CONSUMPTION, DISPOSABLE INCOME AND LIQUIDITY CONSTRAINTS*

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1. INTRODUCTION

During the last 20 years major changes have occurred in the Portuguese economy. From 1986, when Portugal joined the European Union, until the third stage of Economic and Monetary Union, with the introduction of the Single Currency, profound changes have conditioned the development of the Portuguese economy and the behaviour of economic agents. A new economic regime emerged in Portugal characterized particularly by a strengthening of macroeconomic stability, which was made possible by the effect of price stability and the reduced risk premium in euro area interest rates. The Portuguese participation in the European Union also implied profound reforms in some sectors of the economy, among them the financial sector. The reforms in this sector started in the mid-80's and culminated with complete liberalization of international capital movements in 1992. These measures implied far reaching changes in the Portuguese banking sector and this paved the way to far greater competitiveness. New financial credit instruments were created and financial intermediation spread was drastically cut. Moreover, the prospects of Portuguese participation in the euro area and the expectation of the reduction in the volatility and in the level of interest rates have also conditioned the behaviour of economic agents, specially the demand for credit. Indeed, in 2005 household indebtedness as a percentage of disposable income in Portugal was 117%, which contrasts with levels of 20% in the beginning of the 90's. The only country in the euro area to record higher levels of household indebtedness as a percentage of disposable income was Holland in 2004.

The literature available on the impact of financial liberalization on economic activity is vast, particularly regarding the impact on consumption and on the relation between consumption and disposable income. Some of the literature uses models based on Life-Cycle/Permanent Income Hypothesis and consider the possibility that some consumers are unable to smooth consumption over the life-cycle, that is, some consumers do not want to or cannot borrow in order to finance their current consumption. In practice, some obstacles may prevent consumers from accessing credit, for example, legal restrictions on bank loans, the need for guarantees or interest rates which are too high. By preventing consumers from borrowing to smooth consumption over the life-cycle, credit constraints could give rise to a high percentage of households taking their consumption decisions, at each point in time, based on their current income rather than on their expected income. This article analyses the sensitivity of consumption to disposable income in Portugal – which will be used as an indicator of liquidity constraints - and its evolution over the last years relating it with the economic conditions, among them the major changes carried out in the financial market.

The literature in Portugal on this subject is scarce. Luz (1992) presents an estimation for the percentage of consumers with liquidity constraints for the period 1959-1986, using a process of constant coefficients estimate based on the model described in Jappelli and Pagano (1989). Botas (1999) presents a consumption function with agents having liquidity constraints and estimates the evolution of the per-

centage of disposable income received by this type of consumer between 1958 and 1997, using a linear trend as a proxy for the impact of financial liberalization on liquidity constraints. This article uses more recent data with quarterly periodicity, for the period 1980-2005, and relates the evolution of liquidity constraints with variables from the financial sector and the economic cycle.

The article is organized as follows: section 2 presents a model for consumption with rational expectations and introduces the concept of liquidity constrained consumers. Section 3 presents the results for the estimation of the percentage of disposable income received by liquidity constrained consumers, considering both fixed and time-varying coefficients. Tests are also carried out on some variables that could be correlated with the evolution of liquidity constraints. Section 4 summarizes the main conclusions.

2. A CONSUMPTION MODEL WITH RATIONAL EXPECTATIONS AND LIQUIDITY CONSTRAINTS

Modelling consumption function has always been at the heart of macroeconomic analysis, not only because private consumption represents more then two thirds of Gross Domestic Product (GDP) in developed countries but also because consumption decisions are simultaneously saving decisions and consequently determine the availability of funds for capital accumulation and investment.

One of the main references in studying consumption is Hall (1978) which combines the Life Cycle/Permanent Income Hypothesis (LC-PIH)[1] with rational expectations and concludes that in certain precisely stated conditions consumption follows a random walk. In other words, the author concludes that the best way to forecast consumption in the next period is current consumption; disposable income (current and past) does not help to forecast consumption. Later studies analyse the results of Hall (1978). Flavin (1981), for example, concludes that consumption responds not only to changes in permanent income signalled by innovations in the current income process but also to changes in current income itself. To describe the response of consumption to expected changes in current income Flavin (1981) uses the term "excess sensitivity" of consumption to current income.

Several studies pointed out the existence of liquidity constraints in the economy as the main reason for the "excess sensitivity" of consumption to current income, that is, the inability of some individuals, taking into account their expected future income, to borrow whatever they need to finance their current consumption expenditures. [2] One strand within these studies attempts to establish a link between consumption path and financial market liberalization, in other words, the key idea is that financial liberalization could have a direct impact on the consumption of those individuals who had credit restrictions and can now borrow by giving their future labour income as a guarantee.[3]

This article uses the overlapping generations model presented in Blanchard (1985) and introduces the possibility that some consumers are liquidity constrained. Blanchard (1985) assumes that all consumers have the same instantaneous probability of death, which is independent of age. In spite of different ages and different levels of wealth, all consumers have the same expected lifetime and the same propensity to consume. In this manner and even with the existence of an infinite number of generations, the economy behaves if it has only one representative consumer. This makes the aggregation of all generations straightforward.

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(1) Life Cycle Hypothesis is described in Modigliani and Brumberg (1954) and the Permanent Income Theory is presented in Friedman (1957).

(2) See, for example, Hayashi (1982), Jappelli and Pagano (1989) and Campbell and Mankiw (1991).

(3) See, for example, Bayoumi and Koujianou (1989), Blundell-Wignall, Browne and Tarditi (1995), Bai and Whitley (1997), Sefton and Veld (1999) and Fernandez-Corugedo and Price (2002).

Individuals face a maximization problem under uncertainty about life span, subject to intertemporal budget constraint and a No-Ponzi-Game condition. Summing over generations the following consumption function could be derived,

$$C_t = \Pi \left[V_{t-1} + H_t \right] \tag{1}$$

where $\Pi = 1 - (1-p)\beta$ and p and β stand for the probability of death and the discount factor, respectively. V_{t-1} is non human wealth, composed of real and financial assets, and H_t represents human wealth, that is, the sum of discounted future labour income.

This consumption function assumes that all consumers have a sufficient level of wealth or/and may accede to external finance in order to smooth consumption through their lifetime, that is, it assumes the inexistence of liquidity constraints in the economy. Considering the hypothesis of some consumers to be liquidity constrained and assuming, for simplicity and according with other empirical studies[4], that these individuals in every period consume all their labour income, the consumption for the individuals with liquidity constraints is defined as,

$$C_t^R = Y_t^R = \lambda Y_t \tag{2}$$

where λ stands for the percentage of income received by consumers who are unable to do consumption smoothing.[5]

The aggregate consumption function is then,

$$C_t = \lambda Y_t + \Pi \left[V_{t-1} + H_t^{NR} \right] \tag{3}$$

where H_t^{NR} represents human wealth of forward-looking consumers.

The above model can be rewritten to obtain the following consumption function,

$$C_t = \frac{1-p}{1-\Pi+\Pi p} \left[\frac{C_{t+1}}{1+r_t} - \lambda_{t+1} \frac{Y_{t+1}}{1+r_t} \right] + \frac{\Pi p}{1-\Pi+\Pi p} V_{t-1} + \left[\frac{\Pi p (1-\lambda_t)}{1-\Pi+\Pi p} + \lambda_t \right] Y_t \tag{4}$$

3. ESTIMATION AND EMPIRICAL RESULTS

3.1. Estimation of λ parameter

The consumption function is estimated using quarterly data for the period 1980 to 2005. Data for non durables consumption and services, for household disposable income and for private consumption deflator correspond to the quarterly series published within this Economic Bulletin, which follows the methodology described in Castro and Esteves (2004). Data for wealth is composed of housing stocks and financial assets held by households and was computed using the information published in Cardoso and Cunha (2005). Finally, the interest rate on loans for 31 to 90 days is based on information from Money and Banking Statistics from the Banco de Portugal. All series were deflated using the private consumption deflator.

In estimating the consumption function, the parameters which stand for the instantaneous probability of death (p) and the discount factor (β) were calibrated at 0.00417 and 0.998, respectively, using re-

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(4) See, for example, Hayashi (1982) and Campbell and Mankiw (1991).

(5) It is assumed that constrained consumers hold no net wealth, they only have their current income. In the case of holding assets, for example housing assets, it is assumed they are exactly offset by their mortgage debts.

sults from other studies[6]. To assure that results don't change significantly with different calibrations of these parameters, a sensitivity analysis was made considering values of 0.00625, 0.005 and 0.00417 for the instantaneous probability of death and 0.998 and 0.995 for the discount rate.

The consumption function presented in the preceding section for the case of a constant λ could be re-written as,

$$\frac{C_t}{Y_t} - \frac{1-p}{1-\Pi+\Pi p} \frac{C_{t+1}}{(1+r_t)Y_t} - \frac{\Pi p}{1-\Pi+\Pi p} \frac{V_{t-1}}{Y_t} - \frac{\Pi p}{1-\Pi+\Pi p} =$$

$$= \lambda \left[1 - \frac{\Pi p}{1-\Pi+\Pi p} - \frac{1-p}{1-\Pi+\Pi p} \frac{Y_{t+1}}{(1+r_t)Y_t} \right] + \varepsilon_{t+1}$$

(5)

The above equation was estimated by using the Generalized Method of Moments (GMM) of Hansen (1982)[7], using as instruments the lags 2 to 6 from the endogenous regressor.[8]

First, the λ is estimated as a constant parameter throughout the entire horizon (Hip.1). Next the parameter λ is estimated for different sample periods (Hip. 2), using a step dummy variable (SD91) and replacing λ by $\lambda + \lambda_{SD}$ SD91, where

$$\begin{cases} SD91 = 0 \text{ for } t < 1991 \\ SD91 = 1 \text{ for } t \geq 1991 \end{cases}$$

In this way, it is intended to check for the existence of evidence of a structural break in parameter λ during the period under consideration.[9] The estimation through the use of a step dummy variable assumes that the transition between the periods is made at one time and not gradually. Despite this limitation, this type of analysis allows for a first indication of whether there exists a break in the parameter to be estimated.

Table 1 presents the results. For the whole sample and for p and β equal to 0.00417 and 0.998, respectively, a value of 66% for the percentage of disposable income received by liquidity constrained consumers is obtained. This result compares with 63% presented in Botas (1999) for the period 1958-1997 and 62% and 64% presented in Luz (1992) for the sample 1959-1986.[10]

In the estimation with the step dummy the values obtained were 69% for the period 1981-1990 and 55% for 1991-2005. This points to a reduction in the percentage of disposable income received by liquidity constrained consumers from the 80's to 90's.

For a better evaluation of liquidity constraints as they evolve through time, the λ is estimated using a Kalman filter (see graph 1). The λ parameter is considered to follow a random-walk process, as in Bacchetta and Gerlach (1997) and in Takala (2001),

$$\lambda_t = \lambda_{t-1} + \zeta_t$$

(6)

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(6) See Athanasoulis (2001), Annicchiarico (2003) and Sefton and Veld (1999).

(7) Following the methodology presented in Sefton and Veld (1999), the covariance matrix was estimated using the Bartlett kernel with 6 lags [see Newey and West (1987)] and White robust standard errors were computed [See White (1980)].

(8) It should be noticed that given the above mentioned calibration, the only parameter to estimate is λ_t.

(9) This methodology was used, for example, in Bayoumi and Koujianou (1989).

(10) Besides the sample period it is worth mentioning some other differences among these studies. Botas (1999) starts with a similar model, but considers $C_t = \lambda Y_t + \left[(1+r_t) V_{t-1} + (1-\lambda) H_t \right]$ and the consumption variable used is total consumption and not non-durables consumption and services. Luz (1992) uses the model described in Jappelli and Pagano (1989), that is, a Euler equation given by $C_t = a_0 + a_1 C_{t-1} + \lambda \left(Y_t^a - a_1 Y_t^a \right) + e_t$ to estimate the percentage of disposable income received by consumers with liquidity constraints.

Table 1

ESTIMATION OF λ WITH CONSTANT COEFFICIENTS							
		Hip.1				Hip.2	
		λ				λ	λ$_{SD}$
	β = 0.998			β = 0.995		β = 0.998	
	p = 0.00417	*p* = 0.005	*p* = 0.00625	*p* = 0.00417	*p* = 0.005	*p* = 0.00625	*p* = 0.00417
Coefficients	0.663	0.669	0.677	0.700	0.706	0.716	0.692	-0.145
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.048)
R^2	0.529	0.519	0.504	0.486	0.475	0.454	0.530	
Tests of the instruments								
R^2	0.573						0.588	0.488
Hansen's test	3.787	3.632	3.666	3.796	3.826	3.876	5.955	
p-value	(0.436)	(0.458)	(0.453)	(0.434)	(0.430)	(0.423)	(0.652)	

where the disturbance error term $\zeta_t \sim N\left(0, \sigma_\zeta^2\right)$ is assumed to follow a white-noise process with $\sigma_\zeta^2 = 0.0025$.[11]

In λ_t estimation the fitted values were used for the non-predetermined regressor in a way analogous to the two-step instrumental variables estimation procedure. In the first step, the non-predetermined variable is regressed on the instruments and in the second step the Kalman filter is used to estimate the parameter λ_t.

According to the results the percentage of disposable income available to consumers with liquidity constraints was about 70% at the end of the 80's. At the beginning of 90's liquidity constraints started to ease. By the second half of the decade they had reached values near 40%. This result is consistent with the idea that financial market liberalization, in parallel with the fall in nominal interest rates, reduced credit restrictions, allowing some individuals who had liquidity constraints before to increase their consumption through loans from the credit market.

The results also suggest that liquidity constraints increased at the end of 90's, turning to a relatively smooth path from 2001 onwards. Thus, the increase in the percentage of households whose consumption decisions depend on current income could be associated to the strong rise in this sector's indebtedness during the 90's, which led to a sharp increase in household debt servicing. Moreover, the rise in nominal interest rates from mid-1999 until the end of 2000 (about 2 p.p.) also contributed to the increase in household debt servicing as a percentage of their disposable income.

As mentioned before, the results presented in Chart 1 pointed to a relative stabilization of liquidity constraints at the end of the sample period and to a small increase in the uncertainty related to the λ estimation, reflected in the widening of the fluctuation bands defined through the standard deviation of the estimation. To explain this result, it is important to bear in mind some forces that might have acted in opposite directions, contributing to the apparent stabilization of this parameter. On the one hand, the increase in debt servicing was contained in the last years, after a period of strong increase. The low level of nominal interest rates (during this period nominal interest rates were cut by 2 p.p., reversing the rise observed during 1999 and 2000) and some measures carried out by financial institutions, for example, the lengthening of bank loan terms and the introduction of new products in the credit market, had contributed to interrupt the increasing trend in liquidity constraints. These changes allowed house-

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(11) With the purpose of studying the sensitivity of the final results to changes in σ_ζ^2, other values were tested for this parameter. It was concluded that the λ profile does not change significantly with different values of σ_ζ^2.

Chart 1

λ ESTIMATION WITH TIME-VARYING COEFFICIENTS
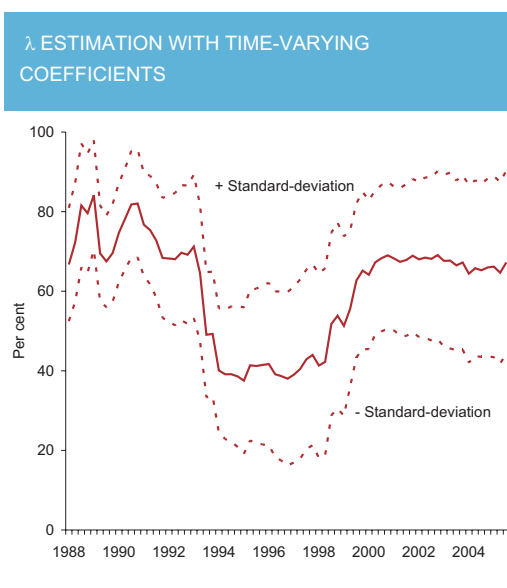
holds to continue to obtain bank loans, although at a more moderate pace vis-à-vis the recent past, and to pay lower instalments. On the other hand, the high level of the unemployment rate and the low growth of the Portuguese economy observed in the last years must have contributed to the deterioration in consumer expectations, pulling in the opposite direction by increasing credit restrictions from the demand side and not allowing, for a given proportion of consumers, a smoother path for consumption in relation to changes in disposable income.

The high level of indebtedness in Portuguese households, allied to the possibility of another increase in interest rates could give rise to an increase in liquidity constraints in the next few years. It is worth mentioning that the impact of an interest rate increase is likely to be relatively heterogeneous, mainly affecting those households with high levels of indebtedness and those with lower income and with a higher probability of suffering from the effects of unemployment.

In this context, it is important to mention the study of Benito and Mumtaz (2005) which uses microeconomic data for the United Kingdom and concludes that beyond a certain point, further increases in debt are associated with a rising probability of facing liquidity constraints. This result is likely to reflect a high probability of credit constraints, including a self-imposed credit constraint associated with a reluctance to increase the level of indebtedness. According to the authors, this result suggests that there are limits, both on the demand and the supply side of the credit market, for the role of debt in consumption smoothing.

Lastly, the results can be compared with others presented in the literature for different countries. A majority of studies have concluded that the reduction in liquidity constraints took place during the 80's, which is in accordance with the fact that the liberalization of financial market in Portugal took place a decade later than in most other countries that the studies refer to. For example, Blundell-Wignall et all. (1995) concludes that econometric results for the United States, Canada and Japan clearly pointed to a reduction in liquidity constraints in 80's and 90's compared to the 60's and 70's. Bayoumi and Koujianou (1989) reached a similar conclusion for the United States, Canada, Japan and France using information for the 70's and 80's.

3.2. Liquidity constraints and economic conditions

In this section the aim is to test empirically whether the evolution of liquidity constraints could be partly explained by the major changes that have occurred in Portugal during the 80's and 90's, specially the financial market liberalization and the decrease in interest rates. The aim is also to test whether liquidity constraints could be related to the economic cycle and to the unemployment rate. The consumption function (4) could be rewritten in the form,[12]

$$\frac{C_t}{Y_t} - \frac{1-p}{1-\Pi+\Pi p} \frac{C_{t+1}}{(1+r_t)Y_t} - \frac{\Pi p}{1-\Pi+\Pi p} \frac{V_{t-1}}{Y_t} - \frac{\Pi p}{1-\Pi+\Pi p} =$$

$$= \lambda_t \left[1 - \frac{\Pi p}{1-\Pi+\Pi p} \right] - \lambda_{t+1} \left[\frac{1-p}{1-\Pi+\Pi p} \frac{Y_{t+1}}{(1+r_t)Y_t} \right] \varepsilon_{t+1}$$

(7)

with

$$\lambda_t = \alpha_0 + \alpha_1 X_t$$

(8)

where X_t stands for the different proxies considered in the explanation of liquidity constraint evolution.

In the existing literature there are some studies for the United Kingdom, for example, Darby and Ireland (1994), Bai and Whitley (1997) and Fernandez-Corugedo and Price (2002) where an equation of the form $\lambda_t = \exp^{(\alpha_0 + \alpha_1 FLIB_t)}$ is used for the evolution of liquidity constraints, where FLIB represents an exogenous proxy for financial market liberalization. In the case of Portugal it was not possible to develop a similar proxy due to the inexistence of information essential to construct time-series data. It was decided to test the ratio of assets owned by Monetary and Financial Institutions (MFI) to GDP as a measure of the degree of financial market liberalization. Also tested was the nominal interest rate as an indicator of consumer accessibility to the credit market liberalization. Lastly, the unemployment rate was tested to explain the evolution of liquidity constraints. Table 2 synthesises the indicators tested and the expected effects on liquidity constraints.

Equations (7) and (8) were estimated jointly using the Generalized Method of Moments, considering as instruments the lags 2 to 6 of the endogenous regressor. The results are presented in Table 3. For the sake of simplicity, Table 3 only presents the results for the estimation of the evolution of liquidity constraints considering the three variables jointly. The estimation of α_1 allows us to conclude that the variables considered in the explanation of the evolution of the liquidity constraints are statistically significant at a 5% level and the signs obtained are as expected. Actually the results point to a reduction of liquidity constraints with the degree of financial market liberalization and with the reduction in the level of nominal interest rates. The results also indicate a negative correlation between the evolution of li-

Table 2

PROXIES FOR LIQUIDITY CONSTRAINTS	
X_t	Expected effect in liquidity constraints
Nominal interest rates	positive
MFI assets / GDP	negative
Unemployment rate	positive

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(12) To simplify it was considered a linear relation between liquidity constraints and economic conditions.

Table 3

ESTIMATION OF λ WITH $\lambda_t = \alpha_0 + \alpha_1 X_t$						
			α_1			
	α_0	Interest rates	MFI assets / GDP	Unemployment rate	R^2	Hansen's test
Coefficients	0.720	0.331	-0.059	0.676	0.551	8.181
p-value	(0.000)	(0.027)	(0.031)	(0.005)		(0.943)

quidity constraints and economic activity, that is, liquidity constraints increase with a high unemployment rate.

There are some studies that relate liquidity constraint evolution with financial market liberalization. For example, Sefton and Veld (1999) use a time trend to measure the degree of financial liberalization and conclude that in the United States, Canada, the United Kingdom and Germany consumers with liquidity constraints decreased after financial market liberalization. Darby and Ireland (1994) estimate the λ parameter for the United Kingdom, using the FLIB indicator mentioned before, and conclude that labour income received by consumers with liquidity constraints have decreased to half the value after financial market liberalization. Bai and Whithey (1997) estimate also the evolution of the λ parameter for the United Kingdom, using a time trend as a proxy for financial market liberalization, and show that there is a big fall in the percentage of consumers with liquidity constraints from 1980 to 1991.

4.   CONCLUSION

This article studies the sensitivity of consumption to disposable income in Portugal using macroeconomic data for the period 1980-2005. The excess sensitivity of consumption to disposable income is interpreted as the existence of liquidity constrained consumers, that is, consumers without wealth and/or those who cannot or may not want to make use of credit market to smooth consumption throughout the life cycle, according to expected future income.

The results suggest that for the whole sample period, 66% of disposable income is received by liquidity constrained consumers. When the 80's are considered separate from the period 1991-2005, the findings indicate that the percentage of disposable income received by these consumers decreases almost 15 p.p..

A more detailed time evolution for the coefficient that measures the liquidity constraints in the economy suggests that this parameter decreases during the 90's, from levels near 70% at 80's to almost 40% in the second half of the 90's. This result is consistent with the idea that the reduction in liquidity constraints occurred after financial liberalization and in line with the decrease in interest rates. The results also point to an increase in liquidity constraints at the end of 90's. This could be related with the big increase in household indebtedness as a percentage of disposable income, which led to a big rise in households' debt service. From 2001 onwards a relative stabilization of liquidity constraints is observed and this could be related with a set of forces that probably acted in opposite directions. On the one hand, debt servicing was held in check by the decrease in nominal interest rates and by some measures carried out by financial institutions, for example, the lengthening of bank loans terms and the introduction of new products in the credit market. On the other hand, the deterioration in consumers' expectations related to the high level of unemployment and to the low growth of the Portuguese economy, probably contributed to increase credit restrictions from the demand side, not allowing, for a

given proportion of consumers, a smoother path of consumption in relation to changes in disposable income.

Lastly, the results presented in this study suggest a correlation between the evolution of liquidity constraints and variables related with financial liberalization and with the economic cycle, as well as the nominal interest rate. Considering a linear relation between liquidity constraints and financial liberalization, measured by the ratio of assets owned by Monetary and Financial Institutions (MFI) to GDP, the parameters obtained in the estimation are statistically significant and allow us to conclude that the higher the degree of financial liberalization the smaller is the percentage of disposable income received by liquidity constrained consumers. On the other hand, when a linear relation is considered between liquidity constraints and the level of nominal interest rates or the unemployment rate, the results indicate that these variables are also statistically significant and have positive signs, that is, it could be concluded that the higher the level of interest rates or the unemployment rate, the higher the percentage of disposable income received by liquidity constrained consumers.

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