An estimation of the Deep Parameters describing the Consumer Behaviour of Argentina

Hildegart A. Ahumada*
(UTDT)
Maria Lorena Garegnani **
(BCRA-UNLP)

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Abstract

This paper dealt with the estimation of the structural parameters of the aggregate consumer behaviour for Argentina following the Euler Equation-GMM approach. The rates of returns on assets were approximated by the real interest rate and the rate of growth of real exchange rate, since they were the main variables explaining variations of "wealth". The results show that parameter estimates have the expected values and the correct signs. The validity of the overidentifying restrictions is tested and the null hypothesis of validity of instruments is not rejected. However, parameter constancy is rejected.

Key words: consumer behaviour – Euler-Equation – Generalised Method of Moments

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*Universidad Torcuato Di Tella (5411) 4784-0080, Miñones 2159-77 (1428). Capital Federal, Argentina. hahumada@utdt.edu

**Banco Central de la República Argentina (5411) 4348-3500 int. 2592, Reconquista 266, 7mo. Piso Edificio Central, Oficina 703 (1003). Capital Federal, Argentina. lgaregnani@bcra.gov.ar. The views expressed herein are solely the responsibility of the authors and should not be interpreted as those of the Central Bank of Argentina.

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1. Introduction

The study of aggregate consumption, one of the first and most intensively researched topics in macro-econometrics, has been renewed since 1978 when two different approaches started their development. This year was path-breaking for modelling consumer behaviour. Hall's work (1978) proposed and opened a way for an alternative econometric approach of the life cycle–permanent income hypothesis. Beginning with this work, consumption studies were focussed on the first order condition for an optimal intertemporal allocation of consumption "the Euler equation". This approach to the consumption function has been dominant in empirical applied research in the U.S since then. At the same time, another approach has evolved based on the solved out consumption function, concentrating on time-series properties of the data, as presented by Davidson, Hendry, Srba and Yeo (DHSY) (1978). Different versions of both approaches have been applied to model consumption until today.

Following the second approach, Ahumada and Garegnani (2003) modelled the aggregate consumption function of Argentina between 1980 and 2000 concentrating on wealth effects. They found that national disposable income is the only long-run determinant of private consumption and a measure of real exchange rate and the deviations from the last peak income appear as suitable proxies for adjusting wealth in the short-run. Their results also showed that consumers´ behaviour of Argentina cannot be interpreted in terms of models with liquidity constraints. Moreover parameter estimates were remarkably constant during two decades.

Given these results, the empirical study of the aggregate consumption is here extended to investigate the microfoundation of the consumer decisions following the Euler Equation-Generalised Method of Moments (GMM) approach as proposed by Hansen and Singleton (1982) (see also Hamilton (1994) and Favero (2001)). The estimation is focussed on the deep parameters describing tastes of consumers in a model assuming intertemporal optimisation and rational expectations. The parameters of such a model should be supposed invariant to policy regimes. Thus, the stability of these structural parameters is a main issue to address. Furthermore, since the attention is on the first order condition, it is an interesting alternative approach to model Argentine consumption sorting out the difficulty to explicitly include wealth (given the lack of suitable data for this variable). Therefore, this paper is aimed at estimating the structural parameters of an aggregate consumption model for Argentina during the last two decades, following the Euler Equation-GMM approach.

Next section presents a review of the literature on consumption models relating both approaches. Section 3 presents the econometric results of applying the Euler Equation-GMM approach. Section 4 concludes.

2. A review of the literature

As Muellbauer and Lattimore (1995) indicate “1978 was a milestone for research on the aggregate consumption function”. Two papers published this year proved to be “key pointers” of the following research: Davidson, Hendry, Srba and Yeo (1978) (DHSY) and Hall (1978), both based on the well-known theories of “permanent income” and “life cycle” (Duesenberry (1949), Brown (1952), Friedman (1957) and Ando and Modigliani (1963)).

DHSY formulated an “error correction” model for the dynamic response of real consumers´ expenditure on non-durables to real personal disposable income. Their model is a reparameterisation of an autoregressive-distributed lag model of the (log) level of the variables as suggested by the life cycle – permanent income hypothesis (LC-PIH).

Hall (1978), instead, proposed an alternative econometric approach to the study of the life cycle–permanent income hypothesis Modelling an intertemporal consumption decision by a “representative consumer” with “rational expectations”, he showed the stochastic implication of the LC-PIH: no variable apart from the same consumption lagged one period should be of any value in predicting current consumption. To evaluate this hypothesis (for the US) some equations were estimated including as regressors, apart from lagged values of consumption, real per capita disposable income, whose coefficients on lagged terms were found to be insignificant. The changes in stock prices lagged by a single quarter (that could be considered as proxies of wealth), were found to have only a modest value in predicting the changes in consumption. With these results Hall concluded that the evidence[i] supports a modified version of the LC-PIH in which the consumption follows an approximate random walk as derived from the Euler equations (first order conditions of the consumers´ maximisation problem) in the simplest model.

Davidson and Hendry (1981) questioned the validity of Hall’s model for the United Kingdom data given that DHSY had found a model which encompassed a random walk formulation of consumers´ expenditure. Based on Monte Carlo experiments, they also demonstrated that if an “Error Correction model” were the “true data generating process”, the random walk model would also be a good description of the data.

Empirical modelling of Hall’s hypothesis was further developed based on the estimation of a dynamic rational expectation model by using the Generalised Method of Moments (GMM). Hall (1978) had obtained his conclusions estimating directly, from aggregate data, the first order condition being consumers as well informed as the econometricians studying their behaviour. If expectations were formed rationally, the errors in forecasting would be uncorrelated with the information people had available at the moment of the forecast. When econometricians could observe the subset of information people used, the rational expectations approach suggests the orthogonality conditions to be used for GMM. An application of this approach to the consumption function using GMM was presented by Hansen and Singleton (1982). They considered a model for real consumption expenditure of the aggregate United States (divided by population) as a measure of the level of spending on consumption goods by a particular stockholder and used lagged consumption growth rates and lagged rates of return as instruments (elements of the subset of the stockholder´s information set that the econometrician was also able to observe), which are assumed to be uncorrelated with the errors (the set of orthogonality conditions) to estimate the unknown parameters of the consumption function.

Using an alternative way of expressing the link between DHSY and credit constraints, Muellbauer and Bover (1986) solved an intertemporal optimisation problem subject to the credit constraint in Lagrangian form. The shadow price of the credit constraint at time t-1 resulted to be dependent on $E_{t-1}y_t - c_{t-1} = E_{t-1}\Delta y_t + y_{t-1} - c_{t-1}$ like the terms in DHSY form. Using quarterly U.S. data on consumption of non-durables and services for 1954-1981 they found significant support for the DHSY form of the consumption function and the rejection of Hall (1978) and Hansen and Singleton (1982) models. They also found that the DHSY consumption function could be interpreted as an approximation to the Euler equation incorporating the effects of liquidity constraints and aggregation. They noted that Hansen and Singleton´s procedure of modelling the Euler Equation,

$$E_t[\alpha(1+r_t)c_{t+1}^{-\beta}]= c_t^{-\beta}(1-\mu_t^*) \qquad (1)$$

- where $\mu_t^*=\mu_t/c_t^{-\beta}$ with μ_t be the marginal increase in expected life-time utility from relaxing the credit constraint in period "t" by one unit - by the non-linear instrumental variables following the expression,

$$\alpha(1+r_{t-1})(c_t/c_{t-1})^{-\beta}-1=\varepsilon_t^* \qquad (2)$$

is mis-specified if some consumers face liquidity constraints. They found that the specification of the utility function is insufficient to eliminate the variables not directly observable and need to be modified.

More recent literature on consumption considered the liquidity constraints as the most popular explanation of why Hall´s consumption model failed (Muellbauer and Lattimore (1995)). Muellbauer and Lattimore (1995) considered that credit constraints could offer an explanation for the excess sensitivity of consumption to predictable income changes. While the Hall-type stochastic Euler equation of consumption (consumption depending on the previous lagged consumption) holds for the credit unconstrained consumers ($1-\pi$), credit constrained ones (π) consume their current income,

$$\Delta c_t = (1-\pi)\Delta c_t^u + \pi\Delta c_t^c = (1-\pi)\varepsilon_t + \pi\Delta y_t^c \qquad (3)$$

where the change in income for credit constrained would be proxied by the change in average non-property income. Thus taking expectations $E_{t-1}\Delta c_t = \pi E_{t-1}\Delta y_t$ which is not zero and could provide an explanation of the excess sensitivity of changes in consumption to anticipated income changes. Muellbauer and Lattimore (1995) also indicated that credit constraints could offer a "potential explanation of an error correction form of the consumption function".

Zeldes (1989) imposed a "liquidity constraint" on the Euler equation, suggesting that consumers are unable to borrow as mach as they would like. Zeldes (1989) tested the PIH against the alternative hypothesis that consumers optimise subject to borrowing constraints, splitting panel data into two groups according to the ratios of financial assets to income. The group with low assets was most likely to be liquidity constrained. Estimating Euler equations for the two groups he found that "the results are generally, but not completely, supportive of the view that liquidity constraints have important influences on consumption". The empirical test of LC-PIH against the existence of liquidity constraints was also considered by DeJuan and Seater (1999). They applied the following Euler equation for estimation,

$$\ln(C_{i,\,t+1}/C_{it}) = B_0 + B_1 r_{i,\,t+1} + B_2 \ln(F_{i,\,t+1}/F_{it}) + B_3 R_i + B_4 \ln(Y_{i,\,t+1}/Y_{it}) + e'_{i,\,t+1} \qquad (4)$$

where C is consumption, Y is real disposable income, R represents those household characteristics that affect the household's rate of time preference, r is the real after-tax interest rate and F denotes family size. Their principal finding of this work is that consumption behaviour is consistent with permanent income life-cycle hypothesis. Their results did not support the liquidity constraints hypothesis either.

These theories are still under discussion. Carroll (2001) argued that the optimal behaviour of impatient consumers with labour income uncertainty is "much better described by Friedman´s original statement of the permanent income hypothesis than by the later explicit maximising versions". Fernandez-Corugedo, Price and Blake (2003) concluded that they "could welcome the return of the UK consumption error correction mechanism (ECM), in the context of a complete vector error correction mechanism (VECM) analysis of the system explaining the relationship between consumption and permanent income".

3. Econometric results: The Euler Equation-GMM approach

Hansen and Singleton (1982) implemented an alternative econometric estimation strategy that allows the estimation and identification of the unknown parameters of consumer preferences. They considered a model for aggregate real consumption expenditure of United States (divided by population) as a measure of the level of spending on consumption goods by a particular stockholder and used lagged consumption growth rates and lagged rates of return as instruments (elements of the subset of the stockholder´s information set that the econometrician was also able to observe), which are assumed to be uncorrelated with the errors (the set of orthogonality conditions) to estimate the unknown parameters of the consumption function. The intertemporal optimisation-rational expectations paradigm requires an alternative econometric approach to estimate deep parameters of interest, the Generalised Method of Moments (GMM).

As the previous review of the literature suggested, the GMM estimation of the Euler Equation would not be appropriate when liquidity constraints were introduced in the intertemporal optimisation problem. Furthermore, there is the empirical question of applying the behaviour of an individual to aggregate data (see also Favero (2001)). Ahumada and Garegnani (2003) provides some evidence that these questions are not critical in the Argentine case. Firstly, their results showed that consumers' behaviour could not be interpreted in terms of models of liquidity constraints (as suggested by Muellbauer and Bover (1986) and DeJuan and Seater(1999)). Secondly, results did not change using aggregate or per capita variables and controlling by population, so aggregate data could describe the (mean) representative consumer behaviour as well. In the next estimation, and following Hansen and Singleton (1982), consumption is defined in per capita terms.

Equation 1 presents the estimation of the Euler Equation[ii]. It is assumed that consumers maximise expected utility where the utility function is of the constant relative risk aversion form, $E_t\{b(1+r_t)c_{t+1}^{-g}\} = c_t^{-g}$ where β is an impatience parameter, r represents the returns on assets, c_t is the private consumer's expenditure per capita and γ is the risk aversion parameter. The instruments used in the estimation are lagged values of the variables dated t-1. In the Argentine case r is approximated by the real interest rate and the rate of growth of real exchange rate, as one of the main variable explaining variation of "wealth" [iii].

Equation 1

Estimation Method: Generalized Method of Moments

	Coefficient	Std. Error	t-Statistic	Prob.
BETA(1)	0.993591	0.002196	452.4827	0.0000
BETA(2)	0.490325	0.093193	5.261377	0.0000

Sample: 1980:4 2000:4
J-statistic: 0.118394 Observations: 81

Equation: BETA(1)*(RATCONSPRIV^(-BETA(2)))*Xi-1 i =2 and 3
Instruments: RATCONSPRIV(-1) X2(-1) X3(-1) C

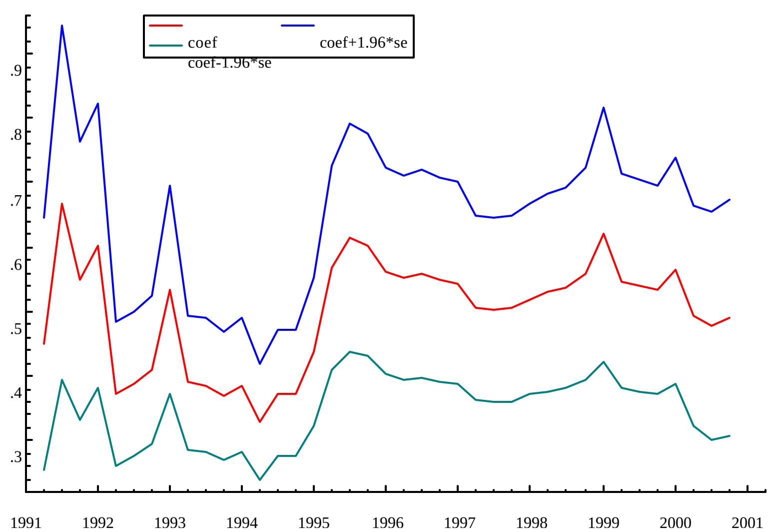
Where BETA(1) represents the impatience parameter, BETA(2) the risk aversion parameter, RATCONSPRIV the ratio c_t/c_{t-1}, X2 and X3 represents one plus the return, the real interest rate and the rate of growth of real exchange rate respectively.

As expected BETA(1) is between 0 and 1, greater values of this parameter mean that the stockholder places a greater weigh on future events. BETA(2), the risk aversion parameter, is positive representing concave preferences.

It is important to note that when the number of orthogonality conditions exceeds the number of parameters to be estimated, the model is overidentified, since more orthogonality conditions were used than are needed to estimate the parameters. In this case Hansen (1982) suggested a test of whether all of the sample moments are close to zero as would be expected if the corresponding population moments were truly zero. The validity of this overidentifying restrictions can be test using the J-statistic reported in Equation 1 to compute the following statistic, $T.J - statistic \sim c^2(p-q)$ where p represents the number of orthogonality conditions (p=8) and q represents the number of parameter to be estimated (q=2). Given the observed value of the statistic 0.118394 the product 0.118394*81 is 9.59, less than the critic value for a $c^2(6)$ with 5% of significance that is 12.6, this means that the null hypothesis of validity of instruments is not rejected at 5% significance level.

As Favero (2001) remarked "in general the parameters estimated on aggregate time–series data implementing GMM on Euler Equations derived by different intertemporal optimisation problems are unstable over time" and he added that "such instability is clearly incompatible with their nature as parameter describing taste and technology suggested by theoretical models". Taking into account these comments the parameters constancy of the model of Equation 1 was evaluated and rejected by their recursive estimation. Only the recursive graphic of risk aversion parameter (BETA(2)) is shown given its higher variability. It could be verified that recursive estimates of this coefficient are not inside the previous 1.96 times standard errors intervals.

<u>Recursive graphic</u>



In order to continue analysing the structural stability of the model another test is used (see Hamilton (1994)) to evaluate the hypothesis that (q x 1) parameter vector θ that characterizes the first T_0 observations in the sample is equal to the value that characterizes the last T-T_0 observations, where T_0 is a known change point. Andrews and Fair (1988) suggested using the Wald test,

$$l_T = T(\hat{q}_{1,T_0} - \hat{q}_{2,T-T_0})'\{p^{-1}\hat{V}_{1,T_0} + (1-p)^{-1}\hat{V}_{2,T-T_0}\}^{-1}(\hat{q}_{1,T_0} - \hat{q}_{2,T-T_0})$$

$$Then\ l_T \xrightarrow{L} c^2(q)\ under\ the\ null\ hypothesis\ that\ q_1 = q_2$$

to test the null hypothesis $q_1 = q_2$. In this test p is the fraction of observations contained in the first subsample T_0/T, $\hat{q}_{1,T0}$ is the parameter vector of the first T_0 observations and $\hat{q}_{2,T-T0}$ is the parameter vector for the last T-T_0 observations, $\hat{V}_{1,T_0}$ is the coefficient covariance matrix of the first T_0 observations and $\hat{V}_{2,T-T_0}$ is the coefficient covariance matrix of the last T-T_0 observations.

The implementation of the test was made using as the changing point the beginning of the Convertibility Plan, that is the sample was separated in the first T_0 observations (1980:1 to 1991:1), and the second T-T_0 observations (1991:2 to 2000:4). The results of the two estimations of the Equation 1 are presented in Equation 2 and 3.

<u>Equation 2</u>

Estimation Method: Generalized Method of Moments

	Coefficient	Std. Error	t-Statistic	Prob.
BETA(1)	0.984694	0.003316	296.9336	0.0000
BETA(2)	0.512931	0.109857	4.669066	0.0000

Sample: 1980:4 1991:1
J-statistic: 0.142775 Observations: 42

Equation: BETA(1)*(RATCONSPRIV^(-BETA(2)))*Xi-1 i =2 and 3
Instruments: RATCONSPRIV(-1) X2(-1) X3(-1) C

<u>Equation 3</u>

Estimation Method: Generalized Method of Moments

	Coefficient	Std. Error	t-Statistic	Prob.
BETA(1)	0.999733	0.001076	928.9700	0.0000
BETA(2)	-0.000269	0.060869	-0.004426	0.9965

Sample: 1991:2 2000:4
J-statistic: 0.156162 Observations: 39

Equation: BETA(1)*(RATCONSPRIV^(-BETA(2)))*Xi-1 i =2 and 3
Instruments: RATCONSPRIV(-1) X2(-1) X3(-1) C

These results give a l_T = 1275.5 which is greater than the critic value at 5% level of significance of a $\chi^2(2)$ (5.99), which means that the null hypothesis is rejected confirming the parameters instability previously found.

Following this approach, the deep parameters of the aggregate consumption function are not constant over time, which is incompatible with a consumption model for Argentina over the last two decades.

4. Conclusions

This paper dealt with the estimation of the structural parameters of the aggregate consumer behaviour for Argentina (1980-2000) following the Euler Equation-Generalised Method of Moments (GMM) approach. The model assumes that consumers maximise expected utility where the utility function is of the constant relative risk aversion form. It involve two deep parameters to estimate: one measuring impatience and the other, the risk aversion of the consumers. In the Argentine case the rates of returns on assets were approximated by the real interest rate and the rate of growth of real exchange rate, since they were as the main variables explaining variations of "wealth". The results show that parameters have the expected values and the correct signs, being similar to those found in other empirical applications. The validity of the overidentifying restrictions is tested and the null hypothesis of validity of instruments (one-lagged values of all variables of the model) is not rejected. However, parameter constancy was evaluated and rejected by their recursive estimation and Andrews and Fair (1988) Wald test.

Therefore, the Euler Equation-GMM approach to the consumption modelling presents for Argentina the empirical problem pointed out by Favero (2001). The estimates of the deep parameters (in particular, the estimate of the risk aversion) are unstable over time. This finding shades the microfoundation of the aggregate consumer behaviour for Argentina during 1980-2000 based on a model which assume intertemporal optimisation and rational expectations of a representative agent.

Appendix 1: Data definitions and sources

Private Consumption: Sum of the expenditure in goods and services of private residents and non-profit institutions (thousands of pesos at 1986 prices)[iv]. Statistical Appendix of Economic Ministry and ECLAC Bs.As.
Real exchange rate: Ratio of wholesale to consumer prices. INDEC.
Interest rate: Deposit rate. International Financial Statistics-International Monetary Fund.
Inflation: $(p_t - p_{t-1})$ being p_t the log of general level of consumers´ prices. INDEC.

References

Ahumada, H. and Garegnani, M.L. (2003) “Wealth Effects in the Consumption Function of Argentina: 1980-2000”, Latin American Meeting of the Econometric Society, Panama, August 28-31, 2003.

Ando A. and Modigliani F. (1963) “The “life cycle” hypothesis of saving: aggregate implications and tests”, American Economic Review, 53, 55-84.

Andrews, D. and Fair, R. (1988) “Inference in Nonlinear Econometric Models with Structural Change”, Review of Economic Studies, 55, 615-640.

Banerjee, A., Dolado, J., Galbraith, J. and Hendry, D.F. (1993) “Cointegration, Error Correction and the Econometric Analysis of Non Stationary Data”, Oxford University Press, Oxford.

Bertaut, C. (2002) “Equity Prices, Household Wealth, and Consumption Growth in Foreign Industrial Countries: Wealth Effects in the 1990s”, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, 724, April.

Carroll, C. (2001) “A Theory of the Consumption Function, With and Without Liquidity Constraints (Expanded Version)”, NBER Working Paper Series, Working Paper Nº 8387.

Carroll, C. (1992) “The Buffer-Stock Theory of Saving: Some Macroeconomic Evidence”, Brooking Papers on Economic Activity, 2, 61-156.

Campbell J.Y. and Mankiw, N.G. (1989) “Consumption, Income and Interest Rates: Reinterpreting the Time Series Evidence”, NBER Working Paper Series, Working Paper Nº 2924.

Davidson, J.E.H. and Hendry, D.F. (1981) “Interpreting econometric evidence: the consumption function in the United Kingdom”, European Economic Review, 16, 177-192. Reprinted in Hendry, D. F., Econometrics: Alchemy or Science? (1993).

Davidson, J.E.H., Hendry, D.F., Srba, F. and Yeo, J.S. (1978) “Econometric modelling of the aggregate time series relationship between consumers' expenditure and income in the United Kingdom”, Economic Journal, 88, 661-692. Reprinted in Hendry, D.F., Econometrics: Alchemy or Science? (1993).

Deaton, A.S. (1991) “Saving and Liquidity Constraints”, Econometrica, Vol 59, Nº5, 1221-1248.

Deaton, A.S. (1987) “Life-Cycle Models of Consumption: Is the Evidence Consistent with the Theory?” in Bewley (ed), Advances in Econometric Fifth World Congress, Vol. 2, Cambridge: Cambridge University Press.

de Brouwer, G. J. (1996) “Consumption and Liquidity Constraints in Australia and East Asia: Does Financial Integration Matter?, Research Discussion Paper 9602, Economic Research Department, Reserve Bank of Australia.

DeJuan, J. and Seater, J. (1999) “The permanent income hypothesis: Evidence from the consumer expenditure survey”, Journal of Monetary Economics, 43, 351-376.

Engle, R. and Granger, C. (1987) “Cointegration and Error Correction: representation, estimation and testing”, Econometrica, Vol 50, 251-276.

Favero, C. (2001) “Applied Macroeconometrics”, Oxford University Press.

Fernandez-Corugedo, E., Price, S. and Blake, A. (2003) “The Dynamic of Consumers’ Expenditure: the UK Consumption ECM redux. “ , Bank of England working paper series, Bank of England.

Flavin, M.A. (1981) “The Adjustment of Consumption to Changing Expectations about Future Income”, Journal of Political Economy, 89(5), 974-1009.

Giovannini, A. (1985) “Saving and the Real Interest Rate in LDCs”, Journal of Development Economics, 18, 197-217.

Hall, R. (1981) “Intertemporal substitution in consumption”, NBER Working Paper Series, Working Paper Nº 720.

Hall, R. (1978) “Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence”, Journal of Political Economy, Vol 86, Nº 6, 971-987.

Hamilton, J.(1994) “Time Series Analysis”, Princeton University Press, Princeton.

Hansen, L.P. (1982) "Large Sample Properties of Generalized Method of Moments Estimators", Econometrica, Vol 50, N°4, 1029-1054.

Hansen, L.P. and Singleton, K.J. (1982) "Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models", Econometrica, Vol 50, Nº 5, 1269-1286.

Hendry, D.F. and Doornik, J. (1997) “Modelling Dynamic Systems Using PcFiml 9.0 for Windows”, International Thomson Business Press.

Hendry, D.F. and Doornik, J. (1996) “Empirical Econometric Modelling Using PcGive for Windows”, International Thomson Business Press. Hendry, D.F. (1995) “Dynamic Econometrics”, Advanced Texts in Econometrics, Oxford University Press.

Hendry, D.F. and Ungern-Sternberg, T. (1981) “Liquidity and inflation effects on consumers´ expenditure”, in A. S. Deaton (ed.), Essays in the Theory and Measurement of Consumers´ Behaviour, Cambridge: Cambridge University Press. Reprinted in Hendry, D. F., Econometrics: Alchemy or Science? (1993).

Heymann, D. and Sanguinetti, P. (1998) “Quiebres de Tendencia, Expectativas y Fluctuaciones Económicas”, Desarrollo Económico, Publicación trimestral del Instituto de Desarrollo Económico y Social, Vol. 38, Abril-Junio de 1998, Nº 149.

Muellbauer, J. and Lattimore, R. (1995) “The consumption function: A theoretical and Empirical Overview” in Pesaran and Wickens Eds. Handbook of Applied Econometrics: Macroeconomics. Blackwell Publishers, 221-311.

Muellbauer, J. and Bover, O. (1986) “Liquidity Constraints and Aggregation in the Consumption Function under Uncertainty”, Discussion Paper 12, Oxford, Institute of Economic and Statistic.

Rossi, N. (1988) “Government Spending, the Real Interest Rate and the Behavior of Liquidity-Constrained Consumers in Developing Countries”, IMF Staff Papers, Vol. 35, 104-140.

Zeldes, S. P. (1989) “Consumption and Liquidity Constraints: An Empirical Investigation”, Journal of Political Economy, 1989, vol. 97, Nº 2, 305-346.

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[i] This implication is tested with time-series data for the post-war United States (1948-1977).
[ii] Estimation of the Euler Equation is made using the appropriate routine in E-Views (Favero (2001)).
[iii] The use of the real interest rate and the rate of growth of real exchange rate as returns was based on the results obtained in Ahumada and Garegnani (2003). Although the real interest rate was not found significant in Equation 1 of that work, it is included as it is considered the conventional measure of returns in a standard optimisation problem for the representative consumer. The rate of growth of real exchange rate was incorporated as it resulted significant as a measure of “wealth perception” in the short run. The inflation was not incorporated, as it was found insignificant as regressor and no additional effect was detected when it was used to adjust the measure of disposable income.
[iv] In the old national accounts the private consumption is taken as a proportion of total consumption.