RESIDENTIAL AND STOCK MARKET EFFECTS ON CONSUMPTION ACROSS EUROPE

ABSTRACT

The aim of this paper is to explain private consumption as a function of income and wealth with data from European Union countries. To examine how the developments in housing and stock markets may have affected consumption behaviour, we adopt two econometric procedures. First, we use the Stock-Watson procedure to account for wealth effects on consumption over the long run. Second, through an error-correction model we measure wealth effects on consumption over the short run. We found significant albeit mixed values for the long run elasticities of consumption with respect to real residential and equity prices. We also found strong evidence that consumption exhibits error-correction behaviour in the short run, with the value of the error-correction term signifying that household consumption takes several quarters to completely respond to changes in the markets.

JEL CLASSIFICATIONS

E21, E44, E58.

KEYWORDS

Housing Prices, Asset Prices, Wealth Effects, Consumption, European Union, Dynamic Ordinary Least Squares, Error-Correction Models.

This version: July 2005
(24 pages)

1. Introduction

The aim of this paper is to empirically test a model explaining private consumption as a function of income and wealth (proxied by financial assets and real estate prices), with data from European Union (EU) countries.

We know that income explains a large part of consumption as well as wealth, but concerning the effects of the latter, mainly those of changes on financial asset prices, few is known for Europe.

In the late 90's the interest of studying the effect of stock prices fluctuations on consumption arose mainly as a consequence of a large involvement of families in stock markets, placing their savings in equities that depreciated strongly after the collapse of the so called "new economy" boom. A fear that this collapse might imply a high decrease of private consumption, as well as a reduction of investment and income, has thrown the attention of economists towards the analysis of these wealth effects, mainly in the United States (US)[1].

Additionally, housing wealth, which belongs to non-financial wealth, is considered an important component of household wealth. We think that real estate prices may also influence private consumption and this may occur more when interest rates are low (through the refinancing of loans due to lower mortgage rates) and as the financial system deregulates and increases its transparency. Nevertheless, albeit the economic links between house prices and economic activity are complex, it seems reasonable to consider disaggregate wealth when empirically studying wealth effects on consumption. Muellbauer and Lattimore (1995) argue that house prices have a dual effect: a positive wealth effect – which depends on the degree of liquidity of housing – and a negative real price effect. These effects may be different for different countries, since the importance of housing wealth in the consumption function is possibly a joint function of the degrees of home ownership and financial system development. A difference between housing wealth and equity wealth is that housing acts not only as a store of wealth but also provides a service. Housing services are included as part of consumption, so as house price increases so will nominal consumption, but real consumption may not necessarily adjust. That is, an increase in house prices may or may not make the household sector better off because the positive effect for homeowners could be offset by the negative impact on renters[2].

Aiming to expand the existent literature, our analysis takes data from nine European states, that we consider a meaningful sample: four core economies of the continental EU (Belgium, France, Germany and The Netherlands); four more peripheral economies (Denmark, Finland, Italy and Portugal) and an economy of the EU country that seems to approach more the North American patterns (United Kingdom). Tables 1 and 2 in the Appendix present some raw data concerning stock and housing markets for the considered countries. We expect results that will suggest the better path to follow with further research.

In the following section we discuss the theoretical background pertinent to our research. The subsequent sections present the methodology, the data and the econometric results. The last section concludes.

2. Theoretical background and some earlier evidence

The effect of wealth on private consumption has traditionally been analysed in the framework of the permanent income hypothesis or the life-cycle model (Friedman, 1957; Ando and Modigliani, 1963 and Modigliani, 1971)[3]. Here we depart from the "life cycle theory" of Modigliani (as a benchmark model that explains consumption as a variable depending on wealth, beyond income). In that framework, household planned consumption in each period t (C_t*) is a multiple of the total amount of resources, which are net financial wealth at the beginning of the period (W_{t-1}) and human wealth (H_t), measured as current labour income plus the expected value of income to be earned in the future. Therefore, planned consumption (the consumption decision rule) can be expressed as:

$$C_t^* = \beta \cdot (W_{t-1} ; H_t) \qquad (1)$$

where the factor of proportionality, β, known as the propensity to consume, is set to keep consumption levels steady, in the face of uneven income or wealth streams, over the person's lifetime[4]. Since human wealth is not observable, some measure of income is taken instead as a proxy. So, traditionally the wealth effect has been measured by estimating aggregate time-series regressions of the form (Modigliani and Tarantelli, 1975 and Steindel, 1977):

$$C_t = \alpha + \beta_1 \cdot W_t + \beta_2 \cdot Y_t + u_t \qquad (2)$$

where C stands for household actual consumer spending, Y represents disposable income, W is household net worth or wealth and u is an error term that captures other factors that might influence consumption. β_1 and β_2 are, respectively, the marginal propensities to consume out of wealth and disposable income. A widespread empirical practice is to introduce lags and separate wealth into different categories, as stock market wealth or housing and property wealth.

Modigliani (1971) advocated the significance of wealth effects on consumption, and earlier empirical results established a *rule-of-thumb* that each increase of one dollar in wealth translated to a five cents increase in consumption (Modigliani, 1971 and Bhatia, 1972). Yet, as pointed by Boone *et al.* (1998, p. 6), subsequent evidence presented some criticisms to the "life cycle theory". That is, the simple theoretical formulation from Modigliani ignored several problems that could be crucial to explain the relationship between consumption and wealth. It is argued that this model takes no account of uncertainty in the future stream of revenues, as well as that the strength of any wealth

effect should also be linked to the distribution of wealth and the existence of liquidity constraints. Hence, modified models that took into account these variables were presented[5].

Beyond the theoretical criticisms, there are also the econometric pitfalls associated to the value of estimations from equations such as (2). The conventional analysis presented above does not take into account the possibility that the variables are non-stationary or that there is reverse causality between, for instance, wealth and consumption[6]. Failure to address these problems could lead to inconsistent estimates of the wealth effect on consumption. This problem will be overcome through convenient adaptations of the model, as it will be explained below.

In the last few years, motivated by the rampant growth in equity markets and the potential consequences of the subsequent severe downturn, several authors studied the relation between wealth and consumption embodying more cautious econometric methods. The effects of stock market wealth on consumption have always been a source of controversy. One reason is that the skewed concentration of stock holdings may imply that swings in stock market wealth have little effect on aggregate consumer spending. So, the evidence remains mixed, varying greatly with the considered countries, the data ranges, the wealth definitions, the employed measures of income, the econometric procedures, etc..

Albeit the mixed results presented by the literature undermine the definition of robust conclusions, we summarise now empirical results that different authors found for wealth effects on consumption, associated to the financial and housing markets and for the countries considered in this paper. Boone et al. (1998) found less significant results for France, Germany and Italy than those found for the UK or the US. For France, Grunspan and Sicsic (1997) provide no strong evidence of any wealth effect, although Carruth *et al.* (1999) find evidence using a proxy for inflation. Byrne and Davis (2001) consider that the aggregation of wealth in a typical consumption function is inappropriate, finding evidence that illiquid wealth dominates the effect of conventional liquid assets. They present evidence that in France and Germany the former effect is stronger and that in Italy both are insignificant. Bertaut (2002) examining a set of European countries finds weak results for Italy and a significant response of consumption to stock price changes in the Netherlands, only surpassed by the UK results. Case *et al.* (2005) provide a weak wealth effect associated to the stock market but show evidence that in a set of European countries house price changes have a significant impact on consumption. Muellbauer and Murphy (1994), using UK regional consumption data, find a negative effect from house prices and Kennedy and Anderson (1994) find evidence of mixed effects from house price increases in consumption, for a set of OECD countries. Girouard and Blondal (2001) examine the impact of housing wealth on household consumption for France, Italy and the United Kingdom. Their results show that housing wealth exerts a positive influence on household consumption in France and in the United Kingdom in the short and long run, and Italy presents a negative relationship between those variables. Henley and Morley (2001) use the approach developed by Attfield *et al.* (1992) based on a model of consumptiom growth, in which

consumption is modelled as adjusting partially each period to changes in permanent income, in order to test the impact of housing wealth on consumption. Considering seven countries (Finland, Germany, Ireland, Italy, The Netherlands, Sweden and the United Kingdom), Henley and Morley (2001) suggest a significant degree of diversity in consumption functions and impacts from housing wealth. Ludwig and Sloek (2004) evidence a significant long run impact from stock market and housing market wealth to consumption, particularly in a set of countries with market-based financial systems. Additionally, Aoki *et al.* (2002) look at the relationship between housing prices and economic activity in the UK, and in particular the role of house prices in the transmission of monetary policy. The idea is that house prices matter because houses can be used as a loan collateral against which households borrow to finance housing investment or consumption.

In summary, according to the literature, wealth effects are less significant in continental Europe, compared with the US or the United Kingdom. The reasons that explain that are the more advanced financial deregulation degree in those last two countries, with higher numbers for household stock ownership and stock market capitalisation. Nevertheless, at least theoretically, the continuous process of financial deregulation in Europe - motivated in large part by the single currency and the creation of pan-European financial markets – would facilitate the flow of the "wealth effects", albeit worsening the capability to measure them at the country level.

3. Model, data and methodology

3.1. The model and the data

As stated in the introduction, our aim is to study the wealth effects on consumption for some European countries. The process of rapid ascension of asset prices that lasted from 1995 to 2000 and the recent severe downturn in the markets motivates our concern with the consumption behaviour. Additionally, with the exception of UK, the available empirical work for some of these countries is practically inexistent. In the specific case of Portugal, we have no knowledge of such an empirical exercise relating stock market and real estate wealth to consumer spending.

We face a serious lack of data and the short range of the series for some of the smaller European countries poses serious problems to the estimation of wealth effects on consumption. Moreover, there is the problem of obtaining data on household wealth for those countries, since reliable time series for household financial wealth are more readily available for the US. Since we focus our study on some EU countries, the lack of data forces us to use proxies to wealth variables, in order to capture the likely effects of wealth on consumption. Some authors also followed this solution (e.g., Ludwig and Sloek, 2005).

For the reasons presented in the last section, to study the impact of asset prices on consumption we adapt the general specification adopted by Boone *et al.* (1998), Ludvigson and Steindel (1999),

Pichette (2000), Byrne and Davis (2001), Case *et al.* (2005), Davis and Palumbo (2001) and Mehra (2001), among others. So, we shall begin by studying the following equation for consumption:

$$lfcep = \alpha + \beta_0 \cdot lndip + \beta_1 \cdot leqp + \beta_2 \cdot lrep + \beta_3 \cdot (other\ variables) + u_t \quad (3)$$

where *lfcep* is household consumption expenditure per capita, *lndip* the disposable income per capita, *leqp* the equity prices index and *lrep* the residential prices index, as proxies for household financial and housing wealth. All these variables are in logarithms and measured in real terms. The coefficient α is a constant term, β_0, β_1 and β_2 are, respectively, the elasticities of per capita consumption with relation to per capita disposable income, equity and residential prices indices[7]. By "other variables", we mean three additional variables:

- The unemployment rate (*ur*), as a proxy to precautionary behaviour of households motivated by uncertainty in the future stream of revenues (a problem evidenced by Deaton, 1991 and Carrol, 1992);
- The short term interest rate (*str*), as a proxy to substitution effects on consumption;
- The inflation rate (*inf*), as a proxy for uncertainty as well as the real depreciation of non-indexed financial assets.

So, we estimate for the considered countries a set of consumption equations that include different variables related to asset prices. That is, in a rather *ad-hoc* procedure, we use a real equity prices index as a proxy for financial household wealth. A real residential prices index is used as a proxy for the housing prices wealth effect (this one only for Belgium, Denmark, Finland, the Netherlands, Portugal and UK)[8]. The selected time period differs between countries. Since to estimate a long run relationship it is desirable to select the longest time series available, we try to cover two decades with quarterly data, encompassing several economic cycles[9].

3.2. Methodology and some econometric preliminaries

If the variables in equation (3) are not stationary, we cannot estimate it using ordinary least squares because the estimated coefficients would be inconsistent (Engle and Granger, 1987). Many economic time series are not stationary, that is, they might trend upward over time or their variance increases successively. However, very often, their first differences are stationary. Such time series are said to have a unit root or be integrated of order one, which is commonly denoted by I(1), being their first differences stationary I(0) processes.

So, we begin by testing the presence of unit roots in the employed variables (in logs). With that purpose we use the standard Augmented Dickey-Fuller (ADF) procedure (Dickey and Fuller, 1979). According to McKinnon's critical values (McKinnon, 1991), almost all variables are I(1) with the great majority of test statistics falling within the 95 percent confidence region, being therefore

consistent with the hypothesis of a unit root in those series[10]. Next, we test whether it exists a cointegrating equilibrium relationship between consumption, income and the asset price indices. Table 5 in the Appendix looks at evidence on whether or not those four variables (in logs) are cointegrated. Using testing procedures suggested by Johansen (1988 and 1991) that allow the researcher to estimate the number of cointegrating relationships, our results suggest that in most cases there's only one cointegrating vector between those variables. Notice that, Johansen tests rely on asymptotics which, given the short sample period, implies that the test results should not be over-interpreted. Additionally, cointegration should not merely be understood as a pure statistical tool for finding relationships between any given time series but as a statistical means for quantifying interdependencies between economic variables. In this context, cointegration is used to find an explicit causal long run relation between time series that can be explained by theory. In fact, economic theory often suggests that certain time series will not develop too far away from each other. For instance, disposable income and consumption are apparently linked together and it is obvious that by some economic relationship both variables will be trending together. This simple example shows that prior to estimating cointegrating relationships, economic theory should confirm that the involved variables do have a fundamental long run relation at all.

How can such cointegrating relationships between variables be uncovered empirically? Since all the above variables (with the mentioned exceptions) are integrated of order 1, we should avoid using a static regression approach as (3) and use instead a dynamic approach. Most of the studies described above have estimated macroeconomic functions based on the approach by Davidson *et al.* (1978) and Hendry and von Ungern-Sternberg (1981). This approach is based on the life cycle hypothesis developed by Modigliani, whereby consumption depends on household's lifetime income and wealth, so that in the long run, trends in consumption are closely related to trends in income and wealth. In the short run household consumption can deviate from this long run equilibrium, but will tend gradually to revert to equilibrium over time. In modelling, this latter process is termed the "error correction mechanism". The short run dynamic terms that can lead to deviations from the trends can include lagged values of income and wealth, along with other factors such as interest rates, unemployment and inflation. So, we will develop equation (3) adopting a two-step econometric procedure: First, we will use a cointegration estimator to estimate the reduced form relationship between consumption, disposable income and asset prices. Specifically, we adopt the Dynamic Ordinary Least Squares (DOLS) estimator (Stock and Watson, 1993). This estimator is asymptotically equivalent to Johansen's (1988) maximum likelihood estimator in the case that variables are I(1) and there is a single cointegrating vector. Moreover, it has been shown to perform well in finite samples in relation to other asymptotically efficient estimators (Stock and Watson, 1993). DOLS presents also several advantages over the Engle-Granger (1987) estimator. For instance, while the Engle-Granger estimator suffers from a non-standard asymptotic distribution (Park and Phillips, 1985), the former allows valid and efficient inferences on the parameters of the

cointegrating vector. Second, through an error-correction model (ECM), we will measure wealth effects on consumption over the short run. That is, the cointegrating technique is not only useful as a mean to find empirical evidence about long-run relationships between economic time series. Cointegrating relations can be embedded in an ECM that tries to explain short run movements of time series. Granger (1983) and Engle and Granger (1987) prove that every cointegration model can be transformed into an ECM and vice-versa. That is, albeit it would be tempting to purge non-stationarity by differencing and estimate using only differenced variables, that would imply that valuable information from economic theory concerning the long run equilibrium relationship (cointegrating) of the data would be lost. So, the model will feature a common error-correction formulation with the long run relationship nested in a short run equation.

4. Econometric results

4.1. Wealth effects over the long run: Stock-Watson procedure (DOLS)

We will depart from equation (3) using the dynamic Stock-Watson procedure to account for wealth effects on consumption over the long run. So, we begin by estimating the following regression equations for the considered countries:

Belgium (4A):

$$lfcep_t = \beta_0 \cdot lndip_t + \beta_1 \cdot leqp_t + \beta_2 \cdot lrep_t + \sum_{i=-2}^{2} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-2}^{2} \delta_{1,i} \cdot dleqp_{t+i} + \sum_{i=-2}^{2} \delta_{2,i} \cdot dlrep_{t+i}$$

Denmark, Finland and the Netherlands (4B):

$$lfcep_t = \beta_0 \cdot lndip_t + \beta_1 \cdot leqp_t + \beta_2 \cdot lrep_t + \sum_{i=-4}^{4} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-4}^{4} \delta_{1,i} \cdot dleqp_{t+i} + \sum_{i=-4}^{4} \delta_{2,i} \cdot dlrep_{t+i}$$

France (4C):

$$lfcep_t = c + \beta_0 \cdot lndip_t + \beta_1 \cdot leqp_t + \sum_{i=-4}^{4} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-4}^{4} \delta_{1,i} \cdot dleqp_{t+i}$$

Germany (4D):

$$lfcep_t = \beta_0 \cdot lndip_t + \beta_1 \cdot leqp_t + \sum_{i=-4}^{4} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-4}^{4} \delta_{1,i} \cdot dleqp_{t+i}$$

Italy (4E):

$$lfcep_t = \beta_0 \cdot lndip_t + \beta_1 \cdot leqp_t + \sum_{i=-2}^{2} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-2}^{2} \delta_{1,i} \cdot dleqp_{t+i}$$

Portugal (4F):

$$lfcep_t = c + \beta_0 \cdot lndip_t + \beta_1 \cdot lsp_t + \beta_2 \cdot lim_t + \sum_{i=-1}^{1} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-1}^{1} \delta_{1,i} \cdot dlsp_{t+i} + \sum_{i=-1}^{1} \delta_{2,i} \cdot dlim_{t+i}$$

United Kingdom (4G):

$$lfcep_t = c + \beta_0 \cdot lndip_t + \beta_1 \cdot leqp_t + \beta_2 \cdot lrep_t + \sum_{i=-4}^{4} \delta_{0,i} \cdot dlndip_{t+i} + \sum_{i=-4}^{4} \delta_{1,i} \cdot dleqp_{t+i} + \sum_{i=-4}^{4} \delta_{2,i} \cdot dlrep_{t+i}$$

All variables are in natural logs, so the parameters yield measures of long run elasticities of consumption with respect to the given variables. Variables that are cointegrated produce consistent parameter estimates, and, in fact, the parameters are "super-consistent", converging at a faster rate than normal. The problem, however, with previous methods is the possibility of biased and inefficient estimates due to non-normal residuals and endogenous regressors. DOLS attempts to control for those deficiencies by adding leads and lags of the first difference of each regressor and then applies ordinary least squares to the augmented regression. These leads and lags are introduced to remove bias caused by endogeneity and to correct for serial correlation (Patterson, 2000) and to ensure normally distributed residuals. The number of leads and lags considered for each country is dependent on those properties. The estimation results of equations (4) are presented in Table 3 in the Appendix.

[insert Table 3 here]

The results imply reasonable long run coefficients for the majority of the countries. Equity prices exert a significant influence on consumption in all countries except Germany and Italy. The positive elasticity values range from 1,6 per cent in Belgium to seven and nineteen per cent in the Netherlands and UK respectively. This is in accordance with their stronger stock ownership numbers and financial market development, since those two economies can be defined has having a market-based financial system[11]. The findings for Germany and Italy are not surprising given the relatively limited importance of equities in household wealth in those countries. We highlight also the fact that the result for Portugal, with 2 per cent, is hardly significant. Nevertheless, our sample is rather small and in that country equity financing has become more common and stock ownership increased among households, there through contributing to stronger wealth effects[12].

In relation to residential prices the results are even more significant for all the considered countries, with the long run consumption elasticity to the residential prices between six and twenty one per cent. Comparing with equity prices, only the Netherlands and the UK present a slightly lower coefficient. In terms of residential prices we highlight the significant result for Portugal, with a value of fourteen per cent.

Finally, splitting the sample in two periods and with the exception of France, we didn't find evidence of a stronger stock market effect on consumption on the second one (beginning in 1993:1). In the UK the stock market effect is even stronger in the first period[13]. We also do not present that results, but if for the different countries we omit the residential price effect, the stock market fluctuations become a greater determinant of consumption, with highly significant coefficients. Overall, these scarce results don't seem to support the idea that financial liberalisation and broadening of stock ownership has increased the potential impact of stock market fluctuations on consumption in the last decade[14].

The relatively small errors obtained with this specification suggest that empirical life cycle models like (4) estimate with a great degree of accuracy the long run effects of disposable income and asset prices on consumption. Additionally, as we can see in Figure 1 in the Appendix, the estimation errors tend to be quickly reversed in the different countries. A behaviour of this kind led Davidson *et al.* (1978) to ask whether consumption moves in the current period to offset (or correct) a previous error. If consumption exhibits this tendency, the short run wealth effects can be different from those estimated above (Tinsley, 1993). So, we need to find evidence that consumption exhibits error-correction behaviour in the short run to assert that changes in income or asset prices eventually generate changes in consumption in the long run.

4.2. Wealth effects over the short run: Error-Correction Model specification (ECM)

The wealth effect estimates presented in Table 3 represent long run effects. If consumption expenditures do not fully react immediately to changes in asset prices then wealth effects in the first periods will be of lower magnitude than long run effects. Nevertheless, the error-correction process eventually will bring actual spending into line with the long run prediction of the life cycle model[15]. So, let us use now an additional approach to model the quarter-to-quarter dynamics of consumption, obtaining the short run wealth effects. With a dynamic error-correction approach we will embed the corresponding vector of cointegrated variables in an Error-Correction Model (ECM) to capture the dynamics of the relationship. Thus, the estimated equations depart from the following:

Belgium, Denmark, Finland, the Netherlands and United Kingdom (5A):

$$dlfcep_t = c + \tau \cdot CI(-1) + \beta_{1,i} \cdot dlfcep_{t-i} + \beta_{2,i} \cdot dlndip_{t-i} + \beta_{3,i} \cdot str_{t-i} + \beta_{4,i} \cdot dur_{t-i} + \beta_{5,i} \cdot dinf_{t-i} + \beta_{6,i} \cdot dleqp_{t-i} + + \beta_{7,i} \cdot dlrep_{t-i}$$

France, Germany and Italy (5B):

$$dlfcep_t = c + \tau \cdot CI(-1) + \beta_{1,i} \cdot dlfcep_{t-i} + \beta_{2,i} \cdot dlndip_{t-i} + \beta_{3,i} \cdot str_{t-i} + \beta_{4,i} \cdot dur_{t-i} + \beta_{5,i} \cdot dinf_{t-i} + \beta_{6,i} \cdot dleqp_{t-i}$$

Portugal (5C):

$$dlfcep_t = c+ \tau \cdot CI(-1) + \beta_{1,i} \cdot dlfcep_{t-i} + \beta_{2,i} \cdot dlndip_{t-i} + \beta_{3,i} \cdot str_{t-i} + \beta_{4,i} \cdot dur_{t-i} + \beta_{5,i} \cdot dinf_{t-i} + \beta_{6,i} \cdot dlsp_{t-i} + + \beta_{7,i} \cdot dlim_{t-i}$$

In that specification d represents the first-order difference operator and several lags are tested. CI is the cointegrating vector, with CI(-1) the corresponding error-correction term. In that error-correction term we are going to consider the cointegrated variables considered in the Appendix – Table 5, lagged one period. The ECM is estimated to uncover short run responses of consumption to the new long run equilibrium. This new long run equilibrium arises from changes in the right-hand side variables in the cointegrating relationship at time t-1. The disequilibrium that exists at

time t from a change in the long run relationship at time t-1 is given by the lagged value of the error-correction term. So, intuitively, τ should be negative so that when the variable *lfcep* is moving away from equilibrium it adjusts back in the next period. The larger τ, the faster will be the rate of convergence to equilibrium, that is, the closing of the gap between actual and planned consumption within each period. The unemployment rate and the other variables are included in differenced form (with exception of the short term interest rate), with the possibility of lags, to help explain short run adjustments. Albeit we attempt to maintain a parsimonious specification, their inclusion is motivated by the extensions to the simple life cycle model[16].

As noted by Pichette (2000, pp. 14-15), the expected sign for the interest rate can be positive or negative, due to the wealth and intertemporal substitution effects. In relation to the unemployment rate, the expected sign is negative since it constitutes a proxy for the incertitude about the economic situation and the same happens with the inflation rate. Notice that, for the consumer, the unemployment rate functions as an index for the probability of a severe cut in income due to a job loss.

It should be noted that specifications (5) incorporate equation (2) but consumption and other variables are contemporaneously cointegrated. That is, following Davidson *et al.* (1978), we derive a short run model that has a log linear approximation of equation (2) as a cointegrating vector. The results from the estimation of equations (5) are shown in the Table 4 in the Appendix.

[insert Table 4 here]

We present only the most significant results obtained from different specifications of equations (5) with various lag lengths. We begin by noticing that these short run results are sensitive to model and data specification. All error-correction term coefficients (*coint. eq.*) are negative and significant in explaining consumption growth, presenting values well below $|-1|$. These estimated coefficients confirm the cointegration relation between the variables and are consistent with households gradually adjusting their spending to income and asset price changes[17]. That is, with the exception of Italy and the UK, the adjustment of current consumption to imbalances between the level of consumption, income and asset prices is slow, typically taking 2 years for a change in income or asset prices to feed through to consumption. Thus only increases in asset prices that are sustained for a sufficiently long period of time can be expected to affect levels of consumption. Moreover, if asset prices rise and then fall, the effect on consumption is smoothed, as most households will not have adjusted their consumption completely in the run-up in asset prices and so will not have to adjust as much to bring consumption back in line as a result of the most recent decline in asset prices.

These consumption growth equations also allow for short run effects on consumption growth through changes in income, asset prices and three additional variables. Those effects over the

consumption growth rate appear with some lags and generally are correctly signed. We highlight here the fact that equity and housing prices have, in general (with the exception of housing prices in Finland), positive short run effects on consumption. Additionally, we show an always negative impact of unemployment on consumption, which confirms the existence of a precautionary behaviour of households motivated by uncertainty in the future stream of revenues (we can consider it an implicit confidence effect). Finally, for Finland and Germany, the inflation term also has a negative effect on consumption.

Summing up this section, the results are according with the literature. Firstly, we found a significant residential price effect on consumption. Secondly, with the exception of the UK we found a significant albeit generally weak effect on consumption derived from stock market wealth. Despite massive fluctuations in equity prices and an increase in equity ownership in the European countries, consumption responses to stock market wealth remain limited, albeit with appreciable differences between European countries[18]. The no appreciable effect of stock prices on consumer spending is broadly consistent with life cycle saving and a modest wealth effect. That is, the life cycle theory predicts only modest effects of wealth gains on consumer spending, as spending gains would be distributed over the household's lifetime[19]. On the other hand, in focusing mainly on the relationship between stock prices and economic activity, the literature largely ignores other assets such as house prices.

5. Conclusions

The analysis just developed focused on the direct effects of equity and residential prices on consumer spending. The statistical results obtained depend upon the econometric specification, so any conclusion must only be tentative. On one hand, we found a strong connection between residential prices growth and consumption growth. On the other hand, we found the traditional weak effect of equity prices fluctuations on consumption. So, albeit our data set doesn't permit a full comparison between all the considered countries, the housing market appears to be more important than the stock market as a factor influencing consumption. This is in accordance with the existing strong correlation between residential prices changes, consumption and the credit cycles. This conclusion also stresses the importance of disaggregating the different types of assets, to see their individual influence on consumer spending. Nevertheless, being disposable income the main determinant of consumption, those wealth effects only gradually affect household consumption, with the strongest effects coming from housing wealth.

However, it is possible that changes in asset prices have an impact on household consumption, even if most households do not own equities. That can happen because stock prices are a general indicator of future economic conditions, affecting consumers confidence and the way they perceive the future. This effect can stimulate the global impact of asset prices fluctuations on consumption.

Additionally, sharp variations in stock prices can affect investment and credit in the economy, further amplifying the effects on output. Notice also that different segments of the population may respond differently to changes in equity wealth, because of differences in income expectations, the presence of liquidity or credit constraints and influences from other sources of wealth. We think that recent approaches that look at micro data and attempt to reconcile responses for population subgroups with that we observe at the macro level are likely to be informative. An understanding of these effects would be extremely important in assigning the impact of changes in household wealth in European countries, where equity ownership increased recently due primarily to privatisation processes.

For all those reasons, and since we didn't found evidence of a common reaction of consumption to asset price changes, there is further interest to study the effects of stock market and residential wealth (and its fluctuations) on consumption and output. The European Monetary Union has brought countries with rather different financial systems into a monetary union, thereby obviating the possibility of using independent monetary policy to offset asymmetric macroeconomic shocks. So, the complete study of the differences between countries and their magnitude is important even for the definition of the monetary policy by the European Central Bank (ECB), since several authors discuss whether the ECB should consider asset prices in its decisions (Gertler *et al.*, 1998). The existence of wealth effects, linked to severe escalations in share or residential prices can, through their effects on aggregate demand, raise the monetary authority's fears of inflation. That could justify an intervention by the central bank. In addition, the monetary authorities must also weigh the risk that a severe contraction in asset markets could lead to systemic problems in the financial system, either threatening the soundness of financial intermediaries either affecting the balance-sheet position of firms. Naturally consumption depends on more than monetary policy (e.g., financial, institutional and labour market factors). All these factors together could contribute in a unified Europe to more similar consumption behaviour between the EU economies.

We think that there is scope for future analysis on this matter that attempts to better explain the connection between asset prices and consumer spending and its implications to the conduct of monetary policy. Naturally that the link between asset prices and aggregate demand does not sum up to the wealth effects. There are other connections, such as a possible direct causal link from stock prices to business investment or a cost of capital effect, that one may want to take into account when studying the full impact of asset prices on inflation.

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Appendix

Table 1: Data on stock markets

	Stock market capitalisation / GDP (%)			Real share prices (annualised rate of growth)	
	1991	1999	2001	1980:1-1990:1	1990:1-2000:1
Belgium	33 %	79 %	73 %	8,4 %	5,4 %
Denmark	32 %	59 %	53 %	16,7 %	5,8 %
Finlnad	11 %	289 %	158 %	14,2 %	22,6 %
France	28 %	111 %	91 %	16,9 %	11,8 %
Germany	20 %	72 %	58 %	10,5 %	7,8 %
Italy	13 %	66 %	49 %	12,1 %	6,4 %
The Netherlands	53 %	185 %	131 %	9,5 %	16,0 %
Portugal	17 %[a]	62 %	43 %	...	27,0 %[b]
United Kingdom	91 %	214 %	151 %	9,0 %	7,0 %

Table 2: Data on housing markets

	Residential debt to GDP ratio (%)	Owner occupation rate (%)	Real house prices (annualised rate of growth)	
	2003	2002	1980:1-1990:1	1990:1-2000:1
Belgium	27 %	68 %[c]	- 0,8 %	3,8 %
Denmark	88 %	51 %	- 2,0 %	3,3 %
Finland	36 %	58 %	7,0 %	- 2,2 %
France	25 %	56 %	...	...
Germany	54 %	42 %	...	...
Italy	13 %	80 %	...	...
The Netherlands	100 %	53 %[c]	- 3,1 %	6,7 %
Portugal	51 %	75 %[d]	…	3,1 %[e]
United Kingdom	70 %	70 %	5,1 %	0,3 %

Notes:
[a] 1995; [b] 1993:1-2000:1; [c] 2001; [d] 2003; [e] 1995:1-2000:1
Sources: NewCronos, Bank of International Settlements and European Mortgage Federation (2004, Statistical Tables 1 and 4).

Appendix - Table 3: Estimates of the Income, Equity and Residential Prices Elasticities of Consumption

	Belgium	Denmark	Finland	France	Germany	Italy	The Netherlands	Portugal	United Kingdom
estimation period	**1983:4-2001:1**	**1981:2-2000:4**	**1981:2-2000:4**	**1981:2-2000:4**	**1992:2-2000:3**	**1981:1-2001:1**	**1988:2-2000:4**	**1995:3-2001:2**	**1981:2-2000:3**
variables									
constant	…	…	…	**0,4837**	…	…	…	**-0,7702**	**-1,2400**
				22,334 **				*-4,552* **	*-11,250* **
lndip	**0,2045**	**0,3042**	**0,2874**	**0,0685**	**0,8329**	**0,4437**	**0,1696**	**0,4548**	**0,1848**
	20,272 **	*25,404* **	*12,122* **	*4,024* **	*9,630* **	*3,157* **	*5,762* **	*12,595* **	*5,807* **
leqp	**0,0160**	**-0,0609**	**0,0376**	**0,0833**	**-0,0340**	**0,0336**	**0,0738**	…	**0,1964**
	2,192 *	*-5,982* **	*4,432* **	*11,236* **	*-1,290*	*0,776*	*7,787* **		*6,713* **
lrep	**0,1271**	**0,2171**	**0,0667**	…	…	…	**0,0643**	…	**0,1648**
	15,443 **	*24,886* **	*16,385* **				*6,434* **		*7,217* **
lsp	…	…	…	…	…	…	…	**0,0203**	…
								2,714 *	
lim	…	…	…	…	…	…	…	**0,1419**	…
								3,373 **	

diagnostic tests		prob		prob		prob		prob		prob		prob		prob		prob		prob
JB	1,23	0,54	1,36	0,51	1,07	0,59	0,77	0,68	2,90	0,23	4,18	0,12	0,42	0,81	0,67	0,72	0,73	0,70
Q-stat (AC)	0,05	0,83	0,69	0,41	2,60	0,11	0,77	0,38	0,12	0,73	0,08	0,78	0,10	0,75	0,71	0,40	0,28	0,60
BG SC-LM	5,92	0,05	0,91	0,64	7,37	0,03	4,82	0,09	2,49	0,29	1,22	0,54	0,14	0,93	3,22	0,20	2,34	0,31
Arch LM	3,46	0,18	0,04	0,98	0,67	0,72	0,47	0,79	1,72	0,19	3,73	0,16	3,55	0,17	0,49	0,49	2,22	0,33

Notes: For Portugal, and due to the lack of data in the BIS database, we use the log of share prices index (lsp), from Eurostat's NewCronos database and the log of a real estate prices index (lim), from "Confidencial Imobiliário". The equations are estimated applying the Stock and Watson procedure, with 4 leads, 4 lags and the contemporaneous first difference of the estimating equation's variables included as stationarity regressors (Belgium and Italy include only two leads and lags and Portugal only one lead and lag). t-statistics are calculated as in Hamilton (1994, p. 611). Coefficients significant at 5% and 1%, are denoted by * and **, respectively. The constant was excluded in Belgium, Denmark, Finland, Germany, Italy and the Netherlands. Coefficients on led and lagged difference variables not shown. The diagnostic tests presented (with p-values) are the Jarque-Bera normality test, the Ljung-Box Q-statistic, the Breusch-Godfrey residual serial correlation LM test (with 2 lags) and the Arch LM test for autoregressive conditional heteroskedasticity in the residuals (with 2 lags). Dummy variables to account for quarter specific fixed effects were introduced in all countries with the exception of Portugal.

Appendix - Table 4: Results for the nine countries (dependent variable: dlfcep)

	Belgium	Denmark	Finland	France	Germany	Italy	Netherlands	Portugal	United Kingdom
estimation period	**1983:4-2001:3**	**1983:2-2001:4**	**1981:4-2001:1**	**1988:2-2001:4**	**1992:4-2000:4**	**1980:4-2001:3**	**1987:3-2001:4**	**1995:4-2001:3**	**1983:2-2001:3**
Variables									
coint. eq.	**-0,1155**	**-0,2814**	**-0,2305**	**-0,1644**	**-0,2390**	**-0,0714**	**-0,1257**	**-0,3100**	**-0,0518**
	-2,7979	*-3,6912*	*-7,6760*	*-2,3894*	*-4,7131*	*-3,4614*	*-2,4968*	*-2,1474*	*-1,7589*
constant	…	…	…	…	…	**0,0048**	…	…	…
						3,3400			
dlfcep(-1)	…	**-0,3135**	…	…	…	**0,3835**	**-0,2143**	…	…
		-3,2222				*4,2569*	*-1,8293*		
dlfcep(-2)	**0,1694**	…	…	…	…	…	…	…	…
	1,4879								
dlndip	…	**0,1472**	…	**-0,3289**	…	…	…	**0,2487**	…
		2,5583		*-3,4910*				*3,1502*	
dlndip(-1)	…	…	…	**-0,2690**	…	**0,0598**	…	…	…
				-2,6942		*2,6346*			
dlndip(-2)	…	…	…	…	**-0,2220**	…	…	…	…
					-2,6082				
str	**0,0005**	…	…	…	…	…	…	…	…
	3,7372								
str(-1)	…	…	…	…	…	**-0,0026**	**0,0005**	…	…
						-2,4010	*2,6925*		
str(-2)	…	…	**-0,0024**	**0,0007**	…	…	…	**-0,0066**	**0,0006**
			-6,4614	*3,6527*				*-5,7630*	*5,7201*
dur	**-0,0081**	**-0,0154**	…	…	…	…	**-0,0130**	…	**-0,0105**
	-2,5145	*-3,1294*					*-2,9563*		*-2,7235*
dur(-1)	…	…	…	**-0,0086**	…	…	…	…	…
				-2,1320					
dur(-2)	…	…	**-0,0301**	**-0,0185**	**-0,0301**	…	…	**-0,0166**	…
			-4,5250	*-4,0021*	*-4,5250*			*-2,7778*	
dinf	…	…	…	…	**-0,4179**	…	…	…	…
					-1,6610				
dinf(-1)	…	…	**-0,2278**	…	…	…	…	…	…
			-1,8831						
dleqp	…	…	…	…	…	…	…	…	**0,0248**
									1,6305
dleqp(-2)	…	**0,0484**	…	…	…	**0,0071**	…	…	…
		3,2931				*1,7286*			
dlsp	…	…	…	…	…	…	…	**0,0285**	…
								2,8703	
dlrep	**0,0616**	**0,1389**	…	…	…	…	…	…	**0,0876**
	1,9831	*3,2840*							*2,3244*
dlrep(-1)	…	…	…	…	…	…	**0,0768**	…	…
							1,8062		
dlrep(-2)	…	…	**-0,0522**	…	…	…	…	…	…
			-4,0836						
R-squared	**0,21**	**0,48**	**0,43**	**0,22**	**0,50**	**0,52**	**0,25**	**0,43**	**0,24**
Adj. R-squared	**0,17**	**0,44**	**0,41**	**0,17**	**0,45**	**0,49**	**0,19**	**0,34**	**0,19**
Sum s.r.	**0,0027**	**0,0061**	**0,0070**	**0,0022**	**0,0017**	**0,0015**	**0,0032**	**0,0007**	**0,0041**
S.E. equation	**0,0063**	**0,0094**	**0,0097**	**0,0066**	**0,0076**	**0,0044**	**0,0077**	**0,0059**	**0,0077**
Log likelihood	**265,35**	**246,47**	**252,62**	**200,02**	**116,37**	**340,63**	**202,26**	**91,36**	**257,30**
Akaike AIC	**-7,23**	**-6,41**	**-6,38**	**-7,12**	**-6,81**	**-7,97**	**-6,80**	**-7,28**	**-6,82**
Schwarz SC	**-7,07**	**-6,22**	**-6,25**	**-6,98**	**-6,63**	**-7,79**	**-6,62**	**-7,08**	**-6,66**

Notes: In relation to (5), only Italy includes a constant. t-statistics in italic.

Appendix - Table 5
Results for cointegrating tests (significant at 1%; * significant at 5%)**

Belgium	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	83,3529 **	39,89	45,58
	p = 1	29,3230 *	24,31	29,75
	p = 2	10,9356	12,53	16,31
	p = 3	2,3268	3,84	6,51

Denmark	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	81,4157 **	53,12	60,16
	p = 1	36,9482 *	34,91	41,07
	p = 2	11,1819	19,96	24,60
	p = 3	3,5507	9,24	12,97

Finland	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	71,7028 **	53,12	60,16
	p = 1	37,5954 *	34,91	41,07
	p = 2	15,4677	19,96	24,60
	p = 3	1,7419	9,24	12,97

France	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	68,0474 **	34,91	41,07
	p = 1	18,5892	19,96	24,60
	p = 2	4,3119	9,24	12,97

Germany	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	41,5452 **	34,91	41,07
	p = 1	17,0870	19,96	24,60
	p = 2	4,0561	9,24	12,97

Italy	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	33,3777 *	29,68	35,65
	p = 1	12,2878	15,41	20,04
	p = 2	3,1201	3,76	6,65

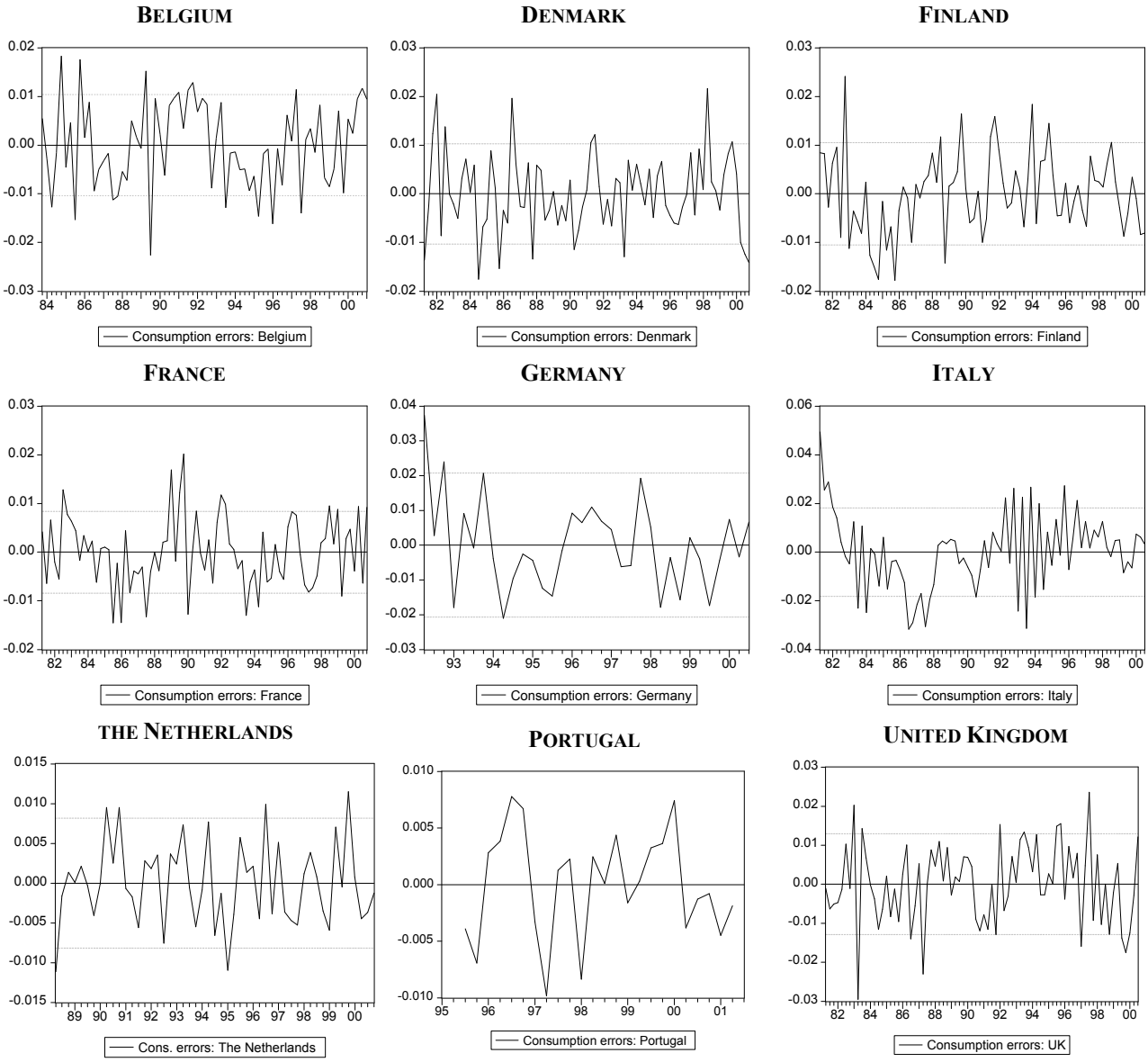
The Netherlands	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	66,7868 **	39,89	45,58
	p = 1	22,8495	24,31	29,75
	p = 2	9,0086	12,53	16,31
	p = 3	3,6069	3,84	6,51

Portugal	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	47,2696 **	39,89	45,58
	p = 1	23,2508	24,31	29,75
	p = 2	3,9666	12,53	16,31
	p = 3	0,2360	3,84	6,51

United Kingdom	H_0: rank = p	LR test	5% critical value	1% critical value
	p = 0	67,5747 **	53,12	60,16
	p = 1	25,2431	34,91	41,07
	p = 2	9,3746	19,96	24,60
	p = 3	3,4813	9,24	12,97

Notes: When the residential prices index is available the test is for rank p = 0 up to p = 3. With only the equity prices index, the test is for rank p = 0 up to p = 2. The results are for a VAR with 1 lag. In most cases, the results were little changed with additional lags in the model. The test assumes no deterministic trend in data with no intercept or trend in the Cointegrating Equation (CE) or test VAR for Belgium, The Netherlands and Portugal and an intercept (no trend) in CE and no intercept in VAR for Denmark, Finland, France, Germany, and UK. The test allows for linear deterministic trend in data, with an intercept (no trend) in CE and test VAR for Italy.

Appendix - Figure 1
Consumption errors predicted from equations (4)



Endnotes

[1] As stated by Green (2002, p. 775): "*The issue is one on which academics and the financial community seem to disagree. Rigorous academic works (Fama, 1981; Fisher and Merton, 1984; Barro, 1990; Poterba and Samwick 1995), have generally found that the wealth effect on consumption is quite small, while research reports from financial service companies generally assert that the effect is real and important.*"

[2] Bayoumi and Edison (2002, pp. 7-9). See also the discussion in Ludwig and Sloek (2004).

[3] The workhorse of modern consumption theory is the rational-expectations version of the permanent income hypothesis, as derived by Hall (1978). Gali (1990) has shown that that type of aggregate consumption function can also be derived from the dynamic optimising behaviour of consumers with finite horizons and life-cycle saving.

[4] A difficulty with estimating equation (1) directly is that planned consumption does not always equal actual consumption owing *inter alia* to lags in adjustment and liquidity constraints. For instance, individuals may not be able to adjust within each period their spending on house services, given large searching, moving and finance costs. Also, if there is considerable habit persistence in consumption behaviour, then individuals may adjust their spending slowly to bring it in line with the level suggested by the economic determinants in (1). Another reason may be the presence of liquidity-constrained individuals, who cannot smooth their consumption by borrowing against their future income due to capital market restrictions. All this suggests using an error-correction approach. Additionally, for a simple illustration of the "life cycle theory" see Davis and Palumbo (2001).

[5] Boone *et al.* (1998, p. 6) : "(…) *the life cycle model takes no account of uncertainty in the future stream of revenues (Deaton [1991] and Carrol [1992]), or bequest motives (Wilhelm [1996] and Laitner and Juster [1996]). Furthermore, Zeldes (1989) argued that the strength of any wealth effect should also be linked to the distribution of wealth and the existence of liquidity constraints.*"

[6] The traditional life-cycle model in Ando and Modigliani (1963) simply implies that aggregate consumption is linearly related to labour income and wealth. It says nothing about the cointegration properties of the variables. In contrast, the theoretical life-cycle model in Gali (1990) implies that consumption, income and wealth variables may share a common trend. But whether this theoretical implication is consistent with actual data still needs to be tested, so one must test for the presence of cointegration.

[7] By using a logarithmic functional form, we are implicitly assuming that elasticities are fixed over the sample period.

[8] For the limitations in using asset prices as proxies, see Bertaut (2002, p. 10). The (in)direct impact of stock market prices on aggregate consumption has been studied, for instance, by Romer (1990) and Poterba and Samwick (1995). The role of housing prices on consumption is the focus in, among others, Miles (1992), Brady *et al*. (2000) and Girouard and Blondal (2001).

[9] Since the theoretical model states that it is the quantity of wealth that affects consumption, not the price of wealth, the stock market capitalisation was also tested but the results were inconclusive. The real equity and residential price indices were obtained from the Bank of International Settlements (using national data) and were first presented in a paper by Borio *et al.* (1994). The remaining data are from Eurostat's NewCronos database. The data for Germany begins after 1990, owing to breaks in the series arising from the German unification. The BIS database does not include Portugal, so instead we use a "share price index" taken from Eurostat's NewCronos database and a real estate prices index published by "Confidencial Imobiliário".

[10] The only exceptions are the unemployment rate (ur) in France and Germany, the short term interest rate (str) in Portugal and the inflation rate (inf) in Belgium, Germany and the UK. The results are almost in all cases unchanged if the ADF model includes an intercept and/or a trend or a different lag structure. ADF results could be made available upon request.

[11] It would be interesting to relate these results with the different financial structures prevailing in each country, albeit due to space limitations we do not perform that analysis here. Notice also that Denmark presents the puzzling result of a significant negative effect. Nevertheless that result is strongly reversed when we estimate the sample only for the 1990s.

[12] Notice that the conclusions for Portugal and Germany should be taken with some caution due to the shorter time period covered.

[13] We can refer here Poterba (2000), who states that the growing importance of retirement accounts may have reduced the marginal propensity to consume out of stock market wealth in the US. Indeed, Ludvigson and Steindel (1999) and Mehra (2001), estimate a lower marginal propensity to consume out of total wealth for more recent periods. The other possible factor contributing to a lower marginal propensity to consume out of wealth is the falling cost of leaving bequests.

[14] An idea supported by Poterba and Samwick (1995) and Boone *et al.* (1998), among others. Nevertheless, since our sample doesn't include the 70's, it's better to interpret that results with some caution.

[15] For a complete exposition of this problem see the stylised example presented in Davis and Palumbo (2001).

[16] Davis and Palumbo (2001, p. 27): "*For example, the unemployment rate or consumer sentiment indexes are intended to capture the precautionary behaviour of households, while including variables that predict the growth rate of income can proxy for the potential effects of borrowing constraints on consumer spending. Meanwhile, including lagged growth rates of consumption, income, and wealth help to capture additional short-run dynamics in the reactions of these variables to transitory shocks that do not affect the target level of consumption (and, thus, do not involve error correction, per se).*"

[17] This result is consistent with the sluggish responses noted by Case *et al.* (2005). The speed of adjustment is usually measured by "half-lives", which are computed as $\ln(0,5)/\ln(1+\tau)$, where τ is the coefficient on the error-correction term.

[18] A noticeable difference is the different behaviour of Denmark and the UK, two non-euro economies, from the rest of the EU. In this line, Carruth *et al.* (1999) found no evidence of a common consumption function across the EU countries.

[19] Bertaut (2002, p. 18): "*For changes in both financial and non-financial wealth, these short-run effects die out over time, and the only lasting effect of wealth on the level of consumption comes from a permanent change to the level of wealth through the error-correction mechanism."*