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Determinants of Consumption and Savings Behavior in Developing Countries

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The determinants of savings generally and the specific effects of government policies on savings and consumption are pivotal forces in investment and economic growth. The Hall hypothesis states that consumption is a function of lifetime ("permanent") income, rather than income in each period independently. Changes in interest and tax rates, money supply, or government expenditure will affect permanent income and hence consumption and savings only if they are unexpected and thus not already incorporated in the estimation of permanent income. We are unable to reject the Hall hypothesis in tests for developing countries when we allow for varying interest rates. We do find evidence of a negative effect of inflation on consumption, and a positive relationship between the real interest rate and consumption. The evidence for the Hall hypothesis also suggests that Ricardian equivalence may be valid—this is Barro's hypothesis that the effect on savings is the same whether government deficits are financed through taxation or debt. Our preliminary testing, however, does not support Ricardian equivalence.

Savings is the part of one's current income that is not spent on current consumption, and it constitutes a large part of a nation's aggregate savings and investment and thus is a major determinant of the growth of future income and consumption. Households balance the tradeoffs between current and future consumption possibilities when making their individual consumption decisions. Understanding the determinants of households' consumption behavior has been central to macroeconomics. The three main theoretical approaches to this issue are Keynesian consumption theory, the life-cycle–permanent-income hypothesis under rational expectations, and the theory of the infinitely lived agent or altruistically linked consumers. The theories differ in the extent to which they explain the observed consumer behavior, and in their predictions regarding the effects of government policies on individual savings behavior. For instance, increased taxes, higher nominal interest rates, or an increase in the money

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supply will always affect household consumption according to Keynesian theory, but the other two approaches predict that these policies will have no effect on individual consumption unless they come as a surprise. Similarly these theories differ substantially regarding the effects on savings of the government budget deficit and its financing.

Observations of consumption behavior from time-series data differ from those of cross-sectional data (see Sargent 1979, chap. 12). What is observed is that the average propensity to consume out of current income is higher than the marginal propensity to consume in the cross-sectional data. But in time-series data when the variables are averaged over ten years, these two propensities are equal. Friedman's (1957) celebrated permanent-income hypothesis as well as the life-cycle hypotheses of Modigliani and Brumberg (1954) and Ando and Modigliani (1963) were partly a response to this empirical puzzle. Hall (1978) addressed this issue using the life-cycle–permanent-income hypothesis, which assumes that capital markets are perfect, the interest rate is constant over time, and consumers have rational expectations regarding the income-generating process. Given this framework, he showed that consumption follows a random walk—that is, it will have a time trend around which it will fluctuate. This is known as the random-walk hypothesis for consumption, which can be explained intuitively as follows. While a consumer's earnings fluctuate over his lifetime, if capital markets are perfect and there is no uncertainty about the rate of interest, then by borrowing and lending, a consumer will smooth out his consumption stream evenly over his lifetime. Thus if his utility function satisfies some general conditions, consumption in each period will be proportional to life-cycle wealth or permanent income rather than to current income. Since permanent income has greater persistence, that is, it follows a random walk, so does the share of consumption in income.

The Hall hypothesis is not merely of technical interest but has several implications for forecasting and policy analysis. First, if the hypothesis is correct, the forecast of future consumption is an extrapolation of the historical trend, and there is no point in forecasting future income and using that to predict future consumption. Second, government policy will affect consumption and hence savings only through its effects on permanent income. A change in a public policy regarding tax rates, interest rates, the money supply, or government expenditures will have no effect on the estimation or perception of permanent income by a consumer if it was predictable in the past. A change in government policy will have an effect on consumption only if it comes as a surprise. Most estimates of the effects of government policy for developing countries are based on estimations of Keynesian consumption functions. An exception to this is a recent paper by Giovannini (1985), which compares estimates of the interest elasticity of savings using traditional Keynesian and the new approach. However, Giovannini did not carry out any formal testing of the life-cycle–permanent-income hypothesis under rational expectations. The main aim of our article is to test the Hall hypothesis for developing countries.

The Hall hypothesis has implications for government policy that may support those derived from the Ricardian equivalence hypothesis. The Ricardian equivalence hypothesis, as derived in Barro (1974), states that the effect on national savings is the same whether a government deficit is financed by current taxes or borrowing from future. When the deficit is financed by government sale of bonds, this creates current government *dissavings* and imposes a tax liability on future generations. Barro shows that if it is assumed that individuals are altruistic toward their children, the current generation will have adjusted its bequests (private savings) to completely offset the increased tax liabilities of future generations caused by the increased government debt (public dissavings). Thus aggregate savings will be the same if instead the deficit is financed by imposing taxes on the current generation. In this case individuals will offset the increased public saving by lowering their savings as smaller bequests will be required to guarantee a given stream of consumption for future generations. This is similar to the results which would be expected under the Hall hypothesis if an individual was infinitely lived and based consumption and savings decisions on permanent income.

We derive the random walk of consumption from the life-cycle–permanent-income hypothesis assuming rational expectations and a fixed interest rate, and we report our empirical results on two excess sensitivity tests of the random-walk hypothesis for developing countries. We then allow interest rates and labor income in our model to vary and derive the random walk of consumption with a time-varying drift. Then we extend the excess sensitivity tests to examine the empirical validity of the Hall hypothesis. In conclusion, we summarize some of the economic significance of our empirical findings and suggest what questions remain.

I. The Random-Walk Hypothesis: Constant Interest Rates

The Model

Hall (1978) assumed that consumers have rational expectations about the income generating process, and he combined Friedman's (1957) permanent-income hypothesis with Modigliani and Brumberg's (1954) life-cycle hypothesis. On this basis, he derived the random walk for consumption as follows: assume that a representative consumer receives a stochastic stream of labor income, $W_t + \tau$, with $\tau = 1, 2, \ldots, T - t$, where T is life expectancy. Let A_t be his nonhuman stock of wealth and Ω_t be the information set at the beginning of period t which contains, among other things, his observed labor income and chosen consumption stream up to period t. Assume that the interest rate is constant over time and capital markets are perfect. This will mean that the consumers can borrow and lend freely at the given interest rate, so that they are not credit-constrained to finance their consumption. Income is the only source of uncertainty.

The consumer's problem is to make a future consumption plan contingent upon information that will be available in each future period in such a way that he maximizes utility as a function of his discounted lifetime stream of consumption:

$$\text{(1)} \qquad \text{Max } U = E_t\left(\sum_{\tau=0}^{T-t} (1+\delta)^{-\tau} u(C_{t+\tau})\right)$$

subject to the limits of his income stream, stock of assets, and the interest rate:

$$\sum_{\tau=0}^{T-t} (1+r)^{-\tau}(C_{t+\tau} - W_{t+\tau}) \leq A_t$$

where $E_t(x)$ denotes the conditional expectation of x given information, Ω_t, r is the fixed interest rate, $\delta > 0$ is the rate of subjective time preference, and $u(.)$ is a differentiable strictly concave function. The first-order necessary condition or what is also known as the Euler equation for this problem is

$$\text{(2)} \qquad \rho u'(C_t) = E_t[u'(C_{t+1})],$$

where $\rho = (1 + \delta)/(1 + r)$ and $u'(C_t)$ is the marginal utility of consumption in period t. This equation states that the marginal utility of consumption follows a random walk with a drift, where the drift, ρ, is determined by the relative size of the rate of time preference and the interest rate.

From equation 2, it follows that

$$\text{(3)} \qquad u'(C_{t+1}) = \rho u'(C_t) + \zeta_{t+1}$$

where the expected value of the error term, $E_t(\zeta_{t+1}) = 0$. For empirical purposes, we assume a constant elasticity utility function:

$$u(c) = (c^{1-\sigma} - 1)/(1 - \sigma), \sigma > 0.$$

Then equation 2 becomes:

$$E_t\left(\frac{u'(C_{t+1})}{\rho u'(C_t)}\right) = 1$$

so that

$$\frac{u'(C_{t+1})}{\rho u'(C_t)} = \eta_{t+1}, \text{ where } E_t(\eta_{t+1}) = 1$$

Multiplying by ρ and taking logs, we get

$$\ln u'(C_{t+1}) - \ln u'(C_t) = \ln \rho + \ln \eta_{t+1}$$

so that the change in consumption is determined by the elasticity of utility with respect to consumption, and by the rates of interest and time preference.

Because this equation is based on the constant elasticity utility function, $u'(C) = C^{-\sigma}$, it can be written as: $\ln C_{t+1} - \ln C_t = 1/\sigma[-\ln \rho - \ln \eta_{t+1}]$. Since the term $(1/\sigma \ln \eta_{t+1})$ does not have expectation zero, it could not be treated as an error term in the regression. The above could be rewritten, however, as:

$$\ln C_{t+1} - \ln C_t = -1/\sigma[\ln \rho + \ln \eta_{t+1} - E_t \ln \eta_{t+1} + E_t \ln \eta_{t+1}]$$

or

(4) $$\ln C_{t+1} - \ln C_t = \alpha + u_{t+1}$$

where $\alpha = -1/\sigma[E_t \ln \eta_{t+1} + \ln 0]$ and

$u_{t+1} = -1/\sigma[\ln \eta_{t+1} + E_t \ln \eta_{t+1}]$.

Note that $E_t u_{t+1} = 0$.

Thus log consumption follows a random walk with a drift parameter α determined by σ and ρ.

An interpretation of equations 3 and 4 can be given as follows: to predict C_{t+1} in period t given the consumer's information Ω_t, that is, given C_t, C_{t-1}, C_{t-2}, . . . W_t, W_{t-1} . . ., what is important is only C_t—no other information is relevant. In other words, $u'(C_t)$ alone is sufficient to predict $u'(C_{t+1})$. To test this we nest the random-walk hypothesis in the following alternative model, which includes current income as a regressor:

(5) $$\ln C_{t+1} - \ln C_t = \alpha + \beta_1 \ln C_t + \beta_2 y_t + \epsilon_{t+1}$$

According to the random-walk hypothesis, $\beta_2 = 0$; this is the null hypothesis tested here.

Another way to view equations 3 or 4 is to treat them as surprise consumption functions. All the information regarding last period's perception about permanent income is captured in C_t. Then the error terms, ζ_{t+1} in equation 3 or u_{t+1} in 4, represent any new information that has arisen at the beginning of period $t + 1$ regarding permanent income. This surprise consumption function interpretation provides an alternative test for the random-walk hypothesis as follows. We assume that income is generated as a function of the prior period's income plus an error term, that is, as a first-order autoregressive process.[1]

(6) $$y_{t+1} = \gamma_0 + \gamma_1 y_t + e_{t+1}$$

Assume that individuals have rational expectations about their future income stream, that is, they know the true income-generating process and use it to predict future income, which in turn is used to predict permanent income. Denote by $P(y_{t+1})$ the predicted y_{t+1} and the residual $y_{t+1}[R(y_{t+1})]$ in the above regression. In our empirical analysis we estimate this equation for each country separately to get estimates of $P(y_{t+1})$ and $R(y_{t+1})$. According to the life-cycle–permanent-income theory, a consumer's actual consumption in period $t + 1$ is

1. A general income-generating process could be incorporated easily. Blinder and Deaton (1985) use a vector autoregressive prediction formula with both lagged exogenous and endogenous variables; and Pagan (1984) discusses the econometric issues involved when the regressors are generated this way.

proportional to his perceived permanent income in period $t + 1$ given all the new information available in period $t + 1$. Since consumers have rational expectations about the income-generating process, the predicted part $P(y_{t+1})$ of y_{t+1} that was based on the previous period's information was already known to the consumer in period t, and its effect on C_{t+1} has been accounted for in the term C_t. The $R(y_{t+1})$ part of y_{t+1}, which is the news or surprise to the consumer in period $t + 1$, is the only factor that will have an independent effect on C_{t+1}, since this new information is used to reestimate permanent income. Under the life-cycle–permanent-income hypothesis, assuming rational expectations and a fixed interest rate, once again the null hypothesis (H_0: $\beta_2 = 0$) could be nested in the following alternative consumption function:

$$(7) \qquad \ln C_{t+1} - \ln C_t = \alpha + \beta_1 \ln C_t + \beta_2 P(y_{t+1}) + \beta_3 R(y_{t+1}) + \epsilon_{t+1}$$

Data And Empirical Findings

Data availability in developing countries puts severe restrictions on the rigor of the tests that can be carried out. Labor income data in most developing countries are not available because the income of the self-employed cannot be separated into its wage and capital components. Net national product data also are seldom available, so private per capita income is constructed by subtracting government taxes and nontax revenues from gross national product. The measure of consumption, C_t, is taken as per capita private expenditure (that is, household plus corporate). Ideally, we would like to define C_t as the flow of per capita consumption, but many countries measure aggregate consumption including expenditure on durables. This may bias the estimates somewhat (see Leiderman and Razin 1988). Finally, variables are converted to U.S. dollars by using official exchange rates, which biases results according to the extent of overvaluation and purchasing power parity.

After discarding the countries having data for less than five continuous years during the period 1970–82, we tested equations 5 and 7 for twenty-three countries. Appendix A shows the time periods covered for each country in our sample.

Table 1 reports the regression estimates of an excess sensitivity test of equations 5 and 7. If the life-cycle–permanent-income hypothesis under rational expectations is true, then equation 4 should hold true, that is, $\ln C_{t+1} - \ln C_t = \alpha + u_{t+1}$. Relatedly, in equations 5 and 7, when $\ln C_{t+1} - \ln C_t$ is regressed on $\ln C_t$, together with y_t or $P(y_{t+1})$, the regression should produce no significant effect of current or predicted income. If, however, the effect of these variables is found to be significant, then the change in (log) consumption is excessively sensitive to current income, contradicting the theory. This is known as the excess sensitivity test. Further discussion of the test and the implications of cointegration theory for it are contained in appendix B.

Note that in equation 5 the coefficient of current income, y, and in equation

Table 1. *Determinants of Changes in Consumption with a Fixed Interest Rate*

Determinant	*Current consumption approach (equation 5)*	*Surprise consumption approach (equation 7)*
[Constant]	0.016 (.32)	0.231 (1.0)
Current consumption, ln C_t	0.031 (7.01)*	0.030 (5.85)*
Current income, y_t	−0.001 (10.78)*	n.a.
Predicted income, $P(y_{t+1})$	n.a.	−0.003 (6.09)*
Unexpected income, $R(y_{t+1})$	n.a.	0.008 (1.81)

* = significant at the 5 percent level.

n.a. Not applicable.

Note: The dependent variable is changes in consumption, ln C_{t+1} − ln C_t. Figures in parentheses are t-statistics.

Source: Authors' calculations.

7 the coefficient of predicted income $P(y_t)$ are both significantly nonzero. Thus both tests reject the random-walk hypothesis.

The significant relationship between current or predicted income and consumption that we find in our tests could be due to several economic factors. First, the assumption of fixed interest rates may not hold. The consumers will have expectations about the interest rate based on current income, interest rates, and inflation. If interest rate expectations are not instrumental in the above regression models, the excess sensitivity is expected. In the next section we will investigate the life-cycle–permanent-income hypothesis under rational expectations when both interest rate and labor earnings are stochastic.

Next-period consumption may also be sensitive to changes in current or predicted income if many consumers are liquidity-constrained, for instance, by being unable to borrow against future income when young. Capital markets in developing countries are imperfect (see Virmani 1986 for further discussion of developing-country capital markets). There is also asymmetric information between lenders and borrowers, and lenders generally base loan decisions on observable characteristics of the borrower such as recent income (in many occasions based on the last two or three years' income) and the stock of physical assets rather than predicted lifetime income. A consumer in period t also would face tighter credit rationing if current aggregate income and assets are low relative to the expected in the next period. Hence while current consumption, C_t, will reflect all the information about permanent income, y_t is still expected to have an independent negative effect on C_{t+1}. To test for the prevalence of liquidity constraints, we would need data on the aggregate stock of physical assets and unemployment rates which we do not have. The signs of the estimates of y_t and $P(y_{t+1})$, however, are consistent with the implications that consumers are liquidity-constrained. A few empirical studies on U.S. data show that a large proportion of households are liquidity-constrained (see Lawrence 1987, Hayashi 1985, and Hall and Mishkin 1982).

Our rejection of the rational expectations hypothesis also may be due to problems of aggregation. The above derivation assumes a constant age structure over time and across countries. However, when the individual age-specific consumption functions are aggregated over age groups, estimates of per capita consumption will be affected by the dependency ratios. A more appropriate test of the life-cycle hypothesis then should take into account such effects (see Raut 1989 on this and the references cited therein).

II. Testing the Hall Hypothesis with Variable Interest Rates

The Model

In this section we relax the assumption that the interest rate is constant. Instead, we assume that the real interest rate as well as labor earnings vary stochastically. As in equation 1, the consumer faces the following intertemporal utility maximization problem:

$$\text{(8)} \qquad \text{Max } U = \mathrm{E}_t\left(\sum_{\tau=0}^{T-t} (1+\delta)^{-\tau} u(C_{t+\tau})\right)$$

but he is now subject to:

$$\sum_{\tau=0}^{T-t}\left[\frac{C_{t+\tau} - W_{t+\tau}}{(1+r_1)+(1+r_2)\ldots(1+r_\tau)}\right] \leq A_t$$

in which the interest rate, r, may differ across periods, i. The first necessary condition gives the Euler equation as

$$\text{(9)} \qquad u'(C_t) = \mathrm{E}_t\left[\frac{u'(C_{t+1})(1+r_{t+1})}{(1+\delta)}\right]$$

which gives

$$\text{(10)} \qquad \mathrm{E}_t\left[\frac{u'(C_{t+1})}{u'(C_t)}\frac{1+r_{t+1}}{1+\delta}\right] = 1.$$

By adding and subtracting the expected value of the log of this equation, we get

$$\text{(11)} \quad \mathrm{E}_t \ln\left[\frac{u'(C_{t+1})}{u(C_t)}\frac{1+r_{t+1}}{1+\delta}\right] + \mathrm{E}_t\left[\frac{u'(C_{t+1})}{u'(C_t)}\frac{1+r_{t+1}}{1+\delta} - \ln\left[\frac{u'(C_{t+1})}{u'(C_t)}\frac{1+r_{t+1}}{1+\delta}\right]\right] = 1$$

Assume that C_{t+1} and $1 + r_{t+1}$ have a jointly stationary bivariate normal distribution. Assuming this and that the rate of time preference, δ, is fixed, the middle term is a constant which we denote by $(1 - \alpha)$. Thus we can rewrite the above equation as

$$\text{(12)} \quad \mathrm{E}_t \ln u'(C_{t+1}) - \ln u'(C_t) = \alpha - \ln(1+\delta) - \mathrm{E}_t \ln(1+r_{t+1})$$

Assuming further that the utility function has constant elasticity, as in the previous section, we get

$$(13) \qquad \ln (C_{t+1}) - \ln C_t = \gamma_0 + \gamma_1 E_t \ln (1 + r_{t+1}) + \epsilon_{t+1}$$

where $\gamma_0 = [\ln (1 + \delta) - \alpha]/\sigma$, $\gamma_1 = -1/\sigma$, and ϵ_{t+1} is uncorrelated with all information dated t or earlier, and $E_t(\epsilon_{t+1}) = 0$. This is the null hypothesis that consumers behave according to the life-cycle–permanent-income hypothesis under rational expectations. Once again, equation 13 can be interpreted as stating that log consumption follows a random walk with a time-varying drift parameter, $\alpha_t = \gamma_0 + \gamma_1 E_t(1 + r_{t+1})$.

We define variables r_{rt} and r_{nt} as real and nominal interest rates, and $infl_t$ as the inflation rate in period t. Assume that these factors are used by the consumer to evaluate expected interest rates over time, $E_t \ln (1 + r_{t+1})$.

The null hypothesis, equation 13, can now be nested in the alternative specification:

$$(14) \qquad \ln (C_{t+1}) - \ln C_t = \gamma_0 + \gamma_1 r_{rt} + \gamma_3 \ln C + \gamma_4 y_t + u_{t+1}.$$

Alternatively,

$$(15) \quad \ln (C_{t+1}) - \ln C_t = \gamma_0 + \gamma_1 r_{nt} + \gamma_2 infl_t + \gamma_3 \ln C_t + \gamma_4 y_t + u'_{t+1}$$

The error term u_{t+1} equals ϵ_{t+1} plus the prediction errors of $\ln (1 + r_{t+1})$ and is uncorrelated with the regressors under the null hypothesis. Hall's life-cycle–permanent-income hypothesis under rational expectations is equivalent to testing H_0: $\gamma_4 = 0$ against the general alternative hypothesis H_1: $\gamma_4 \neq 0$. To test the surprise consumption function under varying interest rates (the equivalent of equation 7) we also replace y_t in equations 14 and 15 by $P(y_{t+1})$ and $R(y_{t+1})$. We thus test four specifications of the Hall hypothesis under varying interest rates.

Data and Empirical Results

We use the same variables and countries as in section II. The most widely available interest rate variable was the central bank discount rate; this will be our nominal interest rate, r_{nt}. The real interest rate, r_{rt}, is constructed by subtracting the consumer price index, our proxy for predicted inflation, from r_{rt}.

Table 2 shows the regression estimates of equations 14 and 15, with the last two columns including predicted and residual income. Our estimates of the coefficients of both current and predicted future income are very low and insignificantly different from zero. Thus the null hypothesis (Hall's life-cycle–permanent-income hypothesis) could not be rejected for these countries. In principle, inflation can affect not only the real interest rate, but also can have a direct effect on consumption if consumers do not have rational expectations (due to money illusion) or if money enters a consumer's utility function (see Deaton 1977; Juster and Wachtel 1972a, 1972b; and von Furstenburg 1980).

Table 2. *Determinants of Changes in Consumption with Variable Interest Rates*

Determinant	*Using real interest rates with* current income (equation 14)	*Using real interest rates with* predicted income (equation 14)	*Using inflation and nominal interest rates with* current income (equation 15)	*Using inflation and nominal interest rates with* predicted income (equation 15)
[Constant]	0.016	0.231	0.322	0.74
	(0.32)	(1.0)	(0.98)	(1.32)
Current consumption, ln C_t	0.016*	0.012*	−0.004	−0.006
	(3.24)	(2.44)	(0.79)	(1.31)
Real interest rate, r_{rt}	0.005*	0.006*	n.a.	n.a.
	(7.67)	(8.42)		
Nominal interest rate, r_{nt}	n.a.	n.a.	−0.004*	−0.003*
			(3.57)	(2.79)
Inflation, $infl_t$	n.a.	n.a.	−0.007*	−0.007*
			(11.41)	(12.14)
Current income, y_t	0.00002	n.a.	0.001	n.a.
	(0.008)		(0.55)	
Predicted income, $P(y_{t+1})$	n.a.	−0.005	n.a.	0.004
		(1.60)		(1.69)
Unexpected income, $R(y_{t+1})$	n.a.	0.046*	n.a.	0.045*
		(3.27)		(3.82)

* = significant at the 5 percent level.
n.a. Not applicable.
Note: The dependent variable is changes in consumption, ln C_{t+1} − ln C_t. Figures in parentheses are *t*-statistics.
Source: Authors' calculations.

An alternative explanation for the negative effect of inflation on consumption is that higher inflation rates increase uncertainty about the real value of future income and thus increase the precautionary demand for savings (see Leland 1968, Levhari and Srinivasan 1969). Another possible explanation is that since in developing countries governments control the returns to most financial assets (including money), higher inflation will mean a lower value of financial assets, and hence consumers spend less and save more to restore the real value of their asset stock.

The first two columns in table 2 show that the real interest rate has a significantly positive effect on consumption. This should be contrasted with the findings of Giovannini (1985), who found that the real interest rate has no significant effect on consumption for most countries in his sample.

The sensitivity of consumption to interest rate expectations may also signify that many consumers are liquidity-constrained (see Muellbauer 1983). However, one needs to model liquidity-constrained consumption behavior rigorously and test it statistically using appropriate data on asset holdings and unemployment rates. Household survey analysis will throw better light on the issue.

III. Ricardian Equivalence

Failure to reject Hall's hypothesis under variable interest rates also suggests the possibility of Ricardian equivalence. As Barro (1974) has shown, when capital markets are perfect and consumers are interlinked by intergenerational altruism, a representative consumer will take into account the welfare of all future generations while making consumption decisions. Technically, in this case the consumers could be treated as infinitely lived. The main difference between the life-cycle and altruistically linked consumer approaches lies in the planning horizon of each. Under certain general conditions, the altruistically linked consumer's problem is as follows:

$$\text{Max } U = \mathrm{E}_t\left(\sum_{\tau=0}^{\infty} (1 + \delta)^{-\tau} u(C_{t+\tau})\right)$$

subject to

$$\sum_{\tau=0}^{\infty} \left[\frac{C_{t+\tau} - W_{t+\tau}}{(1 + r_1)(1 + r_2) \ldots (1 + r_\tau)}\right] \leq A_t$$

which will also yield the same Euler equation as the finite-horizon life-cycle models that we have considered so far. The policy implication of this model of consumer behavior is that private consumption decisions will not be responsive to whether a rise in government expenditures in any period is financed by increasing taxes or by issuing bonds (and thus borrowing against future generations by creating larger budget deficits). The hypothesis is true provided that the increment in the budget deficit does not exceed the present value of all future tax liabilities that are required for debt servicing of the government's borrowing. If the hypothesis is true, then government bonds would not be perceived by households as net wealth (Barro 1974).

In preliminary testing, we estimated Keynesian type consumption functions in which we included among the regressors current per capita real gross national product, per capita taxes, and the per capita budget deficit to see if consumers perceive the budget deficit or government borrowing as net wealth and hence increase their consumption (specification and results are available from Raut upon written request). Our regression results show that the coefficient of the per capita budget deficit is significantly positive, and hence there is evidence against the neutrality hypothesis. This test is very preliminary, and more rigorous tests should be carried out along the lines of Blanchard (1985), Evans (1988), and Leiderman and Razin (1988) with more appropriate data.

IV. Conclusion

We have examined evidence on the determinants of consumption and savings decisions and tested Hall's random-walk hypothesis of consumption on aggregate data from twenty-three developing countries. The Hall hypothesis states that individuals select a level of consumption in each period based on expected lifetime income, rather than on current income. Since income in any term can be seen to move stochastically while consumption is smoothed over time, the ratio of consumption to current income will appear to vary randomly.

If we assume that interest rates are fixed, Hall's random-walk hypothesis cannot be accepted in our tests. This rejection may be due to bias in aggregation across age groups, liquidity constraints, or the stochastic nature of the interest rate. Due to data limitations, we could not test the existence of liquidity constraints or aggregation bias. We extended the analysis, however, to allow for a stochastic interest rate and labor income in the life-cycle–permanent-income framework, assuming rational expectations. This extension led to results consistent with the hypothesis that the path of consumption follows a random walk with a time-varying drift. The tests do not reject this hypothesis.

We also find that while the real interest rate has a positive effect on consumption, the nominal interest and inflation rates both have negative effects on consumption; and the effect of inflation is significantly higher than the effect of the nominal interest rate. Two plausible explanations for such an effect of inflation are, first, that higher inflation can increase uncertainty regarding future income, and thus increase the precautionary demand for savings; and, second, that inflation has a negative effect on real financial wealth, requiring a reduction in consumption to maintain the real stock of savings.

Since we cannot reject the life-cycle–permanent-income hypothesis under rational expectations when the interest rate is assumed to be variable, this suggests that the Ricardian equivalence hypothesis may be valid. We undertook very preliminary testing of the hypothesis (limited by the availability of data) and found that the evidence did not support the hypothesis for developing countries. However, careful testing of the Ricardian equivalence hypothesis using more appropriate data would be useful, as would the explicit modeling of liquidity-constrained consumption behavior.

Appendix A. Countries and Years Used

Burundi (1973–81), Colombia (1973–81), Egypt (1975–82), Guatemala (1973–81), India (1974–82), Indonesia (1973–82), Korea (1973–82), Malaysia (1973–81), Mauritania (1975–79), Morocco (1973–82), Panama (1973–81), Rwanda (1973–80), Singapore (1973–81), Sri Lanka (1973–82), Thailand (1973–82), Togo (1977–82), Tunisia (1973–82), Turkey (1973–81), Venezuela (1973–82), Zaire (1973–82).

Appendix B. Implications of Cointegration Theory for the Analysis

Drawing upon the recent developments in cointegration theory, we can see that there could be several econometric inconsistencies in estimating the null specifications for equations 5 and 7. In this approach, stochastic process X_t is an $I(1)$ process if $X_t - X_{t-1}$ is a stationary process. Two $I(1)$ stochastic processes X_t and Y_t are cointegrated if there exists γ such that $Z_t = Y_t + \gamma X_t$ is a stationary process. U.S. time-series data on consumption and income reveal that they are $I(1)$ processes and are cointegrated. Since the left-hand sides of equations 5 and 7 are $I(0)$, and under the null specifications the right-hand side has one $I(1)$ regressor, in either specification, the coefficient of the $I(1)$ regressor will be forced to zero (see Stock and Watson 1988 and Granger and Newbold 1974 for more on this issue). However, if the null hypothesis is to test both the unit root for log consumption and no excess sensitivity to current or predicted future income, then the regression specifications are consistent and the standard statistical procedures are valid. This composite hypothesis is indeed the random-walk hypothesis of consumption. The alternative specification is also consistent, since C_t and y_t are cointegrated, so least squares estimates of the coefficients of y_t will be consistent although not efficient since we have not subjected the estimates to the restriction on the parameters of C_t and y_t imposed by their being cointegrated. All these facts are related to only long time-series data. However, in our case we have short time series across many countries. Since in the literature very little is known about these issues when one has pooled time-series cross-sectional data, we have not pursued this line of econometric investigation.

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