
Hildegart A. Ahumada
(UTDT)
Maria Lorena Garegnani
(UNLP)

Abstract

The effects of wealth on the consumers’ expenditure have been widely studied since a long time ago, but recent literature has suggested that consumers’ behaviour respond to “perceived wealth”. From an empirical perspective the question is which proxies for wealth should be included to model current consumption in an emerging economy like Argentina subject to liquidity constraints, domestic and external shocks and structural changes. There may be not a unique and time-invariant determinant of wealth, being inflation, real exchange rate movements and debt default risk useful variables for its adjustment. The purpose of this work is to evaluate an empirical representation of the aggregate consumption function of Argentina that takes into account such effects over a period of great macroeconomic variability. The integrated nature of the series is considered to evaluate long-run relationships, first, between private consumption and national disposable income and then, adding several variables of wealth perception. The results show that national disposable income is the only long-run determinant of private consumption and that different proxies for wealth are adopted by the consumers as short-run determinants: a measure of real exchange rate, the sovereign risk after the “Tequila” crisis and an effect associated with last peak income. Asymmetric effects of inflation, the role of liquid assets, interest rates, and labour income, and an interpretation of equilibrium correction form as liquidity constraints are also discussed.

Key words: consumption function – emerging economies – perceived wealth – short and long-run determinants

JEL: E21
Wealth Effects in the Consumption Function of an Emerging Economy:
Argentina 1980-2000

1. Introduction

The effects of wealth on the consumers` expenditure have been widely studied since a long time ago, in particular, after the pioneering work of Ando and Modigliani (1963). The definition of a “consumption function” evolved from the early studies formulated to reconcile the low short-run marginal propensity to consume from income with the relatively stability of the average propensity, to the well-known theories of “permanent income” and “life cycle” (as introduced by Duesenberry (1949), Brown (1952), Friedman (1957) and Ando and Modigliani (1963)). A revival of the discussion around the topic was motivated by Hall’s work (1978) that took an alternative approach to the study of the life cycle – permanent income hypothesis. He concluded that in the stochastic version of this hypothesis no variable apart from consumption lagged one period should be of any value in predicting current consumption. Davidson and Hendry (1981), however, questioned this view in which the true consumption equation is a random walk with an autonomous error process generated independently from income, liquid assets and other variables. In the case of emerging economies, several studies have analysed the issue focusing particularly on the role of interest rates and liquidity constraints. However, in the case of unstable economies such as Argentina that are subject to structural change from economic reforms and deep economic and political crises, the role of wealth effects deserves a more careful assessment.

In this environment, Heymann and Sanguinetti (1998) have suggested that consumers` behaviour respond to “perceived wealth” (that they meant to be an expectation formed with incomplete information) and leave open the question about how it should be empirically defined. In this direction, and given the different nature of shocks, a unique and time-invariant determinant of wealth from the consumers` eyes may not exist. Inflation, real exchange rate and debt default risk premium would be often suggested as different “summary” measures of “perceived wealth”. The motivation of this paper is to perform an empirical analysis of such effects evaluating an aggregate consumption function for Argentina during the last two decades, a period the country suffered large or almost extreme macroeconomic variability.

Next section presents a review of the literature about the consumption function and its main determinants in order to summarise the results from the income-wealth discussion and to extract empirical issues of interest for emerging economies. Section 3 presents a description of the Argentine data. Section 4 briefly introduces the econometric approach and reports the main results. Section 5 evaluates such findings in relation to alternative models and it is divided in: (1) an asymmetric effect of the inflation variable, (2) liquid asset and interest rate, (3) wages and unemployment and (4) liquidity constraints. Section 6 presents the conclusions and policy implications.
2. A review of the literature

The relationship between consumers’ expenditure and income is undoubtedly one of the first and most intensively researched topics in macro-econometrics. The Keynesian consumption function

\[ C = \alpha + \beta Y \quad \alpha > 0, \quad 0 < \beta < 1 \]  

(1)

dominated the early theoretical and empirical literature of the late 1930s and 1940s. The standard Keynesian consumption function is usually written in this form where \( Y \) is personal income net of taxes or disposable income and \( \alpha \) and \( \beta \) are constants. The interpretation of the Keynes’ hypothesis was that current consumption expenditure was highly correlated with income, the marginal propensity to consume was less than unity, and the marginal propensity was less than the average propensity to consume. This implied that the percentage of income saved increases with income.

Kuznets (1942) suggested a proportional relationship between consumption and income but, while it was possible to fit the Keynesian consumption function to short sub-periods, it appeared that the intercept moved up over time, because of a “ratchet effect”.

In response to this new evidence, Brown (1952) introduced lagged consumption to capture the “ratchet effect”

\[ \frac{C}{P} = \alpha + \beta \left( \frac{Y}{P} \right) + \gamma \left( \frac{C}{P} \right)_{t-1} + u_t \]  

(2)

Duesenberry (1949) proposed the Relative Income Hypothesis in which the ratio of current saving to current income depended on the ratio of current income to past peak income, \( Y_0 \), in order to analyse the cyclical variations in the ratio consumption to income.

\[ \frac{S}{Y} = \alpha + \beta \left( \frac{Y_t}{Y_0} \right) + u_t \]  

(3)

where \( S \) = current savings, \( Y_t \) = current disposable income and \( Y_0 \) = previous peak disposable income.

Thus, Duesenberry combined the two hypotheses: the first one was that, in the long-run, savings tended to be proportional to income and the second one was that, in the short-run, the proportion of income saved would depend on cyclical factors.

To reconcile short and long–run behaviour of the observed consumption function, Friedman (1957) introduced the theory of “permanent income”. In this framework, the level of consumption depends on current and expected future income stream, that is,

\[ C_t = \theta Y_{pt} + \mu_t \]  

(4)
where $\mu_t$ is independent of $Y_{pt}$ and has finite variance, and where $Y_{pt}$ is “permanent income”.

The approximation of $Y_{pt}$ presented by Friedman (1957) was

$$(1-\lambda L) Y_{pt} = (1-\lambda) Y_t$$

(5)

to obtain

$$C_t = \theta (1-\lambda) (1-\lambda L)^{-1} Y_t + \mu_t$$

(6)

The effect of wealth on private consumption has traditionally been analysed by the life–cycle hypothesis as exposited by Modigliani (1975) as

$$C_t = \alpha Y_t + (\delta - r) A_t$$

(7)

where $A_t$ is the end period private wealth and $r$ is the rate of return on assets. If capital gains and interest are included in income,

$$A_t = A_{t-1} + Y_{t-1} - C_{t-1}$$

(8)

Replacing (8) in (7) and reordering

$$C_t = \alpha Y_t + (\delta - r - \alpha) Y_{t-1} + (1 - \delta + r) C_{t-1}$$

(9)

which produces an autoregressive-distributed lag model of $C_t$ and $Y_t$.

Since then, a large amount of macroeconomic research has been interested in various aspects of the life-cycle permanent income hypothesis.

Sargent (1977) interprets equation (6) as a rational expectation formulation when $Y_t$ is generated by

$$\Delta_1 Y_t = a + (1-\lambda L) \varepsilon_t$$

(10)

and showed this formulation for the consumers’ expenditure

$$\Delta_1 C_t = \theta a + (1-\lambda^* L) \varepsilon_t^*$$

(11)

As Muellbauer and Lattimore (1995) indicate “1978 was a milestone for research on the aggregate consumption function”. Two papers of this year proved to be key pointers of the following research. One of this
papers was Davidson, Hendry, Srba and Yeo (1978) (DHSY) which introduced the formulation of an error correction model for the dynamic response of real consumers’ expenditure on non-durables to real personal disposable income. They presented results of an equation in constant (1970) prices for consumers’ expenditure on non-durables and services (C) to personal disposable income (Y) and the rate of exchange of prices (P) like the next one:

\[ \Delta c_t = \alpha_1 \Delta y_t + \alpha_2 \Delta y_{t-1} + \alpha_3 \Delta p_t + \alpha_4 \Delta p_{t-1} + \alpha_5 \left( y_{t-1} - y_t \right) + \epsilon_t \]  

(12)

where the lower case letters represent the log of the corresponding capital letters. This paper is seen in the literature as setting the scene for the next work on cointegration of non-stationary time series by Engle and Granger (1987).

The second paper was Hall (1978) who proposed an alternative econometric approach to the study of the life cycle–permanent income hypothesis. He considered that the stochastic implication of the life cycle – permanent income hypothesis is that no variable apart from consumption lagged one period should be of any value in predicting current consumption. In support of this hypothesis some equations were estimated with lagged values of consumption and real per capita disposable income. The coefficients on lagged terms apart from lagged consumption were found to be insignificant\(^1\). With these results Hall’s paper concluded that the evidence\(^2\) supports a modified version of the life cycle–permanent income hypothesis. With Euler equations (first order conditions of the consumers’ maximisation problem) from the simplest model, he concluded that the consumption should follow an approximate random walk.

Hendry and Ungern-Sternberg (1981) (HUS) continued the DHSY formulation of an error correction for the dynamic response of real consumers’ expenditure on non-durables to real personal disposable income including the real personal liquid assets as an “integral correction”. They established that as most households were aware of their liquid asset position and the losses on their liquid assets are the major component of their financial loss during inflationary periods, the product of the rate of inflation and liquid assets could be the prime candidate for relating perceived to measure income. They extended the DHSY model making a re-interpretation of the role of the inflation variable, recalculating the real income by subtracting a proportion of the losses on real liquid assets due to inflation and yielding a ratio of consumption to perceived income which resulted more stable than the one without the real income perceived by consumers. They conclude that during the periods of rapid inflation the conventional measure of the disposable income could not be accepted as a good proxy of the real income and also found negative income effects of inflation on consumers’ expenditure.

As presented before, Hall (1978) deduced that consumers’ expenditure should follow a random walk with (white noise) errors, which are independent from past values of income. Since DHSY and HUS had found a model, which encompassed a random walk formulation of consumers’ expenditure, Davidson and Hendry (1981) questioned the validity of Hall’s model for the United Kingdom data. Based on Monte Carlo experiments they demonstrated that if an “Equilibrium Correction model” were the “true data generating process” the

\(^1\) The changes in stock prices lagged by a single quarter (that could be considered as proxies of wealth), were found to have a modest value in predicting the changes in consumption.

\(^2\) This implication is tested with time-series data for the post-war United States (1948-1977).
random walk model would have also been a good description of the data; that is, a formulation of the consumption equation as a random walk with an autonomous error process generated independently of income, liquid assets and other variables. However, they also concluded that the stochastic implications obtained by Hall (1978) could be expressed as: “no other potential lagged variables Granger-cause the residuals of the equation \( C_t = \alpha_0 + \alpha_1 C_{t-1} + \varepsilon_t \). Since Granger- causality is a different concept from “exogeneity” (as discussed in Engle, Hendry and Richard (1980)) this finding did not preclude that shocks in current income had effects on current consumption as in the DHYS and HUS models. In other words, Hall’s residuals are white noise but not necessarily innovation with respect to an information set which includes “current” income.

Hendry (1992) offers a summary of the main issues involved in a consumption function as the relationship between real disposable income and consumer’s expenditure entails a vast reduction of: (i) micro information to aggregates; (ii) information about alternative assets and their rates of return (financial, durables, housing, etc.); (iii) public and private savings institutions (including pensions, insurance, etc.); (iv) types of income (earnings, profits, rents, interests); (v) the measurement of income and expenditure.

Another literature has emphasised that the consumption reflects the behaviour of the “perceived wealth”. Heymann and Sanguinetti (1998) considered that the decisions about consumption are made taking into account future opportunities and changes in expectations about how future growth could influence current decisions on spending, production and the supply of credit. Internal and external shocks could create new determinants of perception of wealth and consumers must adopt new economic instruments for their decisions. It is very difficult to assume that the individuals introduce immediately these changes. Heymann and Sanguinetti did not postulate that agents automatically know the process generating the relevant variables, and model a learning dynamics of the agents’ behaviour. Certain period of time must be necessary for the consumers in order to change the economic instruments they have been used as a measure of their expected wealth. In this circumstances the consumers could find very difficult to determine their permanent income in order to program their expenditure.

DeJuan and Seater (1999) have used the 1986-1991 US Consumer Expenditure Survey micro-data to test the permanent income life-cycle hypothesis against the alternative hypothesis of “rule of thumb” and liquidity-constrained consumers. The Euler equation that they used combining the permanent income life-cycle hypothesis and the “rule of thumb” consumers is:

\[
\ln(C_{i,t+1}/C_t) = B_0 + B_1 r_{i,t+1} + B_2 \ln(F_{i,t+1}/F_t) + B_3 R_i + B_4 \ln(Y_{i,t+1}/Y_t) + \varepsilon_{i,t+1}
\]

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. The other alternative to permanent income life-cycle hypothesis that was considered is the model of the liquidity-constrained consumers, for whom net assets can never be negative. The constraint of household non-human

\footnote{In Argentina there seems to be an important change in the perception of wealth after the Convertibility Plan, which implies new economic determinants of wealth.}

\footnote{A similar approach in a different context was made by Baba, Hendry and Starr (1992), they said “a period of time is generally required for wealth holders to learn about, adopt and trust a new instrument.”}
wealth greater than zero led to a modified version of equation (13). Their principal finding is that consumption behaviour is consistent with permanent income life-cycle hypothesis. They did not find evidence that current income movements cause changes in total consumption or in several subcategories of consumption and also the results did not support the hypothesis that liquidity constraints affect consumption significantly.

Scott (2000) provided a model of optimal consumption when capital markets are imperfect. He considered that capital market imperfections are widely believed to explain why consumption deviates from the implications of the rational expectation permanent income hypothesis. He modelled the capital market imperfections as consumers facing an upward sloping interest rate schedule, which implies that they could borrow more funds, but only at higher rates. Scott has found that optimal consumption is characterised by an analytic relationship between consumption growth, the interest rate and the debt to income ratio.

A recent study (International Monetary Fund (2002)) has presented a cross-country study of the effect of changes in wealth on consumption. The study found that the impact of wealth changes on consumption varied according to the type of wealth and the nature of the financial system in individual countries. Financial systems were divided between those that were based on bank loans (bank-based) and those where the role of the financial market was dominant (market-based). With bank-based systems - those countries where the role of banks dominated the financial system - the households could be likely to hold an increasing part of their wealth as equities and to find it increasingly easy to borrow against wealth to finance consumption. The study presented a panel of 16 (OECD) advanced economies over the past 30 years. The results showed that: (i) the general impact of changes in wealth tends to be higher for the market-based group than the bank-based group; (ii) the speed of adjustment of consumption to the desired or targeted level of consumption is higher for the market-based group than the bank-based group, (iii) an increase in housing wealth has a bigger impact on consumption than a similar increase in stock wealth and (iv) the impact of changes in wealth on consumption has increased over time in both groups of countries. The final conclusion is that developments in assets prices would become increasingly important for policymakers, because of their direct impact on demand in an individual country and in the rest of the world as a transmission mechanism of business cycle movements.

In the case of emerging countries other determinants apart from income to explain the consumers’ expenditure appears recurrently in empirical models. Based on models which study intertemporal substitution and using the restriction exploited by Hall (1981) and Mankiw, Rotenberg and Summers (1982), Giovannini (1985) evaluates the hypothesis of positive and significant relationship between real interest rates and savings in developing countries. He found that in only five out of eighteen countries, the intertemporal substitutability in consumption was not small, in the majority of cases the response of consumption growth to real rate of interest is slightly different from zero.

According to Rossi (1988) the consumers’ behaviour in developing countries could be dominated by liquidity constraints that affect the ability to substitute consumption intertemporally. He found that Giovannini’s results could be explained by the existence of liquidity constraints which implies a relatively small elasticity of savings. The interest rate elasticity of savings is a relevant indicator in the countries where the role of financial
conditions in an expansion process depends on the level of responsiveness of aggregate savings to changes in the rate of return. Rossi estimated an approximation to the Euler equation for consumption incorporating credit constraints. He considered that consumers who are liquidity constrained at \( t \) may not expect to be constrained at \( t+1 \) and may therefore be forced to let their consumption path follow more closely their income path. From the estimation he concluded that the expected growth of consumption would change with variations in the real interest rate once that credit constraint were taken into account (controlling by equilibrium correction models of consumption-income).

It is also important to note that behind the interest rate is the credit demand. Heymann and Sanguinetti (1998) considered that the variations on the expenditure are associated to the fluctuations in the credit demand with an exogenous rate of interest. Since the behaviour of the interest rate could be associated to either internal or external factors, the “net” domestic effect would be reflected by the sovereign risk (the difference between interest rates of Government bonds of U.S.A. and Argentina (in dollars)). It is another empirical issue which of these instruments are selected by economic agents as financial indicator in order to take their decisions on consumption.

Apart from the negative income effects of inflation on consumer's expenditure in the HUS model Deaton (1977) had presented evidence for disequilibrium effect of inflation on consumer's expenditure. An inflation variable could be seen as a proxy of the erosion of the real value of wealth and it should be included to adjust perceived wealth during inflationary periods.

Heymann and Sanguinetti (1998) also considered that the dynamic of the expenditure would change according to the variations in the previsions of the exchange rate. The cycles in the perception of wealth have a correspondence to fluctuations in the exchange rate. They argued that in a two goods economy, the wealth includes the estimated present value of the income of supply of non-tradable goods. So the perception of wealth depends on the present prices of non-tradable goods and the individual's expectation about future prices. The dynamic of the consumers’ expenditure would change according to the modifications to their previsions about the exchange rate. They proposed the following dynamic about decision of consumption: once the individual has formulated his expectations of the price of non-tradable, he could make a plan of production of non-tradable and calculate his total wealth, finally he would determine their consumption expenditure.

Previous studies for Argentina showed that lagged values of consumption, current and lagged income and the rate of inflation are the determinants of consumer's expenditure. Dueñas (1985) found that the Argentine consumption function responded not only to anticipate changes in current income but also to non-anticipated ones, because private agents are liquidity constrained when they determined the optimum level of consumption. Giovannini (1985) concluded that for the Argentinean experience, intertemporal substitution in consumption was never significantly different from zero, when the time deposits interest rate and the rate of return on the foreign investment (proxied by the U.S. Treasury Bill rate) were used.

Galiani and Sánchez (1994) following the general to particular methodology found a great importance of current income in explaining consumer's expenditure as well as a channel of transmission of the volatility of
inflation to the volatility of aggregate demand via consumer’s expenditure. Ahumada, Canavese and Gonzalez Alvaredo (2000) estimated a consumption function, also following the general to particular methodology, in which the determinants of the private consumption were the income and the rate of inflation. They found a long–run relationship between income and consumption, the form that this term enters in the equations validate the life-cycle permanent income hypothesis.

3. The data

This work econometrically studies the wealth effects on the consumption function of an emerging economy: Argentina during the 1980 and 2000 period (on quarterly basis). The life-cycle model (Ando and Modigliani (1963)) says that the determinants of the consumption are the labour disposable income and the financial wealth. The statistical information about disposable income and wealth available for Argentina only allow working with gross national disposable income, which is the income of the factors owners that participate in the production process inside the country and in the rest of the world adjusted by payments (or reception) of current transfers to (or from) the rest of the world. The gross national disposable income is obtained as the sum of the gross national income and the current net transfers. The private consumer’s expenditure series is obtained as the sum of the expenditure in goods and services of private residents and non-profit institutions. The variables are measured in thousands of pesos at 1986 prices.

Figure 1 shows the behaviour of the consumer’s private expenditure (conspriv) and the national disposable income (incdisp) in logs between 1980 (1) and 2000 (4) and Figure 2 shows a cross–plot of the same variables for such period of time.

Figure 1

---

5 They used a modified version of the inflation variable in order to capture the asymmetric responses of the consumption to
From the time-plot inspection, the behaviour of both series could be separated in two periods, 1980 - 1990 and 1991 - 2000. Between 1980 and 1989, they experienced no trend and even a strong slowdown in 1985, previous to the Austral Plan. During the third and fourth quarters of 1989 and the beginning of 1990 the hyperinflation seemed to significantly reduce the values of both private consumption and gross national disposable income. From the beginning of the Convertibility plan the two macro aggregates have presented a positive trend but suffered a considerable reduction in 1995, with the “Tequila” crisis, and in 1998, with the Brazilian crisis.

Figure 2

The co-movements of both variables seems to be the responsible for the strong positive linear relationship observed (the correlation coefficient is 0.986). This suggests a long–run relationship between private consumption and gross national disposable income, which will be investigated in the next section taking into account time series properties.

4. Econometric results

As presented in the previous section, the basic models of consumption that introduced wealth, like the first versions of the life-cycle hypotheses, assume that consumers’ expenditure is essentially dependent on disposable income (with an autoregressive distributed lag dynamic structure). This section starts analysing the bivariate relationship between private consumption and national disposable income of Argentina and then, the study is extended to a multivariate framework adding different variables of “perceived wealth”.

positive and negative changes in the rate of inflation.
First the (joint) modelling of consumption/income process is performed taking into account their integrated nature, which also leads to the consideration of the exogeneity issues. They must be evaluated in order to validate a conditional model of consumption on disposable income. The analysis of cointegration of these series, using the system-based procedure from Johansen (1988) and Johansen and Juselius (1990) for the whole sample (first quarter of 1980 to fourth quarter of 2000) is presented below.

### lconspriv and lincdisp system

**1981(1) to 2000(4)**  (4 lags and d88,d892,d893 and constant unrestricted)

<table>
<thead>
<tr>
<th>$\lambda_i$</th>
<th>Ho: $r=p$</th>
<th>Max $\lambda_i$</th>
<th>Tr</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.296</td>
<td>p=0</td>
<td>28.18**</td>
<td>25.36**</td>
</tr>
<tr>
<td>0.033</td>
<td>p=1</td>
<td>2.765</td>
<td>2.488</td>
</tr>
</tbody>
</table>

$\lambda_i$ is the maximum eigenvalue statistic ($-T\ln \lambda_i$) and Tr is the Trace statistic ($-T\ln \Sigma(1-\lambda_i)$) for each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum,1992) critical values (See Hendry and Doornik (1997)).

\[
\alpha = \begin{pmatrix} -0.60133 \\ -0.08545 \end{pmatrix}, \quad \beta' = \begin{pmatrix} 1.0000 \\ -0.96395 \end{pmatrix}
\]

$\alpha$ is the matrix of standardised weight coefficients and $\beta'$ the matrix of eigenvectors (cointegration vectors and their weights in bold)

**LR test ($r=1$)**

<table>
<thead>
<tr>
<th>Ho:</th>
<th>Chi$^2$(1)</th>
<th>0.0069</th>
<th>0.8441</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_1=0$;</td>
<td>7.2904</td>
<td>0.0386</td>
<td>0.30817</td>
</tr>
<tr>
<td>$\alpha_2=0$;</td>
<td>0.0386</td>
<td>0.30817</td>
<td></td>
</tr>
<tr>
<td>$\beta_2=-1$;</td>
<td>0.30817</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LR is the likelihood ratio statistics assuming rank =1

The bivariate system estimates show private consumption (lconspriv) and national disposable income (lincdisp) having one long-run (cointegration) relationship with vector coefficient of (1,-0.96). Also LR tests indicate the validity of the conditional model of lconspriv on linlincdisp (rejecting $\alpha_1=0$ and not rejecting $\alpha_2=0$) that is the disequilibria from the cointegration relationship entering only in the private consumption equation.6

Besides, using the LR tests, it could not be rejected that the long-run coefficient of income ($-\beta_2$) is equal to 1. Therefore the relationship between these two variables could be model as an equilibrium correction model of the form of DHSY (1978) and Davidson and Hendry (1981):

\[
\Delta lconspriv = \delta_0 + \delta_1 \Delta lincdisp - \delta_2 (lconspriv_{t-1} - lincdisp_{t-1}) + \epsilon_t
\]

The results of this system would allow replacing $\delta_2$ with $\delta_1 = -0.60$ but all coefficients should be re-estimated in a multivariate model where the effect of other variables is introduced. Following the traditional literature on consumption functions and the characteristics of economic history of Argentina the private consumption/disposable income model would be enriched with proxies of “perceived wealth”, as suggested by

---

Heymann and Sanguinetti (1998). In the countries subject to internal and external shocks, these events could create new determinants of perception of wealth and the consumers must adopt new economic variables as instruments in order to take their decisions. The information set studied before was extended to consider three variables: the inflation rate for the period previous to the Convertibility regime, the sovereign risk after the “Tequila effect” since 1995 and a measure of the real exchange rate for the whole sample.

The inflation variable (first differences of the logs of consumers prices) could be seen as a proxy of the erosion of the real value of wealth; until 1991 a critical variable in a country like Argentina with high and variable inflation. In this period, Argentina faced the acceleration of inflation until reaching hyperinflation rates.

The sovereign risk appears since the Tequila crisis 1995 (1) as a measure of sustainability of wealth (and income). Defined as the spread of interest rates of the Government bonds of U.S.A. and Argentina (in dollars) it is closely related to the domestic interest rate as it represents the effect of its difference from the foreign one that is taken as baseline. This risk could be an indicator about the possibility of public debt payment and could also be related to a exchange rate effect, because private agents could modify their expectations over the changes in real rate of exchange according to changes in country’s default risk (see Ahumada and Garegnani (2000)).

Finally, as previously suggested, the real value of the exchange rate could be considered as a measure of the perception of wealth and this variable is attempted to be included for the whole sample. As the exchange rate remained fixed during the Convertibility regime, an alternative proxy should be taken into account: the ratio of wholesale to consumer prices. Given the higher participation of tradables/non tradables in the former relative to the second index, this ratio could reflect the relative price of these kinds of goods.

Four systems are presented in the Appendix 3 and the results show that, although the system is expanded to the three variable altogether or one-by-one in each case, the same conclusion are still maintained: only the private consumption and the national disposable income have a long-run relationship and such relationship is of homogeneity (long-run coefficient equal to 1).

Given previous cointegration and exogeneity results the econometric analysis continued with a “general” model that included the equilibrium correction of the consumption-income (from a 1 to 1 long-run relationship) and the indicators that did not enter in the long-run relationship: inflation for the pre-Convertibility period, the sovereign risk since Tequila crisis and the measure of the real exchange rate. They are tested for short-run effects on the consumption behaviour.

Apart from these adjustments to the definition of perceived net wealth, an asymmetric effect of rising and decreasing income was tried as an extra measure, following Duesenberry (1949). He proposed the Relative Income Hypothesis in which the ratio of current saving to current income depends on the ratio of current income to past peak of income, in order to analyse the cyclical variations in the ratio consumption to income.
A simplified model is presented in Equation 1. The estimation started with the model presented in Appendix 4, an unrestricted model with 4 lags to each variable and quarterly dummies that allow for homocedastic white-noise and normal residuals.

**Equation 1**

\[
\text{Dpondcpriv} = +0.01914 +0.9229 \text{DLincdisp} +0.2785 \text{efdues} \\
\text{(SE)} \quad \text{(0.003979)} \quad \text{(0.07912)} \quad \text{(0.05293)} \\
-0.1085 \text{drealaxchrate34} -0.005289 \text{Dsrteq} -0.5391 \text{Eqconsprivincdisp}_1 \\
\text{(0.03665)} \quad \text{(0.002769)} \quad \text{(0.08655)} \\
-0.06124 \text{d871} -0.1143 \text{d881} -0.04652 \text{d931} \\
\text{(0.02061)} \quad \text{(0.02044)} \quad \text{(0.02066)}
\]

\[R^2=0.833931 \quad F(8,70)=43.939 \quad [0.0000] \quad \sigma=0.0201762 \quad DW=2.05\]

\[\text{RSS}=0.028495550139 \text{ for 9 variables and 79 observations}\]

**Residuals tests**

\[
\begin{align*}
\text{AR 1- 3 F( 3, 67) } & = 2.2679 \quad [0.0886] \\
\text{ARCH 4 F( 4, 62) } & = 1.8299 \quad [0.1344] \\
\text{Normality Chl}^2(2) & = 1.1948 \quad [0.5502] \\
\xi^2 & = 0.5832 \quad [0.8572] \\
\xi^*\xi & = 0.78826 \quad [0.7272] \\
\text{RESET F( 1, 69)} & = 0.019723 \quad [0.8887] \\
\end{align*}
\]

where LM statistics of autocorrelation (AR), heteroskedasticity (ARCH, square $\xi^2$) and square and cross-product $(\xi^*\xi)$ of regressors; Normality and Specification (RESET) are reported (see Hendry and Doornik, 1996).

The dependent variable in Equation 1 has been linearly transformed as follow:

\[
\text{Dpondcpriv} = \text{Lconspriv} - 0.80*\text{Lconspriv}_1 - 0.20*\text{Lconspriv}^4;
\]

Note that it is a weighted average of the first and four lags, reflecting some kind of seasonal behaviour. These coefficients are derived as a simplification of the general model presented in Appendix 4. The final coefficient for the first lag of Lconspriv is 0.26 and for the fourth lag is 0.20, reasonable similar to those of the unrestricted model for Lconspriv. As shown in the Appendix 4, the hypothesis of the coefficient of lag 1 equal to 0.26 could not be rejected at the traditional significant levels of 1%, 5% and 10% and the hypothesis of the coefficient of lag 4 equal to 0.20 could not be rejected at a 1% significant level.

Since the first difference in income, the DLincdisp variable, enters contemporaneously in this equation, instrumental variable (IV) estimation was also carried out using the first lag of this difference and the first lag of the level of the variable lincdisp as IV. The coefficient of DLincdisp was not statistically different from the one of the previous equation (0.92) but the specification of the model deteriorated in comparison with results of Equation 1.

The model presented in Equation 1 indicates that private consumption is determined in the long-run by national disposable income, the equilibrium correction is significant and has the correct sign. The results also show a short-run effect of national disposable income on private consumption, an increase of 1% in the rate of growth of national disposable income increases the rate of growth of private consumption in 0.92%.
However, this effect should be corrected with the Duesemberry's effect reflected in the coefficient of the efdues variable (difference between the lincdisp of the period less the maximum lincdisp up to this quarter). It shows that if disposable income were growing over the last peak, a rise of 1% would have an impact effect on private consumption of approximately 1.20% (0.92 plus 0.27), that is an overshooting over the long-run effect. If instead, current income is increasing a same 1% but its level is lower than the previous peak, the impact effect is lower than 0.92 that is undershooting the long-run effect.\footnote{Note that in the long-run the relationship is of homogeneity, but in the short-run the impact effect will depend on cyclical factors.}

An effect of the type suggested by Heymann and Sanguinetti could be deduced from the estimated model. When the real exchange rate is approximated by the ratio of wholesale to consumers prices as a proxy for the relative price of tradable over non-tradables, the change in the real rate of exchange between the third and fourth lag has a significant and negative impact effect on the private consumption of approximately 0.11%. The delay in this effect could be due to the period of time the consumers need to adapt their decisions to new variables that affects their perception of wealth.\footnote{The difference between the third and fourth lag could also be due to the seasonality implicit in the dynamic of the exchange rate.}

The rate of growth of sovereign risk also negatively affects the private consumption since the Tequila crisis and it has a shorter lag than the last one. It could also be interpreted as an additional adjustment for wealth when private agents modify their expectations over the changes in real rate of exchange according to changes in country risk.

Furthermore, the dummy variables included in Equation 1 for the first quarter of 1987 and the first quarter of 1988, coincide with periods of acceleration of rate of growth of prices. Instead, the dummy variable for the first quarter of 1993 could be due to a change in the measure of national accounts from this quarter. However, since all the dummy variables were for the first quarter, they could reflect a differential seasonality for this quarter.

Finally parameters constancy of the model of Equation 1 was evaluated -and not rejected- by their recursive estimation as observed in the next graphics (the recursive estimates of the main coefficients are inside the previous 2 times standard errors intervals).
5. Evaluating the econometric results

For the sample and data employed in this study, the results show that national disposable income is the only long-run determinant of private consumption of Argentina. The real exchange rate, the difference between the current disposable income and the previous peak income (“the Duesenberry’s effect”) and the sovereign risk after the Tequila crisis appear to be the variables adopted by the consumers as short-run determinants of “perception of wealth”. In order to make a further evaluation of the resulting model, other effects related to the consumers’ behaviour in emerging economies are incorporated to the previous equation. This section is divided as follows: (1) an asymmetric effect of the inflation variable, (2) liquid asset and interest rate, (3) wages and unemployment. The fourth sub-section discusses an interpretation in terms of liquidity constraints.

5.1. An asymmetric effect of inflation

The abandon of the Convertibility regime brought again the rate of inflation to the core of political and economical discussions. The study of the effect of this variable on consumption decisions could be based on its role as a measure of sustainability of wealth. Since it was surprising that no effect from inflation could be detected previously to the Convertibility plan, this variable was reevaluated.

Two variables were incorporated but still resulted insignificant to the model: the first lag of the pre-Convertibility inflation variable and the first difference of this variable (the results are presented in Appendix 5).

In order to prove if the no significance of the inflation variable was due to omitted asymmetric effects of inflation on consumption, the inflation growth was introduced dividing it into positive and negative changes. It
can be thought that only the “erosion of wealth”, as a consequence of rising inflation, could matter for consumers’ expenditure. On the other hand, only an “euphoria” effect could be expected, created by a reduction in the rate of inflation, which overvalues the “perceived wealth”. At least, the estimated coefficient of this effect could be different.

**Equation 2**

\[
\begin{align*}
D_{pondcpriv} &= +0.01951 +0.9167 DLincdisp +0.2917 efdues \\
&\quad -0.1102 drealexchrate34 -0.005339 Darseq -0.535 Eqconsprivincdisp_1 \\
&\quad -0.06107 d871 -0.1147 d881 -0.04701 d931 \\
&\quad -0.003839 Dinflpreconvpos +0.004575 Dinflpreconvneg \\
&\quad (SE) (0.004298) (0.09112) (0.06707) \\
&\quad (0.04099) (0.002816) (0.08871) \\
&\quad (0.0209) (0.02076) (0.02099) \\
&\quad (0.01488) (0.01681)
\end{align*}
\]

\[R^2=0.834222 \quad F(10,68)=34.219 \quad [0.0000] \quad \sigma=0.0204528 \quad DW=2.05 \]

\[RSS=0.02844547146 \text{ for 11 variables and 79 observations}\]

**Recursive graphics**

Although positive and negative growth of inflation was distinguished, none of them result statistically significant for the whole sample. This suggests that no additional measures of perceived wealth related to inflation were found as significant.

### 5.2 Incorporating liquid assets and the interest rate

One pros -nowadays discussed- of relaxing the restrictions on cash retirements imposed by the financial reform named locally as “corralito” (which froze deposits from last December) is based on the possibility of using these funds for increasing private consumption. Policy makers who sustain this view should have in mind that these liquid assets are part of the “perceived wealth” that influences private consumption.
analyse this issue the first difference of monetary aggregate m3* is introduced to Equation 1. The results are presented in the Equation 3.

Equation 3

\[ D_{pondcpriv} = +0.01814 +0.8518 DLincdisp +0.2817 efdues \\
-0.1605 drealexchrate34 -0.005243 Dsrteq -0.5408 Eqconsprivincdisp_1 \\
-0.06332 d871 -0.1116 d881 -0.04568 d931 \\
-0.003476 Dm3* \\
R^2=0.847687  F(9,53)=32.774 [0.0000]  σ=0.0199911  DW=2.25 
RSS=0.02118107251 for 10 variables and 63 observations

Recursive graphic

From the results of Equation 3 and the recursive graphic for the first difference of the variable m3*, it could be concluded that there is no effect of monetary aggregates on private consumption once the real exchange rate, the Duesenberry’s effect and the sovereign risk are included as measures of “perceived wealth”. Similar results were found for first lag of m3*, as could be seen in Appendix 6.

Other related variable worthwhile analysing is the interest rate. The interest rate plays a fundamental role in asset pricing and as the opportunity cost of consumption (see Giovannini (1985)). As the results of Equation 1 has shown, the rate of growth of sovereign risk could be considered as a short-run determinant of private consumption. This economic variable represents the spread between interest rates of domestic and foreign government bonds. In order to prove that not only this spread but also the level of the real domestic interest rate (rint) for deposits could affect the consumers’ expenditure, the latter is introduced to the model of the Equation 1.

---

9 The definition of M3 includes narrow money and all kind of bank deposits in pesos. M3* also includes deposits in dollars.
Equation 4

\[ \text{Dpondcpriv} = +0.02028 + 0.8933 \text{ DLincdisp} + 0.3014 \text{ efdues} \]

\[ (\text{SE}) \quad (0.004363) \quad (0.09161) \quad (0.06375) \]

\[ -0.005421 \text{ Dsrteq} - 0.5485 \text{ Eqconsprivicdisp}_1 - 0.1037 \text{ drealexchrate34} \]

\[ (\text{SE}) \quad (0.002788) \quad (0.08809) \quad (0.03756) \]

\[ -0.06052 \text{ d871} - 0.1132 \text{ d881} - 0.04667 \text{ d931} \]

\[ (\text{SE}) \quad (0.02072) \quad (0.0206) \quad (0.02075) \]

\[ -0.002517 \text{ rint} \]

\[ (\text{SE}) \quad (0.003874) \]

\[ R^2 = 0.834941 \quad F(9,69) = 38.781 \quad [0.0000] \]

\[ \sigma = 0.02026 \quad DW = 2.02 \]

\[ \text{RSS} = 0.02832214503 \text{ for 10 variables and 79 observations} \]

From these results and the next recursive graphic for the level of the interest rate, it could be concluded that there is no effect of this variable on the private consumption once the sovereign risk is included.

Recursive graphic

5.3 The role of wages and unemployment

As Equation 1 has shown, a short-run determinant of private consumption is the real exchange rate when it is approximated by the ratio of wholesale to consumers prices (for the relative price of tradables over non-tradables). Since real wages mainly reflect the behaviour of non-tradable prices (this follows from the assumption that non-tradables are more labour-intensive than tradables), the changes in the real wage could also be used as a proxy for the variations in the relative price between non-tradables and tradables and the effects of labour income cannot be clearly disentangled from those of real exchange rate. In order to clarify about the interpretation of the effects of the real exchange rate and the real wages, the first difference of industrial real wages\(^{10}\) is introduced in Equation 1 replacing for the proxy of the real exchange rate.

m3* represents M3* in logs.

\(^{10}\) The industrial real wage is the only labour income variable available for the whole sample.
### Equation 5

\[
D_{pondcpriv} = +0.02194 + 0.8998 \text{ DLincdisp} + 0.3138 \text{ efdues}
\]

\[
(\text{SE}) \quad (0.004085) \quad (0.08555) \quad (0.05439)
\]

\[
-0.005616 \text{ Dsrteq} - 0.5716 \text{ Eqconsprivincdisp}_1 - 0.05259 \text{ d871}
\]

\[
(0.002858) \quad (0.08934) \quad (0.02123)
\]

\[
-0.1164 \text{ d881} - 0.04482 \text{ d931} + 0.04803 \text{ DLrealwage}
\]

\[
(0.02112) \quad (0.02133) \quad (0.02434)
\]

R\(^2\)=0.82297  F(8,70)=40.677  [0.0000]  σ=0.0208314  DW=1.87  

RSS=0.03037616035 for 9 variables and 79 observations

### Recursive graphic

Although from Equation 5 the real wage could be considered individually significant at 1% level, the recursive graphic shows it was not the case for the whole sample.

The next step was to verify whether or not the industrial real wage was an omitted variable when real exchange rate is included as an explanatory variable. The first lag of the log of this variable was incorporated to the model but was not statistically different from zero for the whole sample.

Another indicator of labour income, the rate of unemployment, was proved for Equation 1. The first lag of this variable and its first difference were introduced to the model of Equation 1 but results show the non-significance of the unemployment variable for the whole sample.

### 5.4 Liquidity constraints

It is worthwhile noting that the model of Equation 1 also admits an interpretation in terms of Rossi’s model. He proposed an equilibrium correction as a result from an aggregate Euler equation modified by credit constraints\(^{11}\). If households are liquidity constrained, their consumption could be forced to follow the path of their income, and if income is non-stationary, consumption would also be non-stationary and cointegrated with
income, this justifies the inclusion of an equilibrium correction term as a way of testing the existence of liquidity constraints. However, another view to interpret these restrictions consist of verifying an asymmetric response of consumption to income (see DeJuan and Seater (1999)). Next equation shows the results of assuming different coefficient for increases and decreases in income growth and in the adjustment to positive and negative long-run deviations.

**Equation 6**

\[
\begin{align*}
D_{pondcpriv} &= +0.0245 +0.2804 e^{fdues} -0.1192 d\text{realxchrate}34 \\
(\text{SE}) &= (0.005517) (0.0564) (0.03743) \\
-0.005729 Dsrteq &= -0.4218 Eqneg_1 -0.804 Eqpos_1 \\
(0.002791) &= (0.1241) (0.2195) \\
-0.0599 d871 &= -0.116 d881 -0.0415 d931 \\
(0.02081) &= (0.02054) (0.02111) \\
+0.8608 D\text{posincdisp} &= +0.9614 D\text{negincdisp} \\
(0.1472) &= (0.1531)
\end{align*}
\]

\[R^2=0.838819 \quad F(10,68)=-35.389 [0.0000] \quad \sigma=0.0201672 \quad DW=1.97\]

\[\text{RSS } = 0.02765676227 \text{ for } 11 \text{ variables and 79 observations}\]

Wald test for linear restrictions: \( \beta_{D\text{posincdisp}}=\beta_{D\text{negincdisp}} \)
LinRes \( F(1,68) = 0.15633 \) \([0.6938]\)

Wald test for linear restrictions: \( \beta_{Eqneg_1}=\beta_{Eqpos_1} \)
LinRes \( F(1,68) = 1.73 \) \([0.1928]\)

According to these results the asymmetric response of consumption could not be present neither for income growth nor in adjustment to the long-run relationship. The hypotheses of equal response of consumption to short-run increases and decreases of income and equal adjustment to positive and negative long-run deviations could not be rejected at traditional significance levels as could be seen in the previous linear restrictions tests.

Given these findings, the consumers' behaviour of Argentina cannot be interpreted in terms of models of liquidity constraints with asymmetric effects. The presence of an equilibrium correction term could suggest that consumption be kept in line with income but only in the long-run.

6. Conclusions and policy implications

This paper dealt with wealth effects in the consumption function of an emerging economy. The study focussed on the main determinants of consumers’ decisions in Argentina during the last two decades, a period in which there were “different” liquidity constraints, domestic and external shocks and structural changes. From an econometric perspective, the integrated nature of the series was considered to evaluate long-run relationships; first, between private consumption and national disposable income and then, adding several variables that were regarded as potential candidates of wealth perception. The results show that national disposable income is the only long-run determinant of private consumption, as well as one of its short-run determinants. The long-run relationship is of homogeneity, but in the short-run the impact effect depends also

---

\footnote{For a detailed description see Muellbauer and Lattimore (1995), section 5.}
on cyclical factors. However, consumers’ behaviour of Argentina cannot be interpreted in terms of models of liquidity constraints with asymmetric effects. The presence of an equilibrium correction term suggests that consumption is kept in line with income but only in the long-run.

Regarding the dynamics of the model of private consumption, not only the national disposable income has an impact, but there are also other effects from different measures of “perceived wealth”. The proxies adopted by the consumers as short-run determinants appear to be: a measure of real exchange rate (for the whole sample), the sovereign risk after the “Tequila” crisis and an effect associated with last peak income. When the real exchange rate is approximated by the ratio of consumers to wholesale prices as the relative price of tradable over non-tradables, it has a significant and negative lagged effect. The rate of growth of sovereign risk also negatively affects private consumption since the Tequila crisis. A cyclical effect of the difference between current income and the last peak income is also detected.

Once the previous measures of “perceived wealth” were taken into account, variables related to inflation and its asymmetric effect on private consumption could not be found as significant. The role of liquid assets (defined as the widest monetary aggregate in the banking system), interest rates (as a complement to the sovereign risk spread) and labour income (real wages and unemployment) was also evaluated with no significant additional effects.

The correct specification and the ex-post parameter constancy of the model allow performing some partial exercises about the next path of consumers’ expenditure given the current economic situation. First, if national disposable income decreases about 10%, private consumption will also decrease about 9% in the next quarter. Considering the Duesenberry’s effect, if national disposable income were a 20% below the last peak value, the additional fall in private consumption will be more than 5%. Second, relaxing financial restrictions imposed by the “corralito” would not have -per se- any effect on private consumption because consumers’ expenditure is dependent on other measures of “perceived wealth” rather than the one associated to liquid assets. Such measures of “perceived wealth” (real exchange rate and sovereign risk) should be the relevant ones for policy decisions. Third, isolating the estimated effect of the wholesale to consumers prices ratio during the first quarter of 2002, 32% and 9.7% accumulated respectively, a decrease in private consumption of about 2.5% could be expected in the next third quarter. On the other hand, no effect could be derived from the analysis of the sovereign risk after the default was announced as it enters the model only in differences and it remains almost without variation (at extremely high values). Then, from the model specification obtained for the data and sample of this study, a stabilisation of real exchange rate appears as a necessary condition to stop consumption falls.
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). 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.

Real wages: Industrial real wages. ECLAC Bs.As.

Unemployment: Rate of unemployment. INDEC.

Appendix 2: Unit–Root Tests

<table>
<thead>
<tr>
<th>Serie</th>
<th>ADF(j)</th>
</tr>
</thead>
<tbody>
<tr>
<td>lconspriv</td>
<td>ADF(1)=-0.7077</td>
</tr>
<tr>
<td>lincdisp</td>
<td>ADF(1)=-0.4047</td>
</tr>
<tr>
<td>srteq</td>
<td>ADF(1)=-0.7307</td>
</tr>
<tr>
<td>exchrate</td>
<td>ADF(1)=-0.7415</td>
</tr>
<tr>
<td>inflpreconv</td>
<td>ADF(1)=-2.679</td>
</tr>
</tbody>
</table>

All cases include the constant and \( j \) indicates the lags of the Augmented Dickey-Fuller (ADF) test. In all cases the null hypothesis of order of integration equal to one cannot be rejected at traditional levels of 1% and 5%.
Appendix 3: Systems

System 1: The system with the three measures of perception of wealth together

Lconspriv, lincdisp, exchrate, srteq and inflpreconv system

1980(4) to 2000(4) (2 lags and d823,d902 and constant unrestricted)

\[ \lambda_i \quad H_0: r=p \quad \text{Max} \lambda_i \quad \text{Tr} \]

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\lambda_i & H_0: r=p & \text{Max} \lambda_i & \text{Tr} \\
\hline
0.351518 & 35.08* & 30.75 & 33.5 & 80.91** & 70.92* & 68.5 \\
0.238787 & 22.1 & 19.37 & 27.1 & 45.83 & 40.17 & 47.2 \\
0.180871 & 16.16 & 14.17 & 21.0 & 23.73 & 20.8 & 29.7 \\
0.080955 & 6.755 & 5.921 & 14.1 & 7.566 & 6.632 & 15.4 \\
0.009955 & 0.8105 & 0.7104 & 3.8 & 0.8105 & 0.7104 & 3.8 \\
\hline
\end{array}
\]

\( \lambda \) is the maximum eigenvalue statistic(-Tln\( \lambda \)) and \( \text{Tr} \) is the Trace statistic(-Tln\( \sum(1-\lambda) \)). For each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum, 1992) critical values (See Hendry and Doornik (1997)).

\[
\beta
\]

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\Delta \text{Lconspriv} & 1.0000 & -0.98811 & 0.016339 & -0.0014544 & -0.0011310 \\
\Delta \text{Lincdisp} & -1.0492 & 1.0000 & 0.66504 & 0.0024484 & -1.5896 \\
\Delta \text{Exchrate} & -2.0380 & 7.5881 & 1.0000 & -0.16885 & 0.22398 \\
\Delta \text{Srteq} & 17.877 & 7.2274 & 28.391 & 1.0000 & -7.1898 \\
\Delta \text{Inflpreconv} & -3.3171 & 9.0524 & 0.63104 & 0.14945 & 1.0000 \\
\hline
\end{array}
\]

\( \alpha \) is the matrix of standardised weight coefficients and \( \beta \) is the matrix of eigenvectors (cointegration vectors and their weights in bold).

\[
\alpha
\]

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\Delta \text{Lconspriv} & -0.56735 & -0.00081768 & -0.037518 & -0.0014544 & -0.0011310 \\
\Delta \text{Lincdisp} & 0.19042 & -0.0016706 & -0.028477 & -0.0012272 & -0.00052238 \\
\Delta \text{Exchrate} & -0.17218 & 0.079091 & 0.015140 & 0.0010046 & 0.0029735 \\
\Delta \text{Srteq} & 0.47876 & 0.015821 & 0.84301 & -0.033970 & 0.014914 \\
\Delta \text{Inflpreconv} & -0.17151 & 0.25853 & 0.12287 & 0.0044127 & -0.011201 \\
\hline
\end{array}
\]

LR test (r=1)

\[
H_0: \alpha_0=0; \quad \text{Chi}^2(1) = 5.1671 \quad [0.0230] \quad * \\
H_0: \alpha_1=0; \quad \text{Chi}^2(1) = 1.1956 \quad [0.2742] \\
H_0: \alpha_2=0; \quad \text{Chi}^2(1) = 0.1905 \quad [0.6625] \\
H_0: \alpha_3=0; \quad \text{Chi}^2(1) = 0.00964[0.9218] \\
H_0: \alpha_4=0; \quad \text{Chi}^2(1) = 0.01451[0.9041] \\
H_0: \alpha_6=0; \quad \text{Chi}^2(1) = 12.77 \quad [0.0004] \quad ** \\
H_0: \alpha_6=1; \quad \text{Chi}^2(1) = 0.01549[0.9009] \\
H_0: \alpha_7=0; \quad \text{Chi}^2(1) = 0.25581[0.6130] \\
H_0: \alpha_8=0; \quad \text{Chi}^2(1) = 0.09577[0.7570] \\
H_0: \alpha_9=0; \quad \text{Chi}^2(1) = 0.01808[0.8930] \\
\]

LR is the likelihood ratio statistics assuming rank =1.
System 2: A three variable system of private consumption, national disposable income and real exchange rate

\textbf{Lconspriv, lincdisp and exchrate system}

\textbf{1980(4) to 2000(4) (3 lags and d88,d892,d893,d902 and constant unrestricted)}

\begin{tabular}{cccccc}
\hline
\(\lambda_i\) & Ho:r=p & Max\(\lambda_i\) & Tr \\
\hline
0.354 & p=0 & 35.47** & 21.0 & 47.1** & 29.7 \\
0.131 & p=1 & 11.42 & 10.15 & 7.097 & 15.4 \\
0.002 & p=2 & 0.2102 & 0.1869 & 0.3052 & 3.8 \\
\hline
\end{tabular}

MAX \(\lambda_i\) is the maximum eigenvalue statistic\((-T\ln \lambda_i)\) and Tr is the Trace statistic\((-T\ln \Sigma (1-\lambda_i))\) for each statistic the second column presents the adjusted by degree of freedom and the third the 95\% (Osterwald-Lenum,1992) critical values (See Hendry and Doornik (1997)).

\[\begin{array}{ccc}
\alpha & \beta' \\
\Delta \text{lconspriv} & -0.61697 & -0.19469 \\
\Delta \text{lincdisp} & 0.26297 & -0.14354 \\
\Delta \text{exchrate} & 0.03580 & 0.01875 \\
\end{array}\]

\(\alpha\) is the matrix of standardised weight coefficients and \(\beta'\) the matrix of eigenvectors (cointegration vectors and their weights in bold)

\textbf{LR test (r=1)}

\begin{itemize}
  \item Ho: \(\alpha_0=0\); Chi^2(1) = 4.686 [0.0304]*
  \item Ho: \(\alpha_1=0\); Chi^2(1) = 1.7852 [0.1815]
  \item Ho: \(\alpha_2=0\); Chi^2(1) = 0.0248 [0.8747]
  \item Ho: \(\alpha_4=1\); Chi^2(1) = 0.3052 [0.5323]
  \item Ho: \(\alpha_5=0\); Chi^2(1) = 0.0574 [0.8105]
\end{itemize}

LR is the likelihood ratio statistics assuming rank = 1

System 3: A three variable system of private consumption, national disposable income and sovereign risk post Tequila

\textbf{Lconspriv, lincdisp and srteq system}

\textbf{1981(2) to 2000(4) (5 lags and d88,d892,d893,d951,d983 and constant unrestricted)}

\begin{tabular}{cccccc}
\hline
\(\lambda_i\) & Ho:r=p & Max\(\lambda_i\) & Tr \\
\hline
0.325 & p=0 & 31.07** & 21.0 & 38.83** & 29.7 \\
0.070 & p=1 & 5.802 & 4.701 & 7.755 & 15.4 \\
0.002 & p=2 & 1.953 & 1.582 & 1.953 & 3.8 \\
\hline
\end{tabular}

MAX \(\lambda_i\) is the maximum eigenvalue statistic\((-T\ln \lambda_i)\) and Tr is the Trace statistic\((-T\ln \Sigma (1-\lambda_i))\) for each statistic the second column presents the adjusted by degree of freedom and the third the 95\% (Osterwald-Lenum,1992) critical values (See Hendry and Doornik (1997)).

\[\begin{array}{ccc}
\alpha & \beta' \\
\Delta \text{lconspriv} & -0.66188 & -0.08696 \\
\Delta \text{lincdisp} & 0.07034 & -0.07279 \\
\Delta \text{srteq} & -0.53284 & 0.27706 \\
\end{array}\]

\(\alpha\) is the matrix of standardised weight coefficients and \(\beta'\) the matrix of eigenvectors (cointegration vectors and their weights in bold)

\textbf{LR test (r=1)}

\begin{itemize}
  \item Ho: \(\alpha_0=0\); Chi^2(1) = 5.1878 [0.0227]*
  \item Ho: \(\alpha_1=0\); Chi^2(1) = 0.0905 [0.7635]
  \item Ho: \(\alpha_2=0\); Chi^2(1) = 0.5631 [0.4530]
  \item Ho: \(\alpha_4=1\); Chi^2(1) = 1.2574 [0.2621]
  \item Ho: \(\alpha_5=0\); Chi^2(1) = 0.8087 [0.3685]
\end{itemize}

LR is the likelihood ratio statistics assuming rank = 1
System 4: A three variable system of private consumption, national disposable income and pre-
Convertibility inflation.

Lconspriv, lincdisp and inflpreconv system

1980(3) to 2000(4) (1 lag and d881, d892, d894, d901, d902 and constant unrestricted)

<table>
<thead>
<tr>
<th>λi</th>
<th>Ho: r=p</th>
<th>Maxλi</th>
<th>Tr</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.425</td>
<td>p==0</td>
<td>45.42**</td>
<td>56.35**</td>
</tr>
<tr>
<td>0.124</td>
<td>p&lt;=1</td>
<td>10.92</td>
<td>14.1</td>
</tr>
<tr>
<td>0.000</td>
<td>p&lt;=2</td>
<td>0.010</td>
<td>3.8</td>
</tr>
</tbody>
</table>

MAX λi is the maximum eigenvalue statistic(-Tlnλi) and Tr is the Trace statistic(-Tln Σ(1-λi) for each statistic the second column presents the adjusted by degree of freedom and the third the 95% (Osterwald-Lenum, 1992) critical values (See Hendry and Doornik (1997)).

<table>
<thead>
<tr>
<th>α</th>
<th>β'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δlconspriv -0.48277 -0.01659 -5.5295e-005 1.0000 -1.0685 -0.03503</td>
<td></td>
</tr>
<tr>
<td>Δlincdisp 0.16932 0.012452 -3.8973e-005 -6.8075 1.0000 -4.8164</td>
<td></td>
</tr>
<tr>
<td>Δinflpreconv 0.26935 -0.021983 -0.0011643 -5.5409 -11.858 1.0000</td>
<td></td>
</tr>
</tbody>
</table>

α is the matrix of standardised weight coefficients and β' the matrix of eigenvectors (cointegration vectors and their weights in bold)

LR test (r=1)

Ho: α0=0; Chi^2(1) = 6.99 [0.0082]**
Ho: α1=0; Chi^2(1) = 1.8207 [0.1772]
Ho: α2=0; Chi^2(1) = 0.3084 [0.5786]
Ho: α4=1; Chi^2(1) = 2.9191 [0.0875]
Ho: α5=0; Chi^2(1) = 1.6609 [0.1975]

LR is the likelihood ratio statistics assuming rank =1
Appendix 4: Unrestricted model

The first model is an autoregressive distributed lag model for the whole sample, with four lags for each variable and quarterly dummies that allow for homocedastic white-noise and normal residuals.

\[
\begin{align*}
L\text{conspriv} &= +0.8325 + 0.2482 L\text{conspriv}_1 + 0.11 L\text{conspriv}_2 \\
(\text{SE}) &= (0.4704) (0.08063) (0.07712) \\
&-0.06822 L\text{conspriv}_3 + 0.3958 L\text{conspriv}_4 + 1.037 L\text{incdisp} \\
(0.07135) &= (0.07769) (0.1227) \\
&-0.267 L\text{incdisp}_1 - 0.1839 L\text{incdisp}_2 - 0.000555 L\text{incdisp}_3 \\
(0.1308) &= (0.1238) (0.1311) \\
&-0.3703 L\text{incdisp}_4 - 0.04322 \text{reallexchrate} - 0.04366 \text{reallexchrate}_1 \\
(0.1149) &= (0.04532) (0.057) \\
&+0.02822 \text{reallexchrate}_2 - 0.07976 \text{reallexchrate}_3 + 0.1401 \text{reallexchrate}_4 \\
(0.08524) &= (0.08441) (0.05098) \\
&-0.00206 \text{srteq} + 0.0004975 \text{srteq}_1 + 0.003516 \text{srteq}_2 \\
(0.002306) &= (0.003011) (0.002996) \\
&-0.001708 \text{srteq}_3 + 0.002283 \text{srteq}_4 - 0.04913 \text{efdues} \\
(0.00304) &= (0.002501) \text{d881} \\
&-0.09108 \text{d881} - 0.05105 \text{d851} - 0.07743 \text{d871} \\
(0.01878) &= (0.01857) (0.01759) \\
&-0.03912 \text{d982} - 0.02435 \text{d931} + 0.01529 \text{inflpreconv} \\
(0.01618) &= (0.01762) (0.01488) \\
&+0.01588 \text{inflpreconv}_1 - 0.02206 \text{inflpreconv}_2 - 0.02002 \text{inflpreconv}_3 \\
(0.01583) &= (0.01606) (0.0143) \\
&-0.04051 \text{inflpreconv}_4 - 0.02996 \text{d921} \\
(0.01299) &= (0.01688)
\end{align*}
\]

\[R^2 = 0.995125 \quad F(31, 47) = 309.48 [0.0000] \quad \sigma = 0.0152045 \quad DW = 1.77\]

\[RSS = 0.0108652937 \text{ for 32 variables and 79 observations}\]

Coefficient tests

\[
\begin{align*}
\text{Wald test for linear restrictions: } &\beta L\text{conspriv}_1 = 0.26000 \\
\text{LinRes } F(1, 47) &= 0.021585 [0.8838] \\
\text{Wald test for linear restrictions: } &\beta L\text{conspriv}_4 = 0.20000 \\
\text{LinRes } F(1, 47) &= 6.3491 [0.0152] *
\end{align*}
\]
Appendix 5: The inflation effect

In order to prove that the absence of the inflation variable in Equation 1 is due to the statistically insignificance of it, two variables were incorporated in turn to the model: the first lag of the pre-Convertibility inflation variable (inflpreconv) and the first difference of this variable (Dinflpreconv).

\[
\begin{align*}
D_{pondcpriv} = & +0.02035 +0.8934 DLincdisp -0.09637 drealexchrate34 \\
(\text{SE}) = & (0.004147) (0.08412) (0.03849) \\
-0.005467 Dsrteq & +0.3338 efdues -0.5299 Eqconsprivincdisp_1 \\
(0.002773) & (0.07541) (0.08697) \\
+0.01094 & -0.06095 d871 -0.1175 d881 \\
\text{inflpreconv}_1 & (0.01063) (0.0206) (0.02066) \\
-0.00529 & Dsrteq +0.2786 efdues -0.5392 Eqconsprivincdisp_1 \\
(0.004141) & (0.055) (0.08735) \\
-0.06123 & d871 -0.1143 d881 -0.04652 d931 \\
\text{Dinflpreconv} & (0.002794) (0.02069) (0.02081) \\
-6.456e-005 & 6.456e-005 Dinflpreconv \\
(0.004141) & (0.0889) (0.04039) \\
-0.0529 & Dsrteq +0.2786 efdues -0.5392 Eqconsprivincdisp_1 \\
(0.002794) & (0.055) (0.08735) \\
-0.06123 & d871 -0.1143 d881 -0.04652 d931 \\
\text{Dinflpreconv} & (0.002794) (0.02069) (0.02081) \\
R^2 = & 0.836443 \quad F(9,69)=39.208 [0.0000] \quad \sigma=0.0201676 \quad DW=2.06 \\
\text{RSS} = & 0.02806444089 \text{ for 10 variables and 79 observations}
\end{align*}
\]

Recursive graphic

\[
\begin{align*}
D_{pondcpriv} = & +0.02035 +0.8934 DLincdisp -0.09637 drealexchrate34 \\
(\text{SE}) = & (0.004147) (0.08412) (0.03849) \\
-0.005467 Dsrteq & +0.3338 efdues -0.5299 Eqconsprivincdisp_1 \\
(0.002773) & (0.07541) (0.08697) \\
+0.01094 & -0.06095 d871 -0.1175 d881 \\
\text{inflpreconv}_1 & (0.01063) (0.0206) (0.02066) \\
-0.00529 & Dsrteq +0.2786 efdues -0.5392 Eqconsprivincdisp_1 \\
(0.004141) & (0.055) (0.08735) \\
-0.06123 & d871 -0.1143 d881 -0.04652 d931 \\
\text{Dinflpreconv} & (0.002794) (0.02069) (0.02081) \\
R^2 = & 0.833931 \quad F(9,69)=38.499 [0.0000] \quad \sigma=0.0201676 \quad DW=2.06 \\
\text{RSS} = & 0.02849548435 \text{ for 10 variables and 79 observations}
\end{align*}
\]
Results from the equations and the recursive graphics of the estimated coefficients for the variable pre-Convertibility inflation and its first difference show that these coefficients were not statistically different from zero for the whole sample.
Appendix 6: Incorporating liquid assets

The following results and the recursive graphic for the first lag of the variable m3* show that the same conclusion about not significance of monetary aggregates on private consumption was found.

\[
\begin{align*}
\text{Dpondcpriv} &= +0.01265 +0.8347 \text{ Dlincdisp} +0.2952 \text{ efdues} \\
& (0.01146) (0.08998) (0.06141) \\
-0.1457 \text{ drealexchrate34} -0.005256 \text{ Dsrteq} -0.5282 \text{ Eqconsprivincdisp}_1 \\
& (0.04491) (0.002742) (0.09543) \\
-0.0631 \text{ d871} -0.1123 \text{ d881} -0.0476 \text{ d931} \\
& (0.02049) (0.02028) (0.02078) \\
-0.03285 \text{ m3*_1} \\
& (0.006446)
\end{align*}
\]

\[R^2=0.84833 \quad F(9,53)=32.938[0.0000] \quad \sigma=0.0199488 \quad DW=2.26\]

RSS = 0.02109161106 for 10 variables and 63 observations

Recursive graphic
References


