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DOCUMENTO DE TRABAJO 5

Economía

CONSUMPTION-SAVINGS, INTEREST RATES AND INFLATION IN LESS DEVELOPED COUNTRIES: AN ERROR CORRECTION MODEL

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INTRODUCTION*

The purpose of this paper is to asses the responsiveness of the aggregate time-series of consumption-saving to the interest rate in less developed countries. In the development literature, much of the emphasis on this relationship relies on the potential to mobilize savings through changes in the interest rates and its effects on capital accumulation and growth. Given the theoretical ambiguity of this relationship, interest attaches to empirical estimates. Unfortunately, the lack of long and adequate time series, in particular interest rate data, in most developing countries has resulted in scant empirical research.

Basically, there have been two main approaches to the study of the interest rate sensitivity of saving. The first one, and more recent, exploits the implications of intertemporal optimization that at optimum, the marginal rate of substitution between current and future consumption is set equal to the marginal rate of transformation. This is known as the "Euler equation approach" and its modern version is developed by Hall (1978) based on a model that obeys the first-order conditions for a fully rational and forward-looking representative consumer. This model allows us to estimate the coefficient of intertemporal elasticity of substitution. Some results for developing countries are Giovannini (1985), Rossi (1988), Raut and Virmani (1990), Ostry and Reinhart (1991), and Villagomez (1992).

The second approach, a more traditional one, refers to studies that look for a direct effect of the interest rate on saving, based mainly on aggregate consumption or saving functions. For example, Fry (1978), one of the most frequently cited recent empirical papers for less developed countries, estimates the responsiveness of the domestic savings rate to the real interest rate in a function that also includes the rate of income growth, real per capita income and the foreign savings ratio. A similar model was estimated by Giovannini (1985). Other decompose the income term into its transitory and permanent components and/or the inflation rate into its expected and unexpected parts (Gupta, 1987). In other cases a monetary aggregate is also included (Corbo and Schmidt-Hebbel, 1991).

Overall, the empirical evidence obtained with these models has been mixed as is the case in the empirical literature for developed countries. Moreover, these models have been widely criticized. For example, in some cases they are based on questionable functional form assumptions. In other cases, these models face simultaneity problems and the exogeneity of the instruments used in the estimations is questionable. There are also problems with the data because savings is not measured directly in national accounts. It is a residual between magnitudes already measured with error. But one of the strongest criticisms is given by Lucas (1976). In particular, he asserts that the relation between consumption or saving, income and rates of return depends on a wider macroeconomic context and may not be stable over time.

An alternative way to model consumption and saving relationships, but still inside this "traditional" line of research, is offered by the Error Correction Model. This approach is based on the single-equation error correction methodology advocated by David Hendry (1983, 1986 and 1989) in empirical time series research.[1] This type of model can be interpreted as a reparameterization of an auto-regressive distributed lag model (or a dynamic linear regression model) and seems to be a structural representation of dynamic adjustment towards some equilibrium about which economic theory can be informative, while short-run dynamics are data-base determined. Unfortunately, for less developed countries there is little work done using this methodology in consumption models that include an interest rate variable. In a recent paper, Lahiri (1989) finds support for this particular type of model in 5 out of 8 Asian countries. Although he does not include the interest rate variable in his final results, he mentions that cross-sectional results for a much shorter period for which the data on interest rates are readily available, fail to reveal any interest sensitivity of savings for the countries in his sample.

This paper follows the latter approach. The central objective of this exercise is to see if an error correction model, derived from Hendry's methodology, for private from consumption (saving) and including the real interest rate as a regressor can be an adequate characterization of the data generating process for the countries in my sample. Additionally, the model includes both the inflation rate and an inflation-uncertainty term. The inclusion of these variables attempts to isolate their effects on consumption and saving from those of the real interest rate. The rest of the paper is divided into five sections. Section 1 discusses the methodological background of the EC model. In section 2, I present the empirical model to be estimated. The countries' sample and the data set is presented in section 3. Section 4 presents the results and the final section summarizes the main conclusions.

1. Methodological Background[2]

Hendry's approach is grounded in the concept of the data generating process (DGP). Basically, it is postulated that there exists a stochastic DGP defined by the economic mechanism and the associated measurement process. This DGP generates all the relevant variables (w_t, $t = 1,\ldots T$) and can be represented by the density function of these variables

$$D(W_t \mid \theta) \quad (1)$$

where θ is a vector of parameters of the process. The final objective is to obtain an empirical model that should be interpreted as a tentatively adequate, conditional data characterization of the DGP. In that sense, the properties of the model are derived from the process that actually generated the data. Starting from a very general unrestricted model,[3] this objective is reached by a reduction process that includes transforming data, marginalizing with respect to unwanted variables, conditioning sequentially over time and contemporaneously and specifying a functional form. Therefore, the model will include only a small subset x_t of w_t and after sequential factorization, expression (1) can be represented by the following joint probability distribution of the sample

$$\prod_{t=1}^{T} D(X_t \mid X_{t-1}, \mu) \quad (2)$$

Here, $D(\cdot)$ is conditioned on X_{t-1} and $\mu = f(\theta)$, the parameters of interest. Next, let $x_t = (y_t, z_t)$, where y_t denotes the vector of variables to be modelled and z_t denotes the vector of variables not modelled. After conditioning y_t on contemporaneous z_t, expression (2) can be rewritten as

$$\prod_{t=1}^{T} D(y_t \mid z_t, X_{t-1}, \lambda_1) \prod_{t=1}^{T} D(z_t \mid X_{t-1}, \lambda_2) \quad (3)$$

where $\lambda = (\lambda_1, \lambda_2)$, a transformation of μ to sustain the factorization. The first term is the conditional model of y_t while the second term is the marginal model for z_t. Here, z_t is required to be weakly exogenous to the parameters of interest to sustain valid and efficient inferences with the conditional model. Technically, z_t is defined as weakly exogenous for a set of parameters of interest $\mu = f(\theta)$ in a conditional model of y_t with parameters λ_1 if *a)* μ is a function of the parameters λ_1 alone and *b)* λ_1 and the parameters λ_2 are variation free so that (λ_1, λ_2) are elements of $\Lambda_1 \times \Lambda_2$, the Cartesian product of the parameter spaces of the components vectors (Engel *et al.*, 1983). The variation free condition implies that λ_1 and λ_2 impose no restrictions on each other and all the parameters of interest can be obtained from λ_1 alone. This definition allows for the possibility of feedback, for example of y_{t-1} onto z_t in the marginal model (3). If no such feedback occurs, that is, if y does not Granger-Cause z, then we have strong exogeneity. In most cases, weak exogeneity is enough for testing hypotheses.[4]

To get an operational model, the next step is to restrict ourselves to a specific functional form, for example, to a linear approximation given by the following auto-regressive distributed lag form

$$\alpha(L)\, y_t = \beta(L)\, z_t + \varepsilon_t \qquad (4)$$

where L is the lag operator, $\alpha(L)$ and $\beta(L)$ denotes lag polynomials, α and β are vectors including the parameters of interest, which are assumed constant, and ε is an error term. Note that the above reduction process involves the potentiality of losing constancy of the parameters, even if the parameters are constant in the DGP. For Hendry, the assertion of constancy of the parameters is a matter of empirical concern.

Finally, expression 4 is simplified to yield a parsimonious and interpretable data characterization. The objective during this transformation process is to express regressors in nearly-orthogonal form, truncate the lag length and eliminate redundant information. One way to understand this simplification process is as model reduction via variable deletion. As Pagan (1987) points out, this step requires a criterion function and a decision rule that basically monitors the evolution of the change in the residual variance in the reduction process in moving from the general to the simple model. For example, by using the classical F-test, a simplification will be acceptable if it is F-acceptable.

One important issue concerns the error term. In Hendry's methodology, ε_t is a derived process, rather than being autonomous, with properties determined by $D(\cdot)$. In the final model, ε contains everything which actually influences y_t but is not explicitly included in the model and therefore, must alter as the model does. The error term is defined, by construction during the sequential conditioning process, as $x_t - E(x_t \mid X_{t-1})$, which is thereby a martingale difference sequence relative to the available information retained in the model. The final model should retain this characteristic and therefore, the error term is required to be an innovation, i.e., unpredictable from its own past and from the past of other variables in the model.[5] Once a model is selected, an array of tests can be applied to check its congruency, where congruency is defined as the model satisfying the following criteria: *i)* data admissibility, *ii)* theory consistency, *iii)* weak exogeneity, *iv)* parameter constancy, *v)* data coherency and *vi)* encompassing. Points *iii)*, *iv)* and *v)* were already discussed above. In particular, data coherency refers to the requirement that the innovation error is homoscedastic. Theory consistency is related to the role of economic theory in the construction of the model. In general, under the EC approach, economic theory imposes long-run restrictions as discussed below. Theory also plays an important role in the interpretation of the parameters and in the formulation of reasonable initial models. With respect to the first aspect, a model is data admissible if its fitted/predicted values automatically satisfy definitional and/or data constraints.[6] Finally, encompassing refers to the idea that the selected model should be able to account for the results obtained by rival models. Given the objective of this exercise, I will not deal with this last issue.[7]

An important characteristic of these models is the presence of a term called an Error Correction Mechanism (ECM) derived by reparameterizing expression (4) in terms of differences and levels. The ECM can be interpreted as a restricted form of the auto-regressive distributed lag model which imposes long-run proportionality among some regressors. It is assumed that in the real economy, equilibrium among variables posited by economic theory is by no means achieved in every period. Therefore, the ECM term reflects the deviation from the long-run equilibrium outcome, with agents removing a fraction of the resulting disequilibrium each period. In terms of model (4), the ECM term can be expressed as $(y - kz)_{t-1}$ where k is the long-run response of y to z. The case where $k = 1$ corresponds to the assertion of homogeneity and for variables in logarithmic form, this restriction ensures that the relevant ratios are constant in the long run. Recently, the claim that there exists long-run relationships between variables may be recognized as the claim that economic variables are co-integrated. That is, if y_t and z_t are integrated of order one, I(1),[8] then in general, a linear combination of them will also be I(1). However, there may exist a k^* such that $(y - k^*z)$ is I(0). In that case, y and z are said to be cointegrated. Engle and Granger (1987) show that if two variables are cointegrated, then there exists an error correction representation. One advantage of the ECM representation is that because all variables in the regression are stationary, the estimators will be asymptotically normal and the usual standard errors will be asymptotically valid. At the same time, the notion of a steady state is incorporated in a dynamic model unlike a specification including only variables in difference form. In the ECM term, k can also take a value different from one. In that case k should be estimated, for example, by using a two step procedure as suggested by Engle and Granger(1987).In the first stage we estimate the long-run parameters by running a static regression in levels (the cointegrating relationship) while in the second stage, we can use the residual from the static regression as an explanatory variable and estimate the short-run dynamics. The problem with the latter procedure is that the bias in the estimator can be substantial in small samples.

2. The Empirical Model

Given the main objective of this exercise, I force the presence of the real interest rate in the model throughout the reduction process. Note that this restriction will affect, in some cases, the final outcome as will be shown below. In that sense, the above objective should not be confused with the more general task of finding an empirical model for private consumption.

Given that the sample size for most of the countries under study is small, the starting point will be a "pre-simplified feasible general unrestricted model" as explained above. Together with the income and real interest rate variables, our unrestricted model for consumption includes the inflation rate and a term for inflation-uncertainty. The reason for including inflation is that one major difference between Asian and Latin American countries in the last two decades is their inflation performance and its role in shaping financial conditions and affecting macroeconomic stability (Dornbush and Reynoso, 1989). Indeed, this fact has been highlighted in recent work as an important reason behind the different outcomes after the implementation of financial liberalization measures in these countries. Also, there is an increasing amount of research emphasizing the effects of uncertainty on real variables, here consumption and saving, particularly in a high and persistent inflationary environment.

Unfortunately there is disagreement about the magnitude and direction of the effect of inflation and inflation-uncertainty on consumption and savings. A positive relationship between savings and inflation can be explained by involuntary savings as a response to unexpected changes in inflation or by a negative wealth effect that results in a reduction of consumption, while a negative relationship can be attributed to a flight from currency to increased purchase of consumer goods, in particular durables. This is because, at higher rates of inflation, storable commodities are substituted for money as the latter becomes more expensive to hold. In the case of uncertainty, an increase in this variable can increase savings for precautionary motives (Kimball, 1990) or decrease savings as a consequence of an increase in consumers' consumption to avoid a decline in the real value of their savings balances (Levi and Makin, 1978). Also, a negative relationship between savings and uncertainty can result from a flight from money into consumer goods, if higher inflation implies higher uncertainty.[9] This latter effect should be stronger in countries where foreign assets or interest-bearing domestic assets that adjust to inflation are not an alternative. Finally, there is also a negative relationship between uncertainty and measured savings explained by capital flight if the latter leads to a reduction in measured income and an increase in the measured consumption to income ratio (Corbo and Schmidt-Hebbel, 1990). Note that if an increase in inflation and/or uncertainty raises consumption (due to flight from money to consumer goods) and reduces measured income as a consequence of capital flight, then we can expect a stronger effect from the ECM term, implying a greater deviation of consumption from the steady-state growth path.

By including both the real interest rate and the inflation rate, I expect to test empirically whether they have had a significant effect on aggregate consumption (saving). In particular, the inflation term captures the effects of inflation after accounting for the impact of real interest rates. Finally, the inclusion of an uncertainty term attempts to isolate the effects of this variable on consumption and saving from those of the real interest rate and inflation. Other variables that have been found to affect savings in developing countries (e.g. the dependency ratio or the terms of trade) are omitted because of the small sample sizes,

and also because this simplification offers the advantage of bringing to sharp focus the dynamic adjustment of consumption to income, the interest rate, and inflation. The unrestricted model to be estimated is given by

$$c_t = \beta_0 + \beta_1 C_{t-1} + \beta_2 y_t + \beta_3 y_{t-1} + \beta_4 r_t + \beta_5 r_{t-1} + \beta_6 \pi_t + \beta_7 \pi_{t-1} + \beta_8 u_t + \beta_9 u_{t-1} + \varepsilon_t \quad (5)$$

where c is per-capita private consumption, y is per-capita income, r is the real interest rate, $\pi = \Delta \ln p$ is the rate of inflation (where p is the price level and Δ is the difference operator) and u is inflation-uncertainty. All variables, except the inflation rate, are in logs. In some cases one or more variables are allowed to have a greater lag length in order to comply with the evaluation criteria. Here, all regressors are assumed weakly exogenous to c_t and the model is estimated by an ordinary least squares procedure (OLS). Later, this assumption is lifted and contemporaneous variables are instrumented. This is particularly relevant for the case of the real interest rate, given that the variable used here was constructed using the nominal interest rate at time $t-1$ adjusted for inflation at time t, where the latter is intended to proxy expected inflation.

The transformed model is

$$\Delta c_t = \alpha_0 + \alpha_1 \Delta y_t + \alpha_2 r_t + \alpha_3 (c-y)_{t-1} + \alpha_4 \pi_t + \alpha_5 \Delta u_t + \alpha_6 r_{t-1} + \alpha_7 \pi_{t-1} + \alpha_8 u_{t-1} + \varepsilon_t \quad (6)$$

where

$$\alpha_0 = \beta_0 ; \alpha_1 = \beta_2 ; \alpha_2 = \beta_4 ; \alpha_3 = (\beta_1 - 1); \alpha_4 = \beta_6 ;$$

$$\alpha_5 = \beta_8 ; \alpha_6 = \beta_5 ; \alpha_7 = \beta_7 \text{ and } \alpha_8 = (\beta_8 + \beta_9)$$

Here, $(c-y)_{t-1}$ corresponds to the EC term and is discussed below. *A-priori*, the interest rate coefficients can take either a positive or a negative sign. Also, we expect $\alpha_3 < 0$. This is because, if c starts to increase more rapidly than is consistent with steady-state solution, the EC term becomes positive since c_{t-1} has drifted above the steady-state growth path. To force c_t back towards its long-run growth path, the short-term growth in c_t must slow down and this happens if α_3 is negative. The magnitude and direction of the parameters for π and u is ambiguous, as mentioned above.

Model (6) assumes a value of unity for k in the ECM term, implying the following restriction, $\beta_1 - 1 + \beta_2 + \beta_3 = 0$, on model (5). That is, I am assuming a unitary long-run elasticity of income with respect to consumption and that the proportion of income consumed, the average propensity to consume (APC), remains constant in the steady state. On a theoretical ground, this long-run homogeneity assumption is supported, for example, by a permanent-income argument. Also, recent empirical work supports this assumption for some developing countries (Lahiri, 1989). Finally, given the sample size used in this exercise, estimations of k using the two-step procedure mentioned above will imply substantial bias in the estimators.

The transformed model will include additional regressors for the cases where some variables where lagged more than one period. For example, if y_{t-2} is included in (5), then $\Delta^2 y_t$ will appear in (6). Also, $\Delta\pi$ can appear in some models. In any case, there is no particular reason to believe that the same transformation of model (5) should apply to all countries.

Model (6) assumes that all the regressors are stationary. Formal unit root tests are reported in appendix 2. Although in most cases the stationarity assumption is confirmed by the unit root tests, it should be kept in mind that, given the size of the samples, the results from these tests should be taken more as an initial data exploratory tool.

The steady-state solution implied by model (6) is derived by assuming that along a steady state growth path, $\Delta c = g_c$, $\Delta y = g_y$, $g_c = g_y = g$, (where g is the growth rate) and $r_t = r_{t-1}$, $\pi_t = \pi_{t-1}$, $u_t = u_{t-1}$, and is given by the following expression

$$C/Y = \exp\left[(1/-\alpha_3)\left[\alpha_0 + (\alpha_1 - 1)g + (\alpha_2 + \alpha_6)r + (\alpha_4 + \alpha_7)\pi + \alpha_8 u\right]\right] \qquad (7)$$

3. Countries' Sample and Data Set

The sample includes sixteen countries: Brazil, Colombia, Chile, Greece, Indonesia, Korea, Malaysia, Mexico, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, Turkey, Uruguay and Venezuela. The sample represents countries with different structural and institutional characteristics but it also heavily reflects data availability, in particular interest rate data. These countries also have different experiences with interest rate policies. At one extreme we have a country like Singapore, with well developed financial markets that are integrated to international financial markets and with market interest rates, while at the other extreme there are countries like Pakistan with interest rates heavily controlled by the monetary authority. In any case, most of the countries have followed some interest rate liberalization measures.

The variables considered in this paper are (see appendix 1 for data sources):

a) Real private consumption per capita. Although the relevant theoretical variable is consumption on non durables and services, most less developed countries do not distinguish between the different components of consumption. Therefore, I will use total private consumption.

b) Real disposable income per capita. Here I am using GNP as a proxy, although its quality will depend on the degree of correlation with disposable income.[10]

c) The inflation rate is computed from the Consumer Price Index (CPI). All nominal variables are deflated using the CPI.

d) Inflation-uncertainty. This variable is obtained from the standard error of the one step-ahead forecast error using a rolling regression procedure for a price model for each country given by an nth-order autoregressive process. The maximum length is specified so that the residuals are serially uncorrelated together with the use of the Akaike Information Criterion and the Schwarz Criterion.[11]

e) The real interest rate is the most controversial variable even in the case of studies for developed countries. In most cases I used interest rates for time deposit of 6 or 12 months on commercial banks. For some Latin American countries, given the higher inflationary environment, it is better to use rates for a shorter period, such as the 3 month time deposit rates. In particular, for some countries with persistent and unstable inflation, there has been a tremendous change in savings instruments, making it almost impossible to construct a long time series for a single rate. An extreme case is Brazil where in the last years, most agents have become unwilling to commit themselves in the market for terms longer than several days or overnight. For those cases I used 'mixed' series. This might be a valid procedure if the different rates were closely correlated. Unfortunately this cannot be verified except for a few years. In this research the relevant real interest rate for time t is computed using the nominal interest rate at time $t-1$ adjusted for expected inflation. The latter is proxied by actual inflation at time t.[12]

4. Estimation and Results

All models are estimated country by country using annual data and for a sample period that varies across countries depending on data availability but, on average, the sample covers from 1970 to 1989.

The final empirical model for each country is derived starting from the general unrestricted model (5), transforming it to expression (6) and following a simplification process. The basic criterion for this simplification process follows the one suggested by Hendry and implemented in the PC-GIVE module of PC-GIVE, version 6.01, used for the empirical work in this paper. PC-GIVE has a specific procedure programmed to monitor the progress of the sequential reduction process. The program reports the number of parameters, the residual sum of squares, the equation standard error and the Schwarz criterion for each model in the sequence, together with F-tests of each elimination conditional on the previous stage. As mentioned above, it is assumed that all the regressors are weakly exogenous to c_t and all models are estimated using the ordinary least squares procedure (OLS). The set of tests applied to check the congruency of each model includes:

a) Lagrange Multiplier test (AR_n) for n_{th} order of residual autocorrelation.

b) Autoregressive Conditional Heteroscedasticity test ($ARCH_n$) for residual heteroscedasticity of n^{th} order.

c) Test for residual heteroscedasticity due to omitting squares of the regressors (H.T.).

d) Regression specification test (Reset) for the null of correct specification of the original model against the alternative of a model comprising powers of the estimated depended variable.

e) Parameter constancy is tested recursively using a Chow test by re-estimating each model using recursive least squares (RLS). A Chow test for parameter constancy over n forecasts is reported.

Most of the above tests take the form of TR^2 for an auxiliary regression, so that they are asymptotically distributed as χ^2 under the null, but these tests are reported in PC-GIVE as F-approximations because, according to Hendry, they may be better behaved in small samples (see Harvey, 1990).

A formal test for weak exogeneity is not performed. One of the reasons for formulating a conditional model rather than jointly modelling every variable is because of the difficulty of doing the latter. But a formal test for weak exogeneity requires testing the free variation condition, that is, to test for the dependence of the parameters of interest on the parameters of the marginal model. In other words, it would require formulation of a congruent marginal model. Hendry suggests that weak exogeneity can be tested indirectly when testing for parameter constancy. This is because, according to his argument, if the parameters of interest are to remain constant across regime shifts in the conditioning variables, we are precluding the possibility of arbitrary exogeneity claims. Nevertheless, the weak exogeneity assumption is relaxed later, and each final model is estimated using an instrumental variable procedure. In this case, the following additional tests are reported:

f) Given that in most cases, the sample size does not allow us to apply a residual autocorrelation test as in (a), a statistic defined as the sum of squared first n coefficients of residual autocorrelation multiplied by the sample size is reported. This value provides a summary of residual autocorrelation such that if it is greater than or equal to $2n$, it would indicate mis-specification.

g) A specification test for the validity of the choice of instrumental variables asymptotically distributed as $\chi^2(n)$ when n overidentifying instruments are independent of the equation error.[13]

h) A test for numerical parameter constancy, forecast χ^2, that compares within and post-sample residual variances and is asymptotically distributed as χ^2 with n degrees of freedom given by the n forecast period. For these additional tests, the values reported for the χ_2 statistic are standardized by their degrees of freedom for ease of comparison to F-tests.[14]

Results for the final model estimated using OLS for each country in the sample are reported in table 1. Two sets of results are reported for Greece, Uruguay and Venezuela. This is because, although I am assuming that all variables in model (6) are stationary, results reported in appendix 2 suggest that for these countries, the real interest rate is stationary only after taking first differences. Therefore, the first set of results includes "r" while the second includes "Δr". Nevertheless, results differ only in the case of Uruguay.

As mentioned above, an indirect way to test the error correction model is by looking at the long-run income elasticity of consumption derived from model (5). Estimations are reported at the end of table 1. With the exception of Indonesia, Pakistan and Venezuela, whose values for the long-run income elasticity are 0.35, 1.31 and 0.46 respectively, results suggest that the unitary assumption is acceptable for the countries in my sample.

The final models reported in table 1 seem to satisfy the congruency requirement (with the exception of Greece) and, in general, their performance seems adequate considering that I am forcing the inclusion of the real interest rate along the reduction process. Nevertheless, results should be carefully interpreted whenever the real interest rate is not statistically significant, because by keeping it in the model along the reduction process, some of the other coefficients are slightly affected. No test is rejected at the 5% or 10% level, with the exception of the Reset test for Sri Lanka. In the case of Greece, its model shows residual autocorrelation at the second lag even after lagging all variables twice. Moreover, Greece is the only country with a positive sign for the ECM term implying that a drift of c_t from its steady-state growth path will be reinforced by the effect of this term. In any case, the performance of the model for this country, using either r or Δr, is poor as can be seen by the t-values of the coefficients.[15]

For all countries, but Indonesia, the income coefficients are statistically significant. This result conforms with the view of consumption being sensitive to current income. For some countries, the second difference of income was included in the regression model. In those cases, consumption is not only affected by a proportion of income change, but by whether the change itself is increasing or decreasing. In the cases of Korea, Malaysia and Pakistan a decreasing change in income raises consumption while for Brazil and Singapore, consumption is increased by an increasing change in income, although for the latter two countries the coefficients are not statistically significant.

The coefficient for the real interest rate turns out to be negative for the

TABLE 1

ERROR CORRECTION MODEL: REGRESSION RESULTS USING OLS

Item	*Brazil (1970-1989)*	*Chile (1971-1989)*	*Colombia (1963-1989)*	*Greece (1964-1989)*		*Indonesia (1973-1989)*	*Korea (1971-1990)*	*Malaysia (1970-1988)*	*Mexico (1963-1989)*
Constant	−0.098	−0.136	0.019	0.069	0.075	−0.201	−0.004	−0.061	−0.402
	(−1.58)	(−3.07)	(0.56)	(1.85)	(2.72)	(−3.32)	(−0.14)	(−1.19)	(−4.37)
Income Rate of Growth	0.820	0.646	0.700	0.527	0.639	0.255	0.679	0.893	0.729
	(4.37)	(12.77)	(8.12)	(7.06)	(7.80)	(1.51)	(6.46)	(7.57)	(9.61)
Change in the Rate of Growth	0.185	—	—	—	—	—	−0.266	−0.377	—
	(1.25)						(−2.79)	(−4.42)	
Real Interest Rate	−0.007	−0.048	−0.003	0.068	—	−0.474	0.102	−0.172	0.292
	(−0.12)	(−2.05)	(−0.06)	(0.78)		(−3.65)	(0.79)	(−1.14)	(4.32)
Change	—	—	—	—	0.057	—	—	—	—
					(0.97)				
Lagged Consumption Income Ratio (EC Term)	−0.290	−0.725	−0.144	0.107[i]	0.154	−0.528	−0.040	−0.061	−0.672
	(−1.90)	(−6.24)	(−1.40)	(1.44)	(2.35)	(−3.62)	(−0.72)	(−1.06)	(−5.31)
Inflation	—	−0.023	—	—	—	—	—	—	—
		(−2.72)							
Lagged	—	—	—	—	—	—	—	—	—
Change in Inflation	−0.017	—	—	—	—	—	—	−0.219	0.053
	(−1.84)							(−1.51)	(1.89)
Lagged	—	—	—	0.101	0.084	—	0.174	—	—
				(1.70)	(1.44)		(2.00)		
Change in Uncertainty	—	−0.035	—	—	—	—	0.086	—	—
		(−2.14)					(1.89)		
Lagged	—	—	—	—	—	—	—	−0.157	—
								(−2.78)	
Lagged Uncertainty	—	0.035	0.018	—	—	—	—	—	−0.058
		(3.52)	(1.81)						(−2.96)
Summary Statistics									
R^2	0.87	0.94	0.80	0.88	0.88	0.68	0.82	0.91	0.91
Standard Error	0.0403	0.0225	0.0163	0.0133	0.0132	0.0326	0.0205	0.0209	0.0175
Sample Size (T)	20	19	27	26	26	17	20	19	27
AR_n $F(n, m)$[a]	1.05(2,12)	0.17(2,10)	0.89(3,19)	4.36(3,18)	6.66(3,18)	0.57(2,11)	2.39(2,11)	2.02(2,10)	0.22(3,18)
$ARCH$ $F(n, m)$[b]	1.89(3,8)	0.31(1,10)	0.43(3,16)	1.81(3,15)	1.81(3,15)	0.01(3,7)	1.46(3,7)	0.04(2,8)	0.12(3,15)
H.T. $F(n, m)$[c]	—	—	0.46(8,13)	0.69(8,12)	1.20(8,12)	—	—	—	0.57(10,10)
Chow $F(n, m)$[d]	1.43(9,5)	0.32(7,5)	1.26(8,14)	0.91(9,12)	1.00(9,12)	1.57(8,5)	0.69(7,6)	2.81(9,4)	1.55(10,11)
Reset $F(n, m)$[e]	0.63(2,12)	1.42(2,10)	0.97(2,20)	0.63(2,19)	0.84(2,19)	1.94(2,11)	0.04(2,11)	0.94(1,12)	0.37(2,19)
Long Run Income Elasticity[f]	1.149	0.735	0.706	0.826		0.346	0.768	0.734	0.901
	(0.172)	(0.112)	(0.028)	(0.051)		(0.108)	(0.013)	(0.072)	(0.028)
Steady State Average Propensity to Consume (APC)[g]	0.790	0.815	1.050	0.649	0.667	0.643	0.748	0.495	0.494
Long Run Interest Elasticity of Consumption[h]	−0.02	−0.07	−0.02	−0.63	−0.37	−0.90	3.35	−2.12	0.51

TABLE 1 (CONT.)

ERROR CORRECTION MODEL: REGRESSION RESULTS USING OLS

Item	*Pakistan (1971-1987)*	*Philippines (1973-1990)*	*Singapore (1973-1989)*	*Sri Lanka (1970-1990)*	*Thailand (1972-1990)*	*Turkey (1966-1988)*	*Uruguay (1973-1989)*		*Venezuela (1973-1990)*	
Constant	−0.104	−0.236	0.024	−0.039	0.005	0.961	−0.250	−0.196	0.495	0.005
	(−1.61)	(−4.88)	(0.85)	(−1.07)	(0.20)	(2.87)	(−3.56)	(−2.65)	(2.86)	(0.11)
Income Rate of Growth	1.429	0.937	0.399	0.886	0.471	0.677	1.094	0.956	0.639	0.518
	(5.16)	(6.29)	(4.07)	(5.61)	(8.35)	(2.94)	(8.75)	(7.94)	(6.20)	(5.81)
Change in the Rate of Growth	−0.439	—	0.140	—	—	—	—	—	—	—
	(−1.91)		(1.77)							
Real Interest Rate	−0.201	0.749	−0.856	−0.637	−0.406	−0.350	0.075	—	0.169	—
	(−1.98)	(3.52)	(−4.34)	(−3.42)	(−3.28)	(−3.06)	(1.76)		(2.43)	
Change	—	—	—	—	—	—	—	−0.085	—	0.186
								(−1.57)		(1.89)
Lagged Consumption Income Ratio (EC Term)	−0.300	−0.420	−0.064	−0.357	−0.136	−0.571	−1.057	−0.739	−0.312	−0.023
	(−1.41)	(−5.13)	(−1.78)	(−2.25)	(−2.52)	(−2.66)	(−3.57)	(−2.72)	(−3.38)	(−0.29)
Inflation	—	0.723	−0.793	−0.617	−0.479	—	—	—	—	—
		(3.41)	(−4.30)	(−3.53)	(−3.41)					
Lagged	—	—	—	0.477	—	−0.154	—	—	—	—
				(3.11)		(−3.11)				
Change in Inflation	—	—	—	—	—	—	0.080	—	—	—
							(2.13)			
Lagged	0.301	—	—	—	—	—	—	—	−0.312	−0.436
	(2.19)								(−2.86)	(−2.62)
Change in Uncertainty	—	—	—	—	—	0.167	—	—	—	—
						(2.30)				
Lagged	—	—	—	—	—	—	—	0.076	—	0.163
								(1.76)		(1.97)
Lagged Uncertainty	—	—	—	—	—	0.382	—	—	0.148	
						(3.50)			(3.09)	
Summary Statistics										
R^2	0.76	0.84	0.89	0.73	0.93	0.73	0.88	0.86	0.85	0.80
Standard Error	0.0259	0.0150	0.0144	0.0333	0.0084	0.0453	0.0264	0.0263	0.0340	0.0403
Sample Size (T)	17	17	17	21	19	23	17	17	18	18
AR_n $F(n, m)^a$	2.30(1,10)	0.38(2,11)	1.01(1,10)	0.36(3,12)	0.53(2,12)	0.08(3,13)	0.99(2,10)	0.85(2,10)	1.27(2,10)	0.62(2,10)
ARCH $F(n, m)^b$	0.46(2,7)	0.45(3,7)	0.09(2,7)	0.50(3,9)	0.49(3,8)	0.49(3,10)	1.05(2,8)	1.73(2,8)	1.37(2,8)	1.15(2,8)
H.T. $F(n, m)^c$	—	—	—	—	—	—	—	—	—	—
Chow $F(n, m)^d$	1.66(8,3)	1.75(8,5)	2.06(8,3)	1.67(6,9)	2.40(9,5)	1.50(8,6)	0.59(6,5)	0.87(6,6)	2.47(7,5)	0.27(6,6)
Reset $F(n, m)^e$	0.37(2,9)	0.21(2,11)	0.61(1,10)	5.98(2,13)	2.31(2,12)	0.98(2,14)	0.75(2,10)	0.07(2,10)	0.25(2,10)	0.06(2,10)
Long Run Income Elasticity[f]	1.314	0.940	0.770	0.710	0.813	1.051	1.120	1.152	0.464	0.414
	(1.19)	(0.172)	(0.375)	(0.277)	(0.030)	(0.136)	(0.189)	(0.284)	(0.599)	(0.482)
Steady State Average Propensity to Consume (APC)[g]	0.704	0.588	0.842	0.848	0.870	5.227	0.793	0.765	4.077	0.663
Long Run Interest Elasticity of Consumption[h]	−0.67	1.78	−13.37	−1.78	−2.98	−0.61	0.07	—	0.54	—

NOTES: All the results were obtained using the PC-GIVE module of PC-GIVE module of PC-GIVE version 6.01. The dependent variable is the first difference of the logarithm of total private consumption. Figures within parenthesis under country names are period of analysis; those under coefficients are *t*-values; those beside the test statistics are the degrees of freedom for the *F* and χ^2 tests.

a) Lagrange Multiplier test for n^{th} order residual autocorrelation reported as an *F*-form (*F*-equivalent) test with m degrees of freedom. *b) ARCH* (Autoregressive Conditional Heteroscedasticity) test for residual heteroscedasticity of n^{th} order lag reported as *F*-form with *m* degrees of freedom. *c)* Test for residual heteroscedasticity due to omitting squares of regressors. *d)* Chow test for parameter stability. *e)* Regression Specification test (Reset) for the null of correct specification of the original model against the alternative of a model comprising powers of yhat. *f)* Elasticity of consumption to income across steady-state equilibria obtained from the unrestricted model. *g)* Computed from the non-inflationary steady-state (long-run) solution to the estimated model and assuming 3% growth in per-capita income and a real interest rate of 2%. *h)* Implied interest rate elasticity of consumption obtained from the steady-state (long run) solution to the estimated model. *i)* This coefficient corresponds to the consumption —income ratio lagged twice.

majority of the countries in the sample (although statistically significant in only 8 cases) implying a positive relationship between the real interest rate and savings, as will be the case if the substitution effect is the dominant one. Exceptions are Mexico, the Philippines, Venezuela and Korea, whose coefficients are positive suggesting that an increase in the interest rate will reduce savings, that is, a dominant income effect. The interest rate coefficients are statistically significant for 11 countries: Chile, Indonesia, Mexico, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, Turkey, Uruguay and Venezuela. Moreover, the effect of this variable is stronger in the case of Asian countries characterized by low inflation compared to their Latin American counterparts.

The last column of table 1 reports an estimation of the implied long-run interest elasticity of consumption computed from the steady-state solution for each final model.[16] For all high-inflation countries, this interest rate elasticity is less (in absolute value) than 0.07 with the exception of Mexico, Venezuela and Greece whose values are around 0.5. In the case of Asian countries with low inflation, their elasticity values are greater than 1.0, and in some cases abnormally high as for Singapore, Malaysia and Thailand, although these results should be taken with care, particularly in the cases were the ECM coefficient is low and not statistically significant.

As mentioned above, only three countries seem to reject the unitary restriction. Nevertheless, after the estimation of the final model it turns out that for six countries, (Colombia, Greece, Korea, Malaysia, Pakistan and Venezuela) the ECM term is not statistically significant. Pakistan and Venezuela are among the three countries that reject the unitary assumption while the case of Greece has been already discussed above. For Colombia, Korea and Malaysia, two reasons explain their results. First, their long-run income elasticity, although closer to one compared with Indonesia, Pakistan and Venezuela, it is around 0.75, and second, these models are cases where the estimation of the coefficients reflect the restriction of keeping the real interest rate along the reduction process. For the other ten countries, the ECM term is statistically significant and negative. Moreover, on average, this term is stronger in the case of most high inflation countries.

Results with respect to inflation are mixed. Current inflation is relevant in five countries (Chile, the Philippines, Sri Lanka, Thailand and Singapore), and with the exception of the Philippines, the coefficients are negative suggesting a positive relationship between inflation and savings. Lagged inflation is relevant and negatively related to consumption for Turkey while in the case of Sri Lanka there is a positive relationship between both variables. Also, it turns out that for six countries, the change in the inflation rate (current or lagged) influences consumption-savings decisions. For Brazil and Venezuela, accelerating inflation will decrease consumption (or stimulate savings) while for Turkey, Mexico, Sri Lanka and Pakistan a positive coefficient suggests an accelerating inflation will stimulate consumption. Given that the latter are high-inflation countries, the

negative effect of inflation on savings can be explained by a flight from money into consumer goods.

In the case of uncertainty, my results suggest an important role of this variable in influencing consumption-saving decisions in high-inflation countries. Moreover, results are more systematic unlike the inflation case. Of the eleven cases where the coefficients are statistically significant, eight are positive. These countries are Korea and Turkey with current change in uncertainty; Uruguay and Venezuela for lagged change in uncertainty and Chile, Colombia, Turkey and Venezuela for lagged uncertainty. A negative coefficient is found in Chile (with current change in uncertainty), Malaysia (with lagged change in uncertainty) and Mexico (with lagged uncertainty). The negative relationship between uncertainty and savings in these high-inflation countries conforms with the argument that uncertainty will lead to a rise in consumption as a result of a flight from money into consumer goods (mainly durables).

From the above results we can conclude that the effects of the interest rates on consumption-saving decisions are stronger in low inflation countries than in the other countries in my sample. Moreover, my results suggest that inflation-uncertainty has a more important role in shaping consumption-saving decisions in high-inflation countries in the sense that an increase in uncertainty negatively affects savings in these countries.

Up to this point, we have assumed that the regressors are weakly exogenous. This is not tested directly, but, in general, Chow tests support parameter constancy. As an additional exercise, the weak exogeneity assumption is lifted and the final models are re-estimated using an instrumental variable procedure by instrumenting variables that are contemporaneous to consumption and a simultaneity problem is suspected. That is the case for r_t, Δr_t, π_t, $\Delta\pi_t$, and $\Delta^2 y_t$. The set of instruments used varies between countries, but in general includes variables lagged two or more periods (see table 2 for a complete list). Results are reported in table 2. The most important difference with respect to the results obtained using OLS relates to the real interest rate coefficients. It turns out that in only four countries, Indonesia, Singapore, Sri Lanka and the Philippines, are these coefficients statistically significant. Except for the Philippines, coefficients are negative. The implied long-run interest rate elasticities of consumption are similar to those obtained earlier and on average are smaller for high-inflation countries than for low inflation countries.

Results with respect to the other variables are, in general, similar to the ones reported in table 1, with the following exceptions. Inflation is no longer statistically significant for Thailand, Mexico and Korea, and the current change in uncertainty turns out not to be significant for Chile and Korea. But, on average, the negative relationship between consumption and inflation is now stronger (7 out of eleven coefficients) while the positive relationship between uncertainty and consumption is maintained.

TABLE 2

ERROR CORRECTION MODEL: REGRESSION RESULTS USING IV

Item	*Brazil (1970-1989)*	*Chile (1971-1989)*	*Colombia (1963-1989)*	*Greece (1964-1989)*		*Indonesia (1973-1989)*	*Korea (1971-1990)*	*Malaysia (1970-1988)*	*Mexico (1963-1989)*
Constant	−0.120	−0.134	−0.003	0.077	0.079	−0.207	0.004	−0.048	−0.457
	(−1.67)	(−2.57)	(−0.07)	(1.19)	(2.13)	(−2.98)	(0.10)	(−0.99)	(−3.55)
Income Rate of Growth	0.680	0.687	0.869	0.508	0.524	0.202	0.658	1.018	0.670
	(2.65)	(8.63)	(6.04)	(4.39)	(4.45)	(0.79)	(4.54)	(6.27)	(4.69)
Change in the Rate of Growth	0.456	—	—	—	—	—	−0.434	−0.445	—
	(1.91)						(−3.29)	(−4.11)	
Real Interest Rate	−0.071	−0.023	−0.070	0.022	—	−0.505	0.267	−0.026	0.160
	(−0.74)	(−0.80)	(−0.86)	(0.12)		(−2.83)	(1.12)	(−0.13)	(1.29)
Change	—	—	—	—	0.049	—	—	—	—
					(0.61)				
Lagged Consumption Income Ratio (EC Term)	−0.368	−0.704	−0.208	0.155[j]	0.162[j]	−0.647	−0.022	−0.063	−0.491
	(−1.81)	(−4.77)	(−1.74)	(0.93)	(1.92)	(−3.22)	(−0.31)	(−0.73)	(−2.60)
Inflation	—	−0.019	—	—	—	—	—	—	—
		(−1.89)							
Lagged	—	—	—	—	—	—	—	—	—
Change in Inflation	−0.027	—	—	—	—	—	—	−0.325	0.027
	(−2.14)							(−1.85)	(−0.42)
Lagged	—	—	—	0.063	0.061	—	0.216	—	—
				(1.07)	(1.28)		(1.55)		
Change in Uncertainty	—	−0.031	—	—	—	—	0.111	—	—
		(−1.60)					(1.60)		
Change	—	—	—	—	—	—	—	−0.138	—
								(−2.09)	
Lagged Uncertainty	—	0.033	0.018	—	—	—	—	—	−0.082
		(2.91)	(1.63)						(−2.79)
Summary Statistics									
Standard Error	0.0456	0.0280	0.0176	0.0134	0.0132	0.0328	0.0238	0.0229	0.0210
Sample Size (T)	20	19	27	26	26	17	20	19	27
AR_n $F(n, m)$[a]	—	—	0.88(3,19)	4.68(3,18)	8.35(2,19)	—	—	—	0.58(3,18)
$ARCH_n$ $F(n, m)$[b]	1.00(2,10)	0.23(2,7)	1.56(3,16)	3.18(3,15)	2.27(3,15)	0.06(3,7)	0.37(2,9)	0.16(2,8)	0.16(3,15)
Specification $\chi^2(n)/n$[c]	1.17(4)	0.98(2)	1.39(5)	0.90(3)	0.79(3)	2.43(2)	0.81(3)	0.84(2)	1.88(2)
Forecast $\chi^2(n)/n$[d]	0.43(1)	0.31(1)	3.11(7)	1.45(9)	1.25(9)	1.27(3)	0.62(1)	6.45(1)	1.20(6)
$T \times SUM$ of Squared First n^{th} Coefficients of Residual Autocorrelation	4.06(4)	1.33(2)	2.37(4)	12.73(4)	15.9(4)	1.62(3)	5.11(4)	2.95(4)	3.49(3)
Steady State Average Propensity to Consume (APC)	0.700	0.815	0.955	0.668	0.670	0.644	0.954	0.467	0.390
Long Run Interest Elasticity of Consumption	−0.18	−0.06	−0.33	−0.19	—	−0.92	13.04	−0.41	0.35

Table 2 (cont.)
Error Correction Model: Regression Results Using IV

Item	*Pakistan (1971-1987)*	*Philippines (1973-1990)*	*Singapore (1973-1989)*	*Sri Lanka (1970-1990)*	*Thailand (1972-1990)*	*Turkey (1966-1988)*	*Uruguay (1973-1989)*		*Venezuela (1973-1990)*	
Constant	–0.080	–0.221	0.001	–0.041	0.010	0.900	–0.312	–0.242	0.624	0.009
	(–1.06)	(–4.07)	(–0.03)	(–1.00)	(0.26)	(1.50)	(–3.42)	(–2.93)	(3.09)	(0.17)
Income Rate of Growth	1.367	0.952	0.502	0.887	0.441	0.618	1.167	1.133	0.748	0.644
	(4.22)	(4.13)	(3.65)	(4.30)	(3.10)	(1.85)	(7.86)	(7.60)	(5.70)	(5.12)
Change in the Rate of Growth	–0.377	—	0.226	—	—	—	—	—	—	—
	(–1.48)		(1.55)							
Real Interest Rate	–0.103	0.677	–0.785	–0.548	–0.437	–0.314	0.098	—	0.164	—
	(–1.53)	(2.73)	(–2.78)	(–1.93)	(–1.40)	(–1.35)	(1.48)		(1.84)	
Change	—	—	—	—	—	—	—	–0.059	—	0.140
								(–0.67)		(1.00)
Lagged Consumption Income Ratio (EC Term)	–0.223	–0.386	–0.062	–0.348	–0.138	–0.577	–1.180	–0.902	–0.366	–0.007
	(–0.86)	(–4.95)	(–1.78)	(–2.04)	(–2.25)	(–2.37)	(–3.39)	(–2.97)	(–3.52)	(–0.08)
Inflation	—	0.691	–0.657	–0.618	–0.539	—	—	—	—	—
		(2.74)	(–2.63)	(–2.86)	(–1.29)					
Lagged	—	—	—	0.464	—	–0.151	—	—	—	—
				(2.83)		(–2.28)				
Change in Inflation	—	—	—	—	—	—	0.084	—	—	—
							(2.12)			
Lagged	0.360	—	—	—	—	—	—	—	–0.385	–0.467
	(2.28)								(3.09)	(–2.32)
Change in Uncertainty	—	—	—	—	—	0.166	—	—	—	—
						(2.22)				
Lagged	—	—	—	—	—	—	—	0.071	—	0.206
								(0.98)		(2.17)
Lagged Uncertainty	—	—	—	—	—	0.361	—	—	0.185	—
						(1.93)			(3.38)	
Summary Statistics Standard Error	0.0278	0.0156	0.0168	0.0340	0.0086	0.0455	0.0269	0.0300	0.0356	0.0437
Sample Size (T)	17	17	17	21	19	23	17	17	18	18
AR_n $F(n, m)$[a]	—	0.16(1,12)	—	0.02(1,14)	—	0.11(2,14)	—	—	—	—
$ARCH_n$ $F(n, m)$[b]	0.33(1,9)	0.27(2,9)	0.09(2,7)	0.79(3,9)	0.67(2,10)	0.50(3,10)	0.20(2,8)	1.56(1,10)	1.35(2,8)	1.32(2,8)
Specification $\chi^2(n)/n$[c]	2.02(2)	1.76(3)	1.67(2)	0.14(2)	1.23(2)	1.50(2)	2.72(2)	1.22(2)	0.90(4)	0.03(2)
Forecast $\chi^2(n)/n$[d]	2.72(1)	0.22(1)	0.36(1)	0.82(4)	2.28(3)	2.76(4)	0.84(2)		3.91(2)	9.47(2)
$T \times SUM$ of Squared First n^{th} Coefficients of Residual Autocorrelation[e]	1.47(2)	0.10(2)	1.26(2)	7.61(4)	3.35(4)	1.52(4)	1.23(2)	0.31(2)	3.91(2)	0.29(2)
Steady State Average Propensity to Consume (APC)	0.727	0.585	0.821	0.837	0.860	4.614	0.772	0.768	5.030	0.783
Long Run Interest Elasticity of Consumption	–0.47	1.80	–13.07	–0.95	–2.88	–0.54	0.08	—	0.44	—

Notes: All the results were obtained using the PC-GIVE module of PC-GIVE version 6.01. The dependent variable is the first difference of logarithm of total private consumption. Fig- ures within parenthesis under country names are periods of analysis; those under coefficients are *t*-value; those beside the test statistics are the degrees of freedon of the *F* and χ^2 tests.

a) Lagrange Multiplier test for n^{th} order residual autocorrelation reported as an *F*-form (*F*-equivalent) test with m degrees of freedom. *b) ARCH* test for residual heteroscedasticity for n^{th} order lags reported as an *F*-form test with m degrees of freedom. *c)* Test for the validity of the instruments asymptotically distributed as $\chi^2(n)$ when n overidentifying instruments are independent of the equation error. The test values reported are standarized by their degrees of freedom for ease comparison to *F*-tests. *d)* Test for the null of no structural change in any parameter between the sample and the forecast period (given by *h*). The values reported are standarized as in c. *e)* This statistic can be indicative of misspecification if the values are greater or equal to $2n$. The value for n for each country is the number within parenthesis. *f)* Elasticity of consumption to income across steady-state equilibria obtained from the unrestricted model. *g)* Computed from the non-inflationary steady-state solution (long-run) to the estimated model and assuming 3% growth of per-capita income and a real interest rate of 2%. *h)* Implied interest rate elasticity of consumption obtained from the long run solution of the estimated model. *i)* This coefficient corresponds to the consumption income ratio lagged twice. For the list of instruments we use the following notation: *R* = real interest rate, *RN* = nominal interest rate, *INF* = inflation, *Y* = income, *C* = consumption, *EC* = error term, *M* = *m*1 aggregate, *U* = uncertainty, *D* = first difference; the number to the right indicates the laggs. Brazil: *R*2, *EC*2, *DRN*2, *INF*2, 3, *DU*1; Chile: *R*2, *EC*2, *INF*2, *DINF* 2, 3; Colombia: *R*2, *DC* 2, 4, *INF*2, *DINF*2, *EC*2, *DRN*2; Greece: *DM*2, *DY*2, *INF*2, *RN*2, *R*2 (*DRN*2 and *R*2 for second set); Indonesia: *DRN*2, 3, *DC*2, *R*2; Korea: *R*2, D^2 *Y*2, *DRN*3, *EC*2, 3 *DM*2; Malaysia: *INF*2, *DINF*2, *DRN*2, *DM* 1, D^2 *Y*2, *DY*2,; Mexico: *R*2, *INF*2, *DRN*2, 3, *EC*2; Pakistan: *DC*2, *EC* 1, 2, *INF*3, D^2 *Y*2; Philippines: *INF*2, *DC*2, 3, *EC*-1, *U*2, 3; Singapore: *INF*2, 3, *DY*2, 3, *DM*1,; Sri Lanka: *M*1, *DC*2, *DM*2, *R*2, *DRN*2; Thailand: *DRN*2, *DC*3, *EC*1, *DRN*1; Turkey: *DC*2, *R*2, *EC*2, *INF*2; Uruguay: *R*2, *DC*3, *DINF*3, *DM*2 and *DC*3, *DM*2, *DRN*2 for second set; Venezuela: *R*2, *DM*2, *INF*2, 3, *DRN*2, *DC*2 and *DC*2, *DRN*2, 3 and *DINF*2 for set II.

The performance of the models is very similar to the OLS estimations. Note that the standard errors of the equations are very similar, increasing in the instrumental variables procedure on average 8% over the ones obtained with the OLS procedure. In particular, the test for the validity of the instruments is not rejected in any case, although it was close to rejection in the cases of Indonesia and Uruguay. Greece does not show any improvement by using instrumental variables. In general, there is no sign of residual autocorrelation (there is a weak evidence in the case of Sri Lanka) or residual heteroscedasticity. Unfortunately the sample size limits tests for parameter stability using out of sample forecasts. The forecast test used, which is more a measure of numerical parameter constancy, suggests some problems only in the cases of Colombia, Malaysia, Turkey and Venezuela. In general, results obtained using a IV procedure tend to reinforce the results obtained using OLS. In particular, the effect of interest rates on consumption/saving is stronger only in low inflation countries, while inflation and inflation-uncertainty has a stronger role in negatively affecting savings behavior.

CONCLUSIONS

This paper explored the relationship between the real interest rate and the aggregate time-series of consumption (saving) by following Hendry's methodology. The central objective was to see if an error correction model for private consumption derived by forcing the presence of the interest rate along the reduction process can adequately characterize the DGP for the countries in my sample. The model also includes as regressors the inflation rate and a term for inflation-uncertainty. The exercise was performed first by assuming regressors that are weakly exogenous to consumption and, therefore, using an ordinary least squares procedure. Later, this assumption was lifted and the models were estimated using an instrumental variables procedure. The performance of the empirical models, in terms of congruency, using both procedures is very similar with a slight deterioration in some tests when using instrumental variables. Although most of the coefficients are very similar using both procedures, the major difference turns out to be in the case of the interest rate coefficient. When the models are estimated using instrumental variables, most of these coefficients, with the exception of four countries, are statistically not significant.

The central conclusion that can be drawn from this exercise is that the effect of the real interest rate on consumption-saving decisions is small and not significant in most high inflation countries. In the case of low inflation countries, in particular Asian countries, there is a stronger interest rate effect on savings. Moreover, the above results suggest that the effect of inflation and inflation-uncertainty is more important in shaping consumption-saving decisions and the

significance of these coefficients was found to be more systematic. More precisely, it is found that an increase in inflation-uncertainty has a negative effect on savings, mainly because there is a flight from money into consumer goods, in particular durables. Finally, my results show that at least for half of the countries in my sample, an error correction model seems to be an adequate representation of the data.

NOTES

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[1] The current popularity of the error correction model is largely due to David Hendry. But his work is strongly influenced by A.W. Phillips and D. Sargan, in the London School of Economics tradition.

[2] For a complete exposition of this approach see Hendry and Richard (1982), Hendry (1983, 1986 and 1989) and Harvey (1990).

[3] If the data base is too small to estimate the general model, a pre-simplified feasible general unrestricted model is estimated.

[4] The appropriate exogeneity requirement depends on the models' objective. Weak exogeneity will, in general, be sufficient for testing hypothesis; forecasting requires strong exogeneity while super-exogeneity is required to sustain policy analysis. See Engel *et al.* (1983) and Harvey (1990) for a complete discussion.

[5] One implication of this approach is that the presence of residual autocorrelation is taken as a symptom of poor model design. For Hendry, it is inappropriate to assume an underlying autoregressive error process and 'remove' it via the application of the Cochrane-Orcutt transformation unless it is suggested first by a common factor test.

[6] It is important to chose the adequate transformations and functional form to ensure, for example, positive values for consumption or values for the unemployment rate that are between zero and one, etc.

[7] The encompassing aspects are as important as the other ones. A good model should not only explain the data, but should also explain both the successes and the failures of rival models in accounting for the same data. In this work I do not deal with the encompassing aspect because the final models obtained here are not necessarily the "tentatively adequate data characterization of the DGP" for private consumption as mentioned in the text.

[8] A variable is said to be integrated of order n, I(n) if its n^{th} difference has a mean and variance that are constant over time, i.e., is weakly stationary.

[9] The relationship between inflation, inflation variability and inflation uncertainty is the issue of a current debate which started with Friedman's Nobel lecture. In a recent paper, Ball and Cecchetti (1990) argue that inflation raises both, variability and uncertainty, unlike, e.g., Stanley Fisher.

[10] For a discussion of the use of this variable see Villagómez (1992).

[11] For a discussion of this procedure see Evans (1984).

[12] It is interesting to note that for many countries, the interest rate used in this paper reflects the impact of interest rate liberalization measures for a substantial part of the sample period. For example, the average real interest rate for five countries is positive, for four others it is negative, but not lower than −1 percent, while for the rest of the countries the average real interest rate ranges between −2 and −6, 7.

[13] This test is the one defined in Sargan (1964).

[14] A complete exposition and discussion of the different tests used here is given in Hendry (1990).

[15] Although the coefficients are not statistically significant, deleting any one of them resulted in parameter instability, residual heteroscedasticity and increase in residual autocorrelation.

[16] These estimated long-run interest rate elasticities of consumption should be taken only as references because, again, not all the final models estimated represented the final adequate model. Also, note that for the models including r in first difference there is no implied long-run elasticity because, in the steady state solution, $r_t = r_{t-1}$, and r does not enter the equation in levels.

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Appendix 1

Description of the Data Set

Data on GNP, Private Consumption, Population and Consumer Price Indexes were obtained from *International Financial Statistics* (IFS), International Monetary Fund (IMF). The basic interest rate data for Asian countries were obtained from the Asian Development Bank (ADB), *Key Indicators*, various numbers and from *Economic Bulletin for Asia and the Pacific* (EBAP), United Nations, various numbers. An additional source is the Bank of Korea, various numbers. All the interest rates are annualized rates for time deposits. The individual interest rates are: India, Korea, Pakistan and Sri Lanka: 12 months rates; Indonesia, Malaysia, the Philippines and Singapore: 6 months rates.

The basic interest rates for Latin America countries are:

Brazil: Interest rate on short term instruments. Galbis (1979), Green-Villanueva (1990) and IFS, IMF. Before 1983, data refers to the rate paid by finance companies; starting 1983 is the annualized rate on time deposits for 60 days.

Chile: Average interest rate paid on short term deposits taken from IFS, IMF. Before 1977 the maximun legal interest rate was fixed by the Central Bank of Chile.

Colombia: Time deposit interest rate for 3 months. Banco de la República, *Informe Anual*, various numbers. Before 1970 is the rate on 6 months time deposits.

Mexico: An average for different instruments for the period 63-86 and updated until 1989 using data from Banco de México. Reyes Heroles (1988).

Uruguay: Before 1976 is the legal maximum for 6 to 12 months time deposits. After that period is the average interest rate on 6 months time deposits. IFS, IMF.

Venezuela: From 1980-90, a time deposit rate for 6 months. Before 1980 is the mortgage bond rate (cédula hipotecaria). Departamento de Estudios Monetarios y Financieros, Banco Central de Venezuela.

Other countries: *Greece:* Time deposit rate for 6 months, IFS, IMF; *Turkey:* Time deposit rate for 12 months, from Fry (1988).

APPENDIX 2

AUGMENTED DICKEY FULLER TESTS: UNIT ROOT AND TREND STATISTICS

X (sample)	X no trend	X with trend	ΔX no trend	ΔX with trend	Δ^2X no trend	Δ^2X with trend	t-tests for deterministic trends X	t-tests for deterministic trends ΔX
Brazil								
Y	−1.38	−0.86	−2.98*	−3.51*	−4.73**	−4.66**	−0.06	−1.13
(1964-1989)	0.94	0.89	0.19	0.00	−0.73	−0.76		
C	−1.58	−0.23	−2.65+	−2.93	−4.80**	−4.76**	−0.88	−1.60
(1964-1989)	0.93	0.97	0.34	0.12	−0.92	−1.00		
U	−1.96	−1.96	−1.91	−3.41+	−4.18**	−4.04**	4.44	3.03
(1966-1989)	0.86	0.88	0.63	−0.11	−0.60	−0.59		
R	−4.29**	−4.29**	−3.18*	−2.94	−3.10*	−3.13	−0.48	0.85
(1968-1990)	−0.45	−0.66	−0.62	−0.57	−0.56	−0.58		
P	1.43	1.96	2.20	1.23	−1.34	−2.51	−6.66	0.87
(1959-1990)	1.02	1.10	1.22	1.15	0.71	0.42		
Chile								
Y	−4.04**	−4.16**	−4.48**	−4.29**	−7.32**	−7.36**	1.81	−0.89
(1963-1989)	0.40	0.27	−0.22	−0.22	−1.07	−1.10		
C	−3.22*	−3.62*	−6.52**	−6.56**	−11.25**	−10.97**	2.16	−0.24
(1963-1989)	0.47	0.33	−0.43	−0.43	−0.69	−0.64		
U	−0.55	−3.60*	−3.15*	−3.51*	−4.83**	−4.56**	−3.54	−1.90
(1970-1990)	0.93	0.56	0.30	0.29	−0.81	−0.91		
R	−3.59**	−3.92*	−4.57**	−4.47**	−4.79**	−4.68**	0.56	0.15
(1964-1990)	0.57	0.52	0.10	0.10	−0.29	−0.30		
P	−1.68	−3.57*	−2.91*	−2.90	−3.56**	−3.46*	0.46	−0.87
(1960-1990)	0.98	0.89	0.77	0.77	0.37	0.36		
Colombia								
Y	−0.41	−2.34	−3.68**	−3.63*	−5.72**	−5.62**	2.33	−0.04
(1950-1990)	0.99	0.70	0.06	0.05	−0.82	−0.81		
C	−0.67	−2.45	−4.19**	−4.13**	−6.18**	−6.09**	2.23	−0.33
(1950-1990)	0.99	0.68	−0.01	−0.01	−0.84	−0.84		
U	−2.02	−3.19+	−3.60**	−3.48*	−5.57**	−5.55**	−1.99	−0.13
(1961-1990)	0.82	0.64	0.23	0.23	−0.68	−0.71		
R	−2.32	−5.22**	−10.91**	−11.07**	−13.40**	−13.12**	3.54	0.26
(1961-1990)	0.47	−0.45	−1.22	−1.21	−1.57	−1.58		
P	3.62	−1.00	−2.31	−4.19**	−8.10**	−7.98**	2.04	4.24
(1950-1990)	1.03	0.97	0.65	0.04	−1.06	−1.06		
Greece								
Y	−2.42	0.04	−3.19*	−4.63**	−8.19**	−8.03**	−0.94	−2.58
(1950-1989)	0.96	1.00	0.32	−0.09	−1.01	−1.00		
C	−2.36	−0.45	−2.94*	−3.90**	−8.81**	−8.63**	−0.93	−2.31
(1950-1989)	0.97	0.98	0.45	0.16	−1.07	−1.07		
U	−1.78	−1.54	−3.12*	−3.20+	−5.64**	−5.51**	−0.30	−0.79
(1962-1990)	0.83	0.83	0.14	0.08	−0.93	−0.93		
R	−2.45	−2.61	−4.79**	−4.85**	−6.05**	−5.91**	−0.64	0.32
(1962-1990)	0.59	0.50	−0.39	−0.45	−0.95	−0.94		
P	1.80	−0.72	−1.48	−2.64	−5.67**	−5.65**	1.14	2.62
(1950-1990)	1.02	0.99	0.86	0.66	−0.33	−0.34		

Augmented Dickey Fuller tests: unit root and trend statistics

X (*sample*)	*X* no trend	*X* with trend	ΔX no trend	ΔX with trend	$\Delta^2 X$ no trend	$\Delta^2 X$ with trend	*t-tests for deterministic trends* *X*	*t-tests for deterministic trends* ΔX
Indonesia								
Y	–2.50	–2.85	–3.88**	–4.56**	–6.01**	–5.90**	1.06	–1.35
(1962-1989)	0.81	0.67	–0.16	–0.38	1.03	–1.03		
C	–2.67+	–2.49	–3.52*	–4.45**	–5.81**	–5.70**	0.89	–1.32
(1962-1989)	0.77	0.65	–0.13	–0.33	–0.97	–0.98		
U	–1.33	–1.45	–2.53	–2.51	–4.13**	–3.91*	–3.19	0.88
(1972-1990)	0.91	0.72	0.17	0.14	–0.61	–0.61		
R	–3.13*	–5.93**	–5.22**	–4.91**	–5.39**	–5.55**	2.21	1.10
(1971-1989)	0.28	0.00	–0.26	–0.33	–0.86	–0.98		
P	–4.97**	–4.95**	–2.46	–2.92	–8.25**	–9.61**	1.33	–2.37
(1962-1989)	0.84	0.72	0.55	0.22	–1.25	–1.35		
Korea								
Y	0.51	–2.87	–3.96**	–4.08**	–5.78**	–5.70**	3.05	0.87
(1953-1990)	1.01	0.78	0.22	0.16	–0.57	–0.58		
C	0.49	–2.28	–3.65**	–3.66*	–6.86**	–6.73**	2.62	0.78
(1953-1990)	1.01	0.81	0.17	0.14	–0.88	–0.88		
U	–0.81	–1.50	–2.97	–4.73**	–3.87**	–3.35+	–2.30	–2.28
(1970-1990)	0.89	0.83	0.37	–0.44	–0.51	–0.41		
R	–2.81+	–2.71	–4.54**	–4.51**	–5.13**	–4.97**	–0.63	0.42
(1966-1990)	0.46	0.45	–0.41	–0.43	–0.85	–0.85		
P	–1.20	–2.76	–6.89**	–6.25**	–6.79**	–6.64**	9.60	–0.77
(1950-1990)	0.99	0.83	0.43	0.39	–0.11	–0.18		
Malaysia								
Y	–0.40	–3.36+	–5.61**	–5.52**	–7.43**	–7.30**	2.99	0.19
(1955-1989)	0.99	0.48	–0.33	–0.33	–0.95	–0.95		
C	–0.40	–4.27**	–5.01**	–4.95**	–5.83**	–5.73**	2.49	0.37
(1955-1989)	0.99	0.47	–0.06	–0.07	–0.52	–0.52		
U	–1.24	–2.43	–4.05**	–4.15**	–4.89**	–4.75**	–2.11	–0.66
(1966-1990)	0.87	0.69	0.06	–0.02	–0.50	–0.50		
R	–2.77+	–3.15+	–4.35**	–4.25**	–5.82**	–5.67**	0.96	0.33
(1968-1988)	0.36	0.25	–0.60	–0.56	–1.06	–1.07		
P	1.27	–3.25+	–3.53**	–3.93*	–5.88**	–5.76**	1.38	2.95
(1950-1989)	1.02	0.90	0.52	0.42	–0.13	–0.13		
Mexico								
Y	–1.30	0.05	–4.27**	–4.99**	–9.53**	–9.47**	0.12	–1.38
(1950-1989)	0.96	1.01	0.06	–0.10	–1.14	–1.15		
C	–1.11	–0.74	–5.36**	–6.06**	–9.42**	–9.31**	1.11	–0.92
(1950-1989)	0.96	0.91	–0.09	–0.20	–0.91	–0.92		
U	–0.07	–2.37	–4.42**	–5.48**	–7.11**	–6.97**	4.00	1.97
(1961-1990)	0.99	0.69	–0.18	–0.65	–1.39	–1.38		
R	–2.65+	–2.35	–6.41**	–6.58**	–7.61**	–7.41**	–0.23	0.88
(1960-1990)	0.44	0.40	–0.85	–0.95	–1.44	–1.45		
P	1.05	–0.25	–1.85	–3.37+	–6.92**	–6.79**	1.47	1.91
(1950-1990)	1.02	0.99	0.81	0.48	–0.69	–0.69		

AUGMENTED DICKEY FULLER TESTS: UNIT ROOT AND TREND STATISTICS

	X		ΔX		$\Delta^2 X$		*t-tests for deterministic trends*	
X (sample)	*no trend*	*with trend*	*no trend*	*with trend*	*no trend*	*with trend*	*X*	ΔX
Pakistan								
Y	0.52	−1.53	−2.36	−2.52	−4.01**	−3.92*	1.20	1.12
(1960-1989)	1.02	0.88	0.45	0.39	−0.43	−0.43		
C	−0.35	−1.35	−3.26*	−3.26+	−5.97**	−5.84**	1.71	0.42
(1960-1989)	0.96	0.84	0.02	0.00	−1.11	−1.10		
U	−1.68	−1.64	−3.09*	−3.12+	−4.89**	−4.75**	−0.92	−1.02
(1966-1990)	0.80	0.81	0.14	0.07	−0.68	−0.68		
R	−1.78	−3.16+	−2.82+	−2.79	−4.11**	−4.24**	2.07	0.30
(1970-1987)	0.59	0.17	−0.12	−0.17	−0.64	−0.64		
P	1.01	−2.03	2.85+	−3.45*	−6.81**	−6.71**	2.86	1.94
(1950-1990)	1.02	0.92	0.46	0.26	−0.87	−0.87		
Philippines								
Y	−2.54	−1.78	−4.10**	−4.58**	−7.21**	−7.12**	0.01	−1.86
(1950-1990)	0.93	0.89	0.21	0.04	−0.77	−0.77		
C	−2.78+	−2.62	−4.51**	−4.60**	−8.01**	−7.96**	1.22	−1.76
(1950-1990)	0.91	0.80	0.19	0.03	−0.96	−0.98		
U	−2.65+	−2.80	−3.18*	−3.09	−4.23**	−4.13**	0.80	0.16
(1965-1990)	0.63	0.60	0.16	0.16	−0.50	−0.51		
R	−3.91**	−4.70**	−5.51**	−5.38**	−5.74**	−5.42**	1.40	−0.06
(1972-1990)	−0.29	−0.57	−0.92	−0.92	−1.12	−1.11		
P	1.74	−2.43	−3.57**	−4.92**	−7.91**	−7.82**	3.12	2.79
(1950-1990)	1.02	0.91	0.39	−0.01	−0.81	−0.81		
Singapore								
Y	−0.38	−2.79	−3.46*	−3.39+	−5.50**	−5.38**	1.69	−0.02
(1960-1989)	0.99	0.71	0.26	0.26	−0.58	−0.58		
C	0.22	−3.30+	−2.92*	−2.90	−4.34**	−4.22**	1.83	0.81
(1960-1989)	1.01	0.69	0.40	0.39	−0.36	−0.36		
U	0.42	−2.59	−2.67+	−2.79	−4.64**	−4.76**	−4.49	−1.21
(1973-1990)	1.03	0.49	0.02	−0.26	−1.16	−1.23		
R	−4.97**	−4.90**	−7.34**	−6.90**	−13.10**	−12.63**	1.43	−1.24
(1972-1990)	0.16	−0.01	−0.57	−0.68	−0.80	−0.77		
P	−0.65	−2.74	−4.29**	−4.20**	−6.48**	−6.36**	1.65	−0.05
(1960-1990)	0.98	0.76	0.24	0.24	−0.43	−0.44		
Sri Lanka								
Y	0.44	−2.28	−4.11**	−4.13**	−6.27**	−6.18**	1.93	1.31
(1950-1990)	1.01	0.89	0.28	0.24	−0.51	−0.52		
C	0.54	−2.20	−3.48**	−3.64*	−6.85**	−6.78**	1.80	1.30
(1950-1990)	1.01	0.88	0.22	0.14	−0.91	−0.91		
U	−0.55	−2.26	−2.94*	−2.81	−5.10**	−5.39**	2.56	0.25
(1965-1990)	0.96	0.58	0.14	0.16	−1.11	−1.23		
R	−2.77+	−2.97	−4.55**	−4.49**	−6.00**	−5.91**	0.90	−0.34
(1966-1990)	0.29	0.12	−0.57	−0.58	−1.20	−1.22		
P	2.70	−0.38	−1.64	−3.59+	−4.98**	−4.95**	2.33	3.59
(1950-1990)	1.04	0.99	0.77	0.28	−0.39	−0.39		

APPENDIX 2 (CONT.)

AUGMENTED DICKEY FULLER TESTS: UNIT ROOT AND TREND STATISTICS

X (*sample*)	*X*		Δ*X*		$\Delta^2 X$		*t-tests for deterministic trends*	
	no trend	*with trend*	*no trend*	*with trend*	*no trend*	*with trend*	*X*	Δ*X*
Thailand								
Y	0.68	−2.92	−4.21**	−4.60**	−7.03**	−6.89**	2.40	1.17
(1953-1990)	1.01	0.68	0.15	0.05	−0.70	−0.70		
C	1.34	−2.24	−3.44*	−3.86*	−8.72**	−8.60**	2.55	1.76
(1953-1990)	1.03	0.77	0.16	0.01	−1.29	−1.30		
U	−1.00	−0.30	−1.50	−3.93**	−3.90**	−3.84*	−3.36	−2.96
(1969-1990)	0.89	0.97	0.60	−0.17	−0.66	−0.72		
R	−2.58+	−3.31+	−3.86**	−3.78*	−5.00**	−4.83**	1.08	0.38
(1969-1990)	0.47	0.30	−0.26	−0.28	−0.87	−0.87		
P	0.02	−1.87	−3.72**	−3.87*	−6.10**	−6.00**	1.83	0.54
(1953-1990)	1.00	0.91	0.40	0.35	−0.41	−0.41		
Turkey								
Y	−1.26	−0.29	−2.60+	−2.72	−5.86**	−6.04**	0.99	−1.22
(1953-1989)	0.96	0.97	0.39	0.37	−0.88	−0.96		
C	−1.17	−0.85	−3.96**	−4.08**	−6.46**	−6.49**	1.84	−1.00
(1953-1988)	0.96	0.88	−0.04	−0.05	−0.97	−1.01		
U	−2.18	−2.12	−3.25*	−3.17+	−5.28**	−5.15**	0.23	−0.15
(1965-1990)	0.56	0.56	−0.10	−0.10	−1.08	−1.08		
R	−2.80+	−2.84	−3.83**	−3.65*	−4.44**	−4.36**	−0.47	−0.14
(1961-1988)	0.49	0.46	−0.22	−0.22	−0.68	−0.68		
P	2.23	0.27	−1.25	−2.75	−4.93**	−4.95**	0.70	2.52
(1953-1990)	1.08	1.01	0.85	0.56	−0.36	−0.40		
Uruguay								
Y	−3.27*	−3.76*	−4.26**	−4.14**	−4.96**	−4.86**	1.21	0.13
(1961-1989)	0.49	0.38	−0.06	−0.06	−0.60	−0.60		
C	−2.29	−3.42+	−3.65**	−3.49*	−3.96**	−3.89*	2.07	0.08
(1961-1989)	0.65	0.36	−0.04	−0.02	−0.49	−0.49		
U	−0.26	−2.00	−2.88+	−2.72	−4.32**	−4.10**	−2.29	−0.57
(1971-1990)	0.96	0.36	−0.43	−0.42	−1.20	−1.16		
R	−1.76	−1.29	−3.96**	−4.93**	−4.62**	−4.42**	1.56	−1.13
(1971-1990)	0.72	0.66	−0.39	−0.49	−0.86	−0.94		
P	0.45	−3.69*	−3.71**	−3.74*	−3.89**	−3.76*	2.48	0.61
(1961-1990)	1.00	0.52	0.26	0.24	−0.14	−0.14		
Venezuela								
Y	−1.84	−1.10	−4.10**	−4.47**	−7.16**	−7.00**	0.33	−1.43
(1960-1990)	0.87	0.85	−0.22	−0.38	−1.28	−1.28		
C	−1.63	−1.09	−2.51	−2.71	−5.99**	−5.98**	0.74	−1.37
(1960-1990)	0.92	0.80	0.21	0.13	−1.17	−1.21		
U	−0.44	−2.36	−2.24	−3.12	−4.92**	−4.75**	3.24	2.27
(1965-1990)	0.95	0.71	0.34	−0.02	−0.87	−0.87		
R	−0.20	−0.79	−1.86	−2.07	−2.97*	−2.84	−1.74	−1.21
(1971-1990)	0.91	0.61	−0.11	−0.33	−1.47	−1.54		
P	4.13	2.60	1.33	−0.27	−2.75+	−3.15+	−0.79	2.92
(1950-1990)	1.12	1.13	1.25	0.93	0.06	−0.15		

NOTES: Data are annual measures of GNP (Y) per-capita real, real per-capita total private consumption (C), real interest rate (R), inflation-uncertainty (U) and the price level (P) given by the CPI. All variables are in logs. The sources are the same as in appendix. ADF *t*-statistics and coefficients are reported in the first and the second lines for each series. The regression has 2 lags. The 10% (+), 5% (*) and 1%(**) critical values are taken from Fuller's (1976) table 8.5.2. for ADF statistics with a deterministic trend (−3.15, −3.45 and −4.04, respectively) and without a deterministic trend (−2.58, −2.89 and −3.51, respectively) included in the regression. The *t*-test for deterministic trends were obtained by regressing the series againts 4 own lags and time.

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