ln\left[1 - e^{c_t - \phi_t}\right] \tag{17}$$

Where $Ln\Phi_t = \phi t$, $LnC_t = c_t$ and the approximation $Ln(1 + r_{t+1})$ r_{t+1} have been used.

We need to log-linearise the term $Ln\left[1 - e^{c_t - \phi_t}\right]$ around the steady state values of c and ϕ, doing so we find that:

$$Ln\left[1 - e^{c_t - \phi_t}\right] \approx k + \left(1 - \frac{1}{\rho}\right)(c_t - \phi_t)$$

Where $k = Ln\rho - (1 - \frac{1}{\rho})\ L_n\ (1 - \rho)$, and $\rho = 1 - e^{(\bar{c} - \bar{\phi})} = 1 - \frac{\overline{C}}{\overline{\Phi}}$, $\bar{c}$ and $\bar{\phi}$ are the steady states values of c and ϕ respectively. Now (7) can be written as:

$$\phi_{t+1} - \phi_t = r_{t+1} + k + \left(1 - \frac{1}{\rho}\right)(c_t - \phi_t) \tag{18}$$

We need further to use a trick, notice that:

$$\phi_{t+1} - \phi_t \equiv \Delta c_{t+1} + (c_t - \phi_t) - (c_{t+1} - \phi_{t+1})$$

So, we can write (18) as:

$$\Delta c_{t+1} + (c_t - \phi_t) - (c_{t+1} - \phi_{t+1}) \approx r_{t+1} + k + \left(1 - \frac{1}{\rho}\right)(c_t - \phi_t)$$

We can rewrite this expression as:

$$c_t - \phi_t = \rho(c_{t+1} - \phi_{t+1}) - \rho\Delta c_{t+1} + \rho k + \rho r_{t+1}$$

Iterating forward from period 0, we find that:

$$c_0 - \phi_0 = \rho^T\left(c_T - \phi_T\right) + \sum_{t=1}^{T} \rho^t\left(r_t + \Delta c_t\right) + \rho k + \rho^2 k + \rho^3 k + \ldots$$

And assuming that $0 < \rho < 1$ and $T \rightarrow \infty$, this equation can be written as:[19]

$$c_0 - \phi_0 = \sum_{t=1}^{T} \rho^t\left(r_t + \Delta c_t\right) + k_1 \tag{19}$$

Notice that in a completely analogous way, it is possible to derive an equation similar to (19) for net output NO_t:[20]

$$no_0 - \psi_0 = \sum_{t=1}^{\infty} \rho^t\left(r_t + \Delta no_t\right) + k_1 \tag{20}$$

Notice that (8) can be written as: $\Psi_0 = \Phi_0 - B_0$, which is the same as: $\frac{\Psi_0}{\Phi_0} = 1 - \frac{B_0}{\Phi_0}$.

Taking logs and linearising around the steady state, we find that:

$$\phi_0 - \psi_0 = \left(1 - \frac{1}{\Omega}\right)\left(b_0 - \psi_0\right) + k_1 \tag{21}$$

Where $\Omega = 1 + \frac{\overline{B}}{\overline{\Psi}}$ is a constant grater than one.

Substitution of (19) and (20) into (21) leads to the following equation:[21]

$$\sum_{t=1}^{\infty}\beta^t\left[r_t\left(1-\frac{1}{\Omega}\right)-\Delta c_t+\frac{1}{\Omega}\Delta no_t\right]=c_0-k_1\left(1-\frac{1}{\Omega}\right)-b_0\left(1-\frac{1}{\Omega}\right)-\frac{1}{\Omega}no_0$$

Finally we must assume that the steady state of net foreign assets at which we are linearising ($\overline{B}$) is zero, hence $\Omega = 1$ and the above equation can be written as:

$$-\sum_{t=1}^{\infty}\beta^t\left[\Delta no_t-\Delta c_t\right]=no_0-c_0$$

Which is equation (9) in the text.

Notes

1 For example in the case of fiscal imbalances, virtually any deficit path can be consistent with intertemporal solvency postulating large future surpluses.

2 This is the approach taken by Campbell (1987), followed by Gosh and Ostry (1995) and extended further by Bergin and Sheffrin (2000).

3 An important advance along this lines comes from Bergin and Sheffrin (2000).

4 See Appendix A for this derivation.

5 Appendix B gives a detailed derivation first developed in Huang and Lin (1993).

6 We call this the optimal current account, but we mean optimal in the sense that it is the current account the model implies, together with the VAR as a forecast tool.

7 All processes were estimated with seasonal dummies. For Canada the process is an ARMA(4,7), for France an ARMA(8,8), for Italy an ARMA(8,6), for Japan an ARMA(5,5), for United Kingdom an ARMA(5,3), for United States an ARMA(1,4) and for Germany an ARMA(8,8).

8 The process was estimated with seasonal dummies, and the order is ARMA(8,7).

9 Given that the series are quarterly, we tried also, in one specification, the value $\beta = 0.98$. In this case the performance of the optimal model relative to the actual one improves a lot.

10 For example checking white noise in vectorial sense and performing Information Criterion Tests.

11 The normality test was based in Doornik and Hansen (1994).

12 The reference for this kind of bootstrap is Berkowitz and Killian (1996).

13 This result hold in all of the estimations performed.

14 The value of γ that match variance for this case turned out to be 0.512.

15 See Gallego, Hernández and Schmidt-Hebbel (1999) and Edwards (1999).

16 This follows from solving for C_t in the equation: $(aC_t)^a\left[(1-a)\frac{C_t}{P_t}\right]^{1-a}=C_t^*$.

17 The gross real interest rate is known by convention as of time t, then the conditional expectation operator does not apply to it. However for empirical estimation, expected inflation is considered, then the conditional expectation over r_{t+1} is taken into account, equation (4) is unchanged in this case.

18 Also we have used the approximation $Ln(1 + r_{t+1}) \simeq r_{t+1}$.

19 k_1 is an unimportant constant equal to $\frac{\rho k}{1-\rho}$.

20 We assume for simplicity, the same value ρ for the derivation.

21 The assumption $\rho = \beta$ is imposed in this step.

References

CAMPBELL, J. (1987). "Does Saving Anticipate Declining Labor Income? An Alternative Test of the Permanent Income Hypothesis". *Econometrica,* 55 (6), pp. 1249-1273.

BARRO, R. and J. SALA-I-MARTIN (1990). "World Real Interest Rates". *NBER Working Paper Series* WP3317.

BERGIN, P. and S. SHEFFRIN (2000). "Interest Rates, Exchange Rates and Present Value Models of the Current Account". *The Economic Journal,* 110 (463), pp. 535-558.

BERKOWITZ, J. and L. KILLIAN (1996). "Recent Developments in Bootstrapping Time Series". *Working Paper* WP1996-45. Federal Reserve Board Washington.

DEATON, A. (1992). *Understanding Consumption*. Clarendon Press; New York: Oxford University Press.

DOORNIK, J. and H. HANSEN (1994). "An Omnibus Test for Univariate and Multivariate Normalit". *Working Paper*. Nuffield College Oxford.

EDWARDS, S. (1999). "The Mirage of Capital Controls". *Working Paper*. UCLA.

GALLEGO, F.; L. HERNANDEZ and K. SCHMIDT-HEBBEL (1999). "Capital Controls in Chile: Effective? Efficient?". *Documento de Trabajo* Nº 59. Banco Central de Chile.

GHOSH, A. and J. OSTRY (1995). "The Current Account in Developing Countries: A Perspective from the Consumption Smoothing Approach". *The World Bank Economic Review,* 9 (2), pp. 305-333.

HALL, R. (1988). "Intertemporal Substitution in Consumption". *Journal of Political Economy*, 96 (2), pp. 339-357.

HUANG, C. and K. LIN (1993). "Deficits, Government Expenditures and Tax Smoothing in the United Sates: 1929-1988". *Journal of Monetary Economics,* 31 (3), pp. 317-339.

MILESI-FERRETI, G. and A. RAZIN (1996). "Sustainability of Persistent Current Account Deficits". *NBER Working Paper Series* WP5467.

MORANDE, F. (1998). "Savings in Chile. What Went right?". *Journal of Development Economics*, 57 (1), pp. 201-228.

OBSTFELD, M. and K. ROGOFF (1996). *Foundations of International Macroeconomics*. MIT Press. 30.

OBSTFELD, M. and K. ROGOFF (1995). *The Intertemporal Approach to the Current Account*. Handbook of International Economics, Vol. III, Elsevier Science/North Holland.

ROGOFF, K. (1992)."Traded Goods Consumption Smoothing and the Random Walk Behavior of the Real Exchange Rate". *Bank of Japan, Monetary and Economic Studies,* 10 (2), pp. 1-29.