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Consumption, (Dis)Aggregate Wealth and Asset Returns*

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Abstract

In this work, we analyze the importance of the disaggregation of wealth into its main components (financial and housing wealth). We show, from the consumer's intertemporal budget constraint, that the residuals of the trend relationship among consumption, financial wealth, housing wealth and labor income (summarized by the variable *cday*) should help to predict U.K. quarterly asset returns, and to provide better forecasts than a variable like *cay* from Lettau and Ludvigson (2001), which considers aggregate wealth instead.

Using a sample for the U.K. for the period 1975:Q1 - 2003:Q4, we also find that: (i) financial wealth effects are significantly different from housing wealth effects; (ii) changes in financial wealth are mainly transitory, while changes in housing wealth are better understood as permanent; (iii) the relationship among consumption, (dis)aggregate wealth and labor income was relatively stable over time; (iv) consumption doesn't react asymmetrically to positive and negative financial (or housing) wealth shocks.

Keywords: financial wealth, housing wealth, consumption, expected returns.

JEL classification: E21, E44, D12.

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1 Introduction

Conventional macroeconomic analysis includes wealth effect in models of product, income and prices determination, namely, considering that wealth influences not only private consumption, but also money demand, in the general context of assets' choice.

According to Boone *et al.* (1998), the fluctuations of stock prices influence economic activity through, at least, three channels: increasing the prices of assets, the cost of capital decreases and, therefore, investment demand increases; the credit channel, that tends to be influential because of the increase of the value of the collateral (which reduces the problem of the adverse selection) and the reduction of the risk associated with profitable investments; and the wealth effect channel.

The theoretical mechanisms associated to the wealth effect are well-known: as the asset holdings-income ratio increases, consumption becomes more sensitive to changes in the prices of assets (Mankiw and Zeldes, 1991); and, as indirect property of financial assets increases – through mutual or pension funds -, the correlation between the growth of consumption and the fluctuations of stock market increases (Poterba and Samwick, 1995). Dynan and Maki (2001) distinguish two types of wealth effects: the direct channel and the indirect channel. The logic underlying a wealth effect is quite simple: an increase in the price of assets boosts wealth and, therefore, allows an increase in consumption, for the same level of income. If this answer emerges in a relatively quick way, the relationship between wealth and consumption can be referred as the direct channel and it is identified by the negative correlation between the savings rate and the wealth-income ratio. When consumption reacts with a significant lag, there is uncertainty with respect to the persistence of the movement in wealth and it becomes difficult to determine the extension of indirect property of assets. The lag can be so big that wealth effect is not revealed in current consumption of asset holders, but only when the assets are transferred to future generations through bequests. In these circumstances, the aggregate relation between wealth and consumption can exist, because, for example, changes in the stock prices signal future changes in income – this is called the indirect channel.

With the growth of relative importance of financial assets on wealth's composition, research has been characterized by the introduction of features that incorporate the behavior of financial markets in theories of consumption: financial markets influence macroeconomic behavior, mainly, through their impact on consumption and investment; additionally, consumption and investment generate important feedback effects on financial markets.

Theoretical analysis in this area is still not gathering consensus and empirical evidence is still inconclusive.[1]

[1] At the international level, evidence is also quite diversified. In Japan, Mutoh *et al.* (1993) and Ogawa (1992),

Among the empirical studies that find evidence of significant wealth effects on consumption, we can refer: Mankiw and Zeldes (1991), Barrell and In't Veld (1992), and Ludvigson and Steindel (1999). Mankiw and Zeldes (1991) show that stockholders' consumption is more volatile and more strongly correlated with stock market returns than non-stockholders' consumption. Barrell and In't Veld (1992) develop a macroeconomic model that includes long-run government's budget constraint and presupposes weak form of solvability and conclude that wealth effects are important in any model that is intended to be useful in the analyzing of the effects of the adoption of economic policies. Ludvigson and Steindel (1999) also identify a wealth effect on consumption, although referring that the behavior of this market is not a good indicator of future consumption and that the effect is unstable over time.

Other studies found modest wealth effects. Cochrane (1994), Mayer and Simons (1994), Brayton and Tinsley (1996), Campbell *et al.* (1997), Desnoyers (2001), and Lettau and Ludvigson (2001) show that the overall impact on consumption of the changes of net wealth is small and mainly transitory. Poterba and Samwick (1995) show that, although the patterns of stocks property have changed in the last years, these changes didn't have a significant impact on the relation between the fluctuations of the stock prices and the private consumption. Caporale and Williams (1997) suggest a marginal propensity to consume out of wealth, although emphasizing that the processes of financial liberalization/deregulation have strengthened the wealth effects. Otoo (1999) shows that the correlation between the stock prices and the consumer confidence level (either stockholder, or non-stockholder) doesn't change with the property of stocks, which means that consumers use stocks, mainly, as a leading indicator of real economic activity. Poterba (2000) points out that, on one side, the concentrated nature of wealth and, on the other, the desire to leave bequests and precautionary motives in the consumer's behavior constitute important possible causes of the modest wealth effects. Starr-McCluer (2002) suggests that concerns relative to trend inversions of the stock prices can lead stockholders not to spend realized gains.

Another reason for the interest in the linkages between wealth and other macroeconomic variables is that expected excess returns on common stocks appear to vary with the business cycle, suggesting that they should be forecastable by business cycle variables (Lettau and Ludvigson, 2001). Different

Horioka (1996) and Ogawa *et al.* (1996) suggested estimates for the marginal propensity to consume out of wealth of around between 1% and 4%, varying, considerably, with the definitions of wealth and income. In France, Bonner and Dubois (1995) and Grunspan and Sicsic (1997) haven't found evidence of a wealth effect. In Italy, Rossi and Visco (1995) presented evidence of a marginal propensity to consume wealth of between 3% and 3.5%. In Australia, McKibbin and Richards (1988), Tan and Voss (2003) and Bertaut (2002) present estimates for the marginal propensity to consume out of wealth of 2, 4 and 5 cents, respectively. In Canada, Macklem (1994), Boone *et al.* (2001) and Pichette (2000) suggest the existence of a wealth effect of the order of 3% to 8%. For the UK, Corugedo *et al.* (2003) suggest that the marginal propensity to consume out of wealth is, approximately, 5%.

reasons have been pointed for this observation, namely: inefficiencies of financial markets; the rational response of agents to time-varying investment opportunities, driven by cyclical variation in risk aversion (Sundaresan, 1989; Constantinides, 1990; Campbell and Cochrane, 1999) or in the joint distribution of consumption and asset returns.

Financial indicators such as the ratios of price to dividends, price to earnings or dividends to earnings have been successful at predicting returns over long horizons. However, there is little empirical evidence that real macroeconomic variables perform such a function. Lettau and Ludvigson (2001) introduced a new approach to investigate the linkages between macroeconomics and financial markets and have shown that the transitory deviations from the common trend in consumption, aggregate wealth and labor income, *cay*, are a strong predictor of both stock returns, as long as the expected return to human capital and consumption growth is not too volatile. Fernandez-Corugedo *et al.* (2003) use the same approach, but additionally incorporate the relative price of durable goods in the long-run relationship and in the short-term dynamics, showing that unless the relative price of durables and non-durables is constant, the relative price needs to be taken into account in modelling. More recently, Julliard (2004) shows that the expected changes in labor income (which capture the movements in human capital) also carry relevant information for predicting future asset returns and, therefore, provide an appropriate proxy for the consumption-aggregate wealth ratio, because of their ability to track time varying risk premia.

In this paper, we follow the same approach of Lettau and Ludvigson (2001), and use the representative consumer intertemporal budget's constraint to derive an equilibrium relation between the transitory deviations from the common trend in consumption, asset holdings and labor income and expected future asset returns. However, we disaggregate the wealth variable into its main components, this is, housing wealth and financial wealth and show that the consumption-(dis)aggregate wealth ratio helps to predict more accurately future returns, as long as the expected return to human capital and consumption growth are not too volatile.

There is a number of reasons of why the responsiveness of consumers to financial asset shocks and housing asset shocks can be different[2]: liquidity reasons (Pissarides, 1978), utility derived from the property right of an asset as housing services or bequest motives (Poterba, 2000; Bajari *et al.*, 2003), different distributions of assets across income groups[3], expected permanency of changes of different categories of assets, mismeasurement of wealth[4] and 'psychological factors' (Shefrin and Thaler, 1988).

[2]For a more detailed discussion, see Case *et al.* (2001).

[3]Housing wealth tends to be held by consumers in all income classes. Stock market wealth, on the other hand, is in many countries concentrated in the high-income groups which are often thought to have a lower propensity to consume out of both income and wealth.

[4]This may be especially so for houses which are less homogenous and less frequently traded than shares. Also many

Each of these concerns suggests a distinction between the impact of financial wealth and housing wealth on consumption.[5] We argue that, therefore, the disaggregation of wealth is an important issue and should be considered in the context of forecasting future asset returns. This follows from the fact that the consumption-(dis)aggregate wealth ratio summarizes agent's expectations of future returns on assets: when average asset returns (this is, housing asset returns and financial asset returns) are expected to be higher (lower) in the future, forward-looking investors will increase (decrease) consumption out of housing wealth or financial wealth and labor income, allowing consumption to rise (decrease) above (below) its common trend with those variables. In this way, investors may insulate future consumption from fluctuations in expected returns. This is particularly important if we think that the shares of housing and financial wealth are very different across countries[6] and governments and central banks frequently take into account the behavior of both types of assets when defining macroeconomic policies.

The rest of the paper is organized as follows. In Section 2, we present the theoretical framework linking consumption, financial wealth, housing wealth, labor income and expected returns and how we express the important predictive components of the consumption-(dis)aggregate wealth ratio in terms of observable variables. In Section 3, we briefly present the data, estimate the model and discuss the results, using a sample for the U.K. for the period 1975:Q1 - 2003:Q4. We show that: (*i*) financial wealth effects are significantly different from housing wealth effects; (*ii*) changes in financial wealth are mainly transitory, while changes in housing wealth are better understood as permanent; (*iii*) the relationship among consumption, (dis)aggregate wealth and labor income was relatively stable over time; (*iv*) consumption doesn't react asymmetrically to positive and negative financial (or housing) wealth shocks. In Section 4, we test the implication that deviations from trend relationship among consumption, (dis)aggregate wealth and labor income, *cday*, are likely to lead asset returns. We show that *cday* performs better than *cay* and, additionally, it also helps to predict future consumption growth. Finally, in Section 5, we conclude and refer the main limitations of the model and the lines of direction for future research.

consumers may not be aware of the exact value of their indirect share holdings. For example, Sousa (2003) shows that directly held stock market wealth effects are significantly different from indirectly held stock market wealth effects.

[5] At this level, the empirical evidence is also inconclusive with respect to the significance of housing wealth effect. Elliott (1980), Levin (1998) and Mehra (2001) found essentially that the wealth effect is independent of the category of wealth. Thaler (1990), Sheiner (1995), and Hoynes and McFadden (1997) investigated the correlation between individual savings rates and changes in house prices and found a weak relation. In contrast, Case (1992), Kent and Lowe (1998), Skinner (1999), Case *et al.* (2001), and Dvornak and Kohler (2003) found evidence of a considerable housing wealth effect on consumption.

[6] See, for example, Banks *et al.* (2002) for a comparison of wealth porfolios in the U.K. and in the U.S. and Bertaut (2002) for a discussion about the evolution of the composition of wealth across countries.

2 The Consumption-(Dis)Aggregate Wealth ratio

We consider a representative agent economy in which all wealth, including human capital, is tradable. Let W_t be aggregate wealth (human capital plus asset holdings) in period t. C_t is consumption and $R_{w,t+1}$ is the net return on aggregate wealth. The accumulation equation for aggregate wealth may be written[7]:

$$W_{t+1} = (1 + R_{w,t+1})(W_t - C_t) \quad (1)$$

We define $r \equiv \log(1 + R)$, and use lowercase letters to denote log variables throughout. Campbell and Mankiw (1989) show that, if consumption-aggregate wealth ratio is stationary, the budget constraint may be approximated by taking a first-order Taylor expansion of the equation. The resulting approximation gives an expression for the log difference in aggregate wealth

$$\Delta w_{t+1} \approx k + r_{w,t+1} + (1 - 1/\rho_w)(c_t - w_t) \quad (2)$$

where ρ_w is the steady-state ratio of new investment to total wealth, $(W - C)/W$, and k is a constant that plays no role in our analysis.[8] Solving this difference equation forward and imposing that $\lim_{i\to\infty} \rho_w^i (c_{t+i} - w_{t+i}) = 0$, the log consumption-wealth ratio may be written:

$$c_t - w_t = \sum_{i=1}^{\infty} \rho_w^i (r_{w,t+i} - \Delta c_{t+i}). \quad (3)$$

Equation (3) holds not only ex-post (as a consequence of agent's intertemporal budget constraint), but also ex-ante. Accordingly, we can take conditional expectations of both sides of (3) to obtain:

$$c_t - w_t = E_t \sum_{i=1}^{\infty} \rho_w^i (r_{w,t+i} - \Delta c_{t+i}), \quad (4)$$

where E_t is the expectation operator conditional on information available at time t. Equation (4) shows that, if the consumption-aggregate wealth ratio is not constant, it must forecast changes in asset returns or in consumption growth, this is, it can only vary if consumption growth or returns or both are predictable.

Because aggregate wealth (in particular, human capital) is not observable, this framework is not directly suited for predicting asset returns. To overcome this obstacle, Lettau and Ludvigson (2001) assume that the nonstationary component to human capital, denoted H_t, can be well described by aggregate labor income, Y_t, implying that $h_t = k + y_t + z_t$, where k is a constant and z_t is a mean zero

[7] Labor income does not appear explicitly in this equation because of the assumption that the market value of tradable human capital is included in aggregate wealth.

[8] We omit unimportant linearization constants in the equations from now on.

stationary random variable. This assumption may be rationalized by a number of different specifications. First, labor income may be described as the annuity value of human wealth, $Y_t = R_{h,t+1}H_t$, where $R_{h,t+1}$ is the net return of human capital. In this case, $r_{h,t} \equiv \log(1 + R_{h,t+1}) \approx 1/\rho_y(y_t - h_t)$, where $\rho_y \equiv (1 + Y/H)/(Y/H)$, implying $z_t = -\rho_y r_{h,t}$.[9] Second, one could specify a "Gordon growth model" for human capital by assuming that expected returns to human capital are constant and labor income follows a random walk, in which case z_t is a constant equal to $\log(R_h)$. Finally, aggregate labor income can be thought of as the dividend on human capital, as in Campbell (1996) and Jagannathan and Wang (1996). In this case, the return to human capital may be fixed as $1 + R_{h,t+1} = (H_{t+1} + Y_{t+1})/H_t$, and a log-linear approximation of $R_{h,t+1}$ implies that $z_t = E_t \sum_{j=0}^{\infty} \rho_h^j (\Delta y_{t+1+j} - r_{h,t+1+j})$. In each of these cases, the log of aggregate labor income captures the nonstationarity component of human capital.

We can now express the important predictive components of the consumption-(dis)aggregate wealth ratio in terms of observable variables. Let F_t be financial asset holdings, U_t be housing asset holdings and let $1 + R_{f,t}$ and $1 + R_{u,t}$ be, respectively, their gross returns. (Dis)Aggregate wealth can be, therefore, decomposed as

$$W_t = A_t + H_t = F_t + U_t + H_t, \tag{5}$$

and log of (dis)aggregate wealth can be approximated as

$$w_t \approx \alpha a_t + (1 - \alpha)h_t \approx \alpha_f f_t + \alpha_u u_t + (1 - \alpha_f - \alpha_u)h_t, \tag{6}$$

where α, α_f and α_u equal, respectively, the average share of total asset holdings in total wealth, A/W, the share of financial asset holdings in total wealth, F/W, and the share of housing asset holdings in total wealth, U/W. These ratios may also be expressed, respectively, in terms of steady-state labor income and returns as $R_hA/(Y + R_hA)$, $R_hF/(Y + R_hF + R_hU)$ and $R_hU/(Y + R_hF + R_hU)$.

The return to (dis)aggregate wealth can be decomposed into the returns of its components:

$$1 + R_{w,t} = \alpha(1 + R_{a,t}) + (1 - \alpha)(1 + R_{h,t}) \approx \alpha_f(1 + R_{f,t}) + \alpha_u(1 + R_{u,t}) + (1 - \alpha_f - \alpha_u)(1 + R_{h,t}). \tag{7}$$

Campbell (1996) shows that (7) maybe transformed into an approximation equation for log returns taking the form:

$$r_{w,t} \approx \alpha r_{a,t} + (1 - \alpha)r_{h,t} \approx \alpha_f r_{f,t} + \alpha_u r_{u,t} + (1 - \alpha_f - \alpha_u)r_{h,t}. \tag{8}$$

Substituting (6) and (8) into the ex-ante budget constraint (4) gives:

$$c_t - \alpha_f f_t - \alpha_u u_t - (1 - \alpha_f - \alpha_u)h_t = E_t \sum_{i=1}^{\infty} \rho_w^i \left\{ [\alpha_f r_{f,t+i} + \alpha_u r_{u,t+i} + (1 - \alpha_f - \alpha_u)r_{h,t+i}] - \Delta c_{t+i} \right\}. \tag{9}$$

[9] This specification places no restrictions on the functional form of expected or realized returns, and it makes no assumptions about the relationship between returns to human capital and returns to asset wealth.

This equation still contains the unobservable variable h_t on the left-hand side. To remove it, we replace our formulation linking the log of labor income to human capital, $h_t = k + y_t + z_t$, into (9), which yields an approximate equation describing the log consumption-(dis)aggregate wealth ratio using observable variables on the left-hand side:

$$c_t - \alpha_f f_t - \alpha_u u_t - (1 - \alpha_f - \alpha_u) y_t = E_t \sum_{i=1}^{\infty} \rho_w^i \left\{ [\alpha_f r_{f,t+i} + \alpha_u r_{u,t+i} + (1 - \alpha_f - \alpha_u) r_{h,t+i}] - \Delta c_{t+i} \right\} + \eta_t, \tag{10}$$

where $\eta_t = (1 - \alpha_f - \alpha_u) z_t$.

Since all the terms on the right-hand side of (10) are presumed stationary, c, f, u and y must be cointegrated, and the left-hand side of (10) gives the deviation in the common trend of c_t, f_t, u_t, and y_t. We denote the trend deviation term $c_t - \alpha_f f_t - \alpha_u u_t - (1 - \alpha_f - \alpha_u) y_t$ as $cday_t$.[10] Equation (10) shows that $cday_t$ will be a good proxy for market expectations of future financial, $r_{f,t+i}$, and housing asset returns, $r_{u,t+i}$, as long as expected future returns on human capital, $r_{h,t+i}$, and consumption growth Δc_{t+i}, are not too variable, or as long as these variables are highly correlated with expected returns on assets. When the left hand side of equation (10) is high, consumers expect either high future financial asset returns, or high housing asset returns on market wealth - this is, on average, higher future returns - or low future consumption growth. Moreover, since this equation takes into account the different characteristics of the main components of wealth, it should provide a better proxy for market expectations of future returns $(r_{f,t+i}, r_{u,t+i})$ and future consumption growth as long as human capital returns are not too variable.

After this presentation, we briefly present the data, estimate the trend relationship among consumption, financial wealth, housing wealth and labor income, and present the main results, which is done in the next Section.

[10] Lettau and Ludvigson (2001) do not consider the issue of wealth disaggregation. Their specification is given by

$$cay_t = E_t \sum_{i=1}^{\infty} \rho_w^i \left\{ [\alpha r_{a,t+i} + (1 - \alpha) r_{h,t+i}] - \Delta c_{t+i} \right\} + (1 - \alpha) z_t,$$

where cay_t denotes the trend deviation term $c_t - \alpha a_t - (1 - \alpha) y_t$.

3 Estimating the Trend Relationship Among Consumption, (Dis)Aggregate Wealth and Income

The adopted methodology for the estimation of the model[11] consists of two stages. First, a long-run relation (steady-state relation) among consumption, financial wealth, housing wealth and income is estimated. Then, we proceed with the analysis of short-run dynamics. As additional issues of the estimation, we analyze the stability of both the cointegrating vector and the short-term adjustment vector and the presence of an asymmetric behavior in the response of consumption to different wealth shocks.

3.1 Data

An important task in using *cday* to forecast asset returns is the estimation of the parameters of the shared trend in consumption, financial wealth, housing wealth and income.

In the estimation of this relationship, we used quarterly, seasonally adjusted data and all variables were measured at 2001 prices, and expressed in the logarithmic form of per capita terms. Our definition of consumption, excludes durable and semi-durable goods consumption.[12] Data on income includes only labor income. Original data on wealth correspond to the end-period values. Therefore, we lagged once the data, so that the observation of wealth in t correspond to the value at the beginning of the period $t+1$. The main data source was the Office for National Statistics (ONS), although for housing wealth, we also used data from Halifax plc, the Nationwide Building Society and the Office of the Deputy Prime Minister. Some adjustments were required to the consumption and labour income data to obtain series that could be used in our theoretical structure. In Appendix A, we present a detailed technical discussion of data.

[11] We used the following econometric softwares in the estimation of models and performance of econometric tests: PcGive Professional version 10.0b, Econometric Modelling, developed by Jurgen A. Doornik, distributed as part of GiveWin 2.02 (June 2001) by Timberlake Consultants; EViews version 5.0, developed and distributed by Quantitative Micro Software; and Gauss version 6.0, distributed by Aptechs Systems, Inc..

[12] Typically, the theories of consumption behavior refer to the flow of expenditure with the acquisition non-durable goods and services. Therefore, we exclude durable consumption expenditure (from our measure of consumption), because it corresponds to the replacement and, eventually, the increase of the existing stock of durable goods, instead of the flow of services provided by the existing stock of goods.

3.2 The long-run relation

In the estimation of the trend relationship among consumption, financial wealth, housing wealth and labor income, we started by applying the Augmented Dickey-Fuller (ADF) tests to determine the existence of unit roots in the series and concluded that all the series are first-order integrated, $I(1)$. Then, we used the methodology of Engle and Granger (1987) to analyze the existence of cointegration among the series, finding evidence supporting this hypothesis. The results of the ADF tests and the cointegration tests are presented in Appendix B.

Following Davidson and Hendry (1981), Blinder and Deaton (1985), Ludvigson and Steindel (1999), Attfield *et al.* (1990), Davis and Palumbo (2001), and Mehra (2001), among others, we estimate the trend relationship among consumption, wealth and labor income. This relationship is based, fundamentally, on the permanent income hypothesis developed by Friedman (1957) and retaken by the studies of Hall (1978, 1988), Flavin (1981) and Campbell (1987). According to this hypothesis, consumption is a function of human wealth (after-tax labor income) and non-human wealth (asset holdings). In the case of wealth, it is still possible to disaggregate it, because the impact on consumption of different assets' categories can be different (Zeldes, 1989; and Poterba and Samwick, 1995). In our specification, we disaggregate wealth into its main components: financial wealth and housing wealth. Following Saikkonen (1991) and Stock and Watson (1993), we used a dynamic least squares (DOLS) technique, specifying the following equation

$$c_t = \mu + \beta_f f_t + \beta_u u_t + \beta_y y_t + \sum_{i=-k}^{k} b_{f,i}\Delta f_{t-i} + \sum_{i=-k}^{k} b_{u,i}\Delta u_{t-i} + \sum_{i=-k}^{k} b_{y,i}\Delta y_{t-i} + \varepsilon_t, \tag{11}$$

where the parameters β_f, β_u,β_y represent, respectively, the long-run elasticities of consumption with respect to financial wealth, housing wealth, and labor income and Δ denotes the first difference operator.[13]

Implementing the regression in (11) using U.K. data for the period 1975:Q1 - 2003:Q4, generates the following estimates (ignoring coefficient estimates on the first differences) for the shared trend among consumption, financial wealth, housing wealth and income:

$$c_t = \underset{(2.86)}{1.48} + \underset{(4.81)}{0.18}\, f_t + \underset{(2.34)}{0.03}\, u_t + \underset{(4.34)}{0.50}\, y_t. \tag{12}$$

[13] The parameters β_f, β_u,β_y should in principle equal the shares $R_hF/(Y + R_hF + R_hU)$, $R_hU/(Y + R_hF + R_hU)$ and $Y/(Y + R_hF + R_hU)$, respectively, but, in practice, may sum to a number less than one, because only a fraction of total consumption expenditure is observable (Lettau and Ludvigson, 2001). Because of this, we decided to write β_f, β_u and β_y instead of α_f, α_u and α_y to distinguish long-run elasticities of *our definition* of consumption from long-run elasticities of *total* consumption.

where the t-corrected statistics appear below the coefficient estimates.[14]

The estimations show that the long-run elasticity of consumption with respect to financial wealth (0.18) is about six times greater than the long-run elasticity with respect to housing wealth (0.03), reflecting the importance of this component of wealth and, simultaneously, the significance of the disaggregation of wealth; the long-run elasticity of consumption with respect to income is 0.5. As expected, the sum of the coefficients of equation (12) do not sum to unity, since we exclude from our definition of consumption not only the consumption of durable goods, but also the consumption of semi-durable goods. However, we must refer that the average share of our measure of consumption in total consumption in our sample is 76%, which is approximately equal to the sum of the coefficients of equation (12), namely, 71%. Finally, the implied shares, calculated by scaling the coefficients on financial wealth, housing wealth and income by the inverse sum of the coefficients are, respectively, 0.25, 0.04 and 0.70, which are very plausible figures, since they correspond, approximately, to shares of capital and labor of 0.29 and 0.70, respectively.

3.3 The short-term dynamics

We proceed with the analysis of short-run dynamics, that is, the analysis of how consumption reacts to shocks on wealth and how these deviations from long-run relation are corrected. We want to interpret deviations from the shared trend in consumption, financial wealth, housing wealth and income and to analyze whether they are better described as transitory movements in financial wealth and/or housing wealth or as transitory movements in consumption and labor income.

With these questions in mind, we examined a four-variable, cointegrated vector-autoregression (VAR) where the log difference in consumption, in financial wealth, in housing wealth, and in labor income are all regressed on their own lags and an "error correction term", equal to the lagged value of the estimated trend deviation. The estimated model is specified as follows:

$$\Delta \mathbf{x}_t = \theta + \gamma_t \beta_t' \mathbf{x}_{t-1} + \Gamma(L)\Delta \mathbf{x}_{t-1} + e_t, \tag{13}$$

where $\mathbf{x}_t = (c_t, f_t, u_t, y_t)$ is the vector of consumption, financial wealth, housing wealth, and labor income, $\gamma_t = (\gamma_c, \gamma_f, \gamma_u, \gamma_y)'$ is a $(4x1)$ vector, $\beta_t = (1, -\alpha_f, -\alpha_u, -\alpha_y)'$ is the vector of estimated cointegration coefficients shown in equation (12), and $\Gamma(L)$ is a finite-order distributed lag operator. Thus, γ_t is the short-run adjustment vector telling us how the variables react to the last period's

[14] We experimented with various lead/lag lengths in estimating the DOLS specification. For the results reported in (12), we used the value of $k = 5$. However, neither the cointegrating parameter estimates nor the forecasting results we present below are sensitive to the particular value of k.

cointegrating error while returning to long-term equilibrium after a deviation occurs; β_t measures the long-run elasticities of one variable respective to another; the term $\beta_t' \mathbf{x}_{t-1}$ measures the cointegrating residual, $cday_{t-1}$. Table 1 presents the results of the estimation using a one-lag cointegrated VAR.[15]

Table 1: Estimates from a Cointegrated VAR.

	Equation			
Dependent variable	Δc_t	Δf_t	Δu_t	Δy_t
Δc_{t-1}	-0.210**	1.017	0.356**	-0.189
(t-stat)	(-2.130)	(1.390)	(2.06)	(-1.212)
Δf_{t-1}	0.001	0.134	0.004	0.009
(t-stat)	(-0.106)	(1.404)	(0.184)	(0.430)
Δu_{t-1}	0.034	-0.349	0.776*	0.129*
(t-stat)	(1.141)	(-1.567)	(14.756)	(2.729)
Δy_{t-1}	0.116***	0.190	0.197***	-0.080
(t-stat)	(1.851)	(0.408)	(1.789)	(-0.804)
θ	0.123***	-1.108**	-0.036	-0.094
(t-stat)	(1.938)	(-2.348)	(-0.323)	(-0.932)
$\widehat{cday}_{t-1}$	-0.080***	0.757**	0.024	0.067
(t-stat)	(-1.853)	(2.371)	(0.324)	(0.985)
$\bar{R}^2$	0.081	0.063	0.714	0.033

This table reports the estimated coefficients from cointegrated vector-autoregressions (VAR).

Symbols *, **, *** represent, respectively, significance at a level of 1%, 5% and 10%.

t-statistics appear in parentheses. The sample period is 1975:Q3 - 2003:Q4.

The table reveals some interesting properties of the data on consumption, financial wealth, housing wealth, and labor income.

First, estimation of the consumption growth equation shows that $\widehat{cday}_{t-1}$predicts consumption growth. The sign of the coefficient is negative, confirming the idea that deviations from trend are corrected in the following periods. However, its value (approximately, -0.08) suggests that the correction is very slow, which constitutes an indicator that consumers, gradually, adjust their expenditures, which can be interpreted as an evidence of the presence habit formation. This result also constitutes an evidence of the "indirect" channel of wealth effect, since the response of consumption is not immediate.

[15] The lag length was chosen in accordance with findings from Akaike and Schwarz tests.

On the other hand, consumption growth is somewhat predictable by the lag of consumption growth as noted by Flavin (1981), Campbell and Mankiw (1989) and Lettau and Ludvigson (2001), which can be interpreted as a sign of some delay in the adjustment of consumption and represents a statistical rejection of permanent income hypothesis. The lagged values of labor income growth are also statistically significant, which may follow from habit persistence, be evidence in favor of near-rational rules of thumb, or imply that consumers are liquidity constrained.[16]

Second, estimation of the financial wealth growth equation shows that $\widehat{cday}_{t-1}$ is statistically significant. Moreover, the estimated coefficient is the greatest of the four equations (0.757), suggesting that $\widehat{cday}_{t-1}$ strongly predicts financial wealth growth and implying that deviations in financial wealth from its shared trend with consumption, housing wealth, and labor income uncover an important transitory variation in financial wealth.

Third, estimation of housing wealth growth equation also shows that $\widehat{cday}_{t-1}$ doesn't help to predict housing wealth growth: the estimated coefficient is very small (0.024) and it is not statistically significant. However, it is shown that the lagged values of consumption growth, of housing wealth growth and of labor income growth are statistically significant. Moreover, the R^2 statistic shows that this equation explains more than 70% of the housing wealth growth.

Fourth, estimation of labor income growth equation also shows that $\widehat{cday}_{t-1}$ doesn't help to predict labor income growth: the estimated coefficient is relatively small (0.067) and it is not statistically significant. Moreover, only the lagged values of housing wealth growth are significant.

In sum, these results suggest that deviations from the shared trend in consumption, financial wealth, housing wealth, and labor income are better described as transitory movements in financial wealth. By the other hand, changes in house wealth contain an important permanent component. When log consumption deviates from its habitual ratio with log financial wealth, log housing wealth and log labor income, it is financial wealth (and, to some extent, consumption) rather then housing wealth or labor income, that is forecast to adjust until the equilibrating relationship is restored; forward-looking households foresee changes in the return of their future financial wealth.

3.4 Stability

A limitation of the previous estimations is that we have considered that the relation between consumption and wealth is stable over time, which, if it is not the case, will imply that marginal propensity to consume wealth is not constant. Ludvigson and Steindel (1999), Mehra (2001) and Shirvani and

[16] This evidence differs from the results of Lettau and Ludvigson (2001), who find only lagged consumption growth significant.

Wilbratte (2002) try to highlight this issue, emphasizing that the coefficient associated to stock-market wealth in the consumption function increased substantially during the nineties.

The question about the stability of the long-run relationship can be evaluated by testing the structural change of the cointegrating vector.[17] Seo (1998) provides new tests for structural change of the cointegrating vector and the adjustment vector in the cointegrated vector-autoregression (VAR). The novelties of these tests are the following: (*i*) they are based on the maximum likelihood estimator (MLE) from the cointegrated VAR; (*ii*) conventional LM statistics are defined with respect to a known break point, but this constraint is relaxed by allowing an unknown break point. In this case, since classical optimality theory does not hold, alternative testing procedures are required. Based on Andrews (1993) and Andrews and Ploberger's (1994) optimality arguments, Seo (1998) defines average (Ave-LM), exponential average (Exp-LM), and supremum (Sup-LM) LM statistics.

We test the following three hypotheses: $H_0 : \beta_t = \beta_0$, $H_0 : \gamma_t = \gamma_0$, and the joint hypothesis $H_0 : \beta_t = \beta_0, \gamma_t = \gamma_0$, where β_0 and γ_0 are respectively vectors of constant values. The rejection of β_t being a vector of constants suggests that there exists a structural break in the long-term relation among variables. The rejection of γ_t being a vector of constants suggests that there exists a structural change in the short-term speed of adjustment of consumption. Appendix C presents results of the tests of stability.

The results present a somewhat mixed picture concerning the presence of instability. In fact, there is a marginal evidence of a structural break in the short-term speed of adjustment (γ_t) - only the Ave-LM is marginally significant among the three statistics. The tests of the single hypothesis don't show evidence of a structural break in the long-term cointegration relation (β_t) between consumption, financial wealth, housing wealth and labor income, although the tests of the joint hypothesis marginally suggest the contrary. Moreover, they suggest that, if there is a structural break in the cointegration vector, this is close to the beginning point of the U.K. sample, at the time of the oil shocks. This implies that for almost the entire sample period there exists a stable cointegrating relation. Thus, we conclude that c_t, f_t, u_t and y_t maintain a stable long-term relation in the U.K. data.

Another way to see this is to estimate the cointegrated VAR over subsamples. We split the sample into two sub-periods, namely, 1975:Q1 - 1988:Q4 and 1989:Q1 - 2003:Q4 and reestimate equation (11). The stability of the cointegrating vector is summarized in Table 2.

[17] See, for example, Hansen (1992) and Quintos and Phillips (1993).

Table 2: Short-term adjustment vector - subsamples.

Sample	β_f	β_u	β_y
1975:Q1 - 2003:Q4	0.18*	0.03**	0.50*
1975:Q1 - 1988:Q4	0.06	0.19	0.25
1989:Q1 - 2003:Q4	0.14*	0.03***	0.46*

Symbols *, **, *** represent significance at 1%, 5% and 10% level, respectively.

It can be shown that the coefficient estimates for the period 1989:Q1 - 2003.Q4 are very similar to those for the overall period. Only for the period 1975:Q1 - 1988:Q4 do the estimates look very different: for the first sub-period, the elasticity of consumption with respect to housing wealth is greater than that for the financial wealth, while the opposite occurs for the second sub-period. Note, however, that the coefficients are not significant. Of course, a caveat with these estimates is that they are not really proper, since it is never appropriate to throw away information when estimating the parameters of the common trend. Nevertheless, they give a rough idea of where in the sample instability might lie. What's the explanation for this statistical results? The late nineties were an extraordinary episode in which the financial wealth increased dramatically. During this period, wealth remained far above its previously estimated long-run trend with consumption and labor income, and persistently so. Figure 1 demonstrates graphically by plotting the cointegrating residual of the overall sample. The residual takes on large and sustained negative values during the late nineties, as wealth moved well above its long-run trend with consumption and labor income.

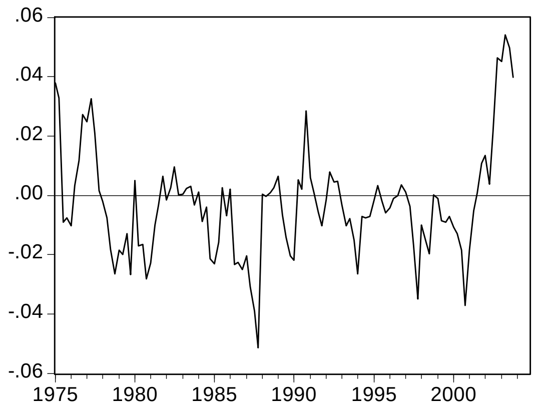

Figure 1: The cointegration residual ($\widehat{cday_t}$).

However, it can be seen that the large and sustained negative values in the cointegrating residual are being eliminated since 2002, coinciding with a large error correction in wealth, a direct result of the broad stock market declines since 2000. Including data from the last half of the nineties creates some instability, not because the period was substantially different from historical experience, but because it was a more extreme version of the historical record, generating a transitory movement in wealth that was larger and more persistent than previously observed in our sample. Therefore, the majority of the instability should be instead the result of the oil shocks of the seventies.

We proceed with the analysis of the stability of the adjustment vector, which is shown in Table 3.

Once again, the estimated coefficients for the second sub-period are closer to those in the overall sample. There are not substantial changes in the speed of adjustment of consumption, housing wealth, with the exceptions of financial wealth and income, but once again the coefficients are not statistically significant for the period 1975:Q1 - 1988:Q4.

Table 3: Short-term adjustment vector - subsamples.

Sample	β_c	β_f	β_u	β_y
1975:Q1 - 2003:Q4	-0.080**	0.757	0.024***	0.067***
1975:Q1 - 1988:Q4	-0.094***	1.174	0.008	0.184
1989:Q1 - 2003:Q4	-0.060**	0.578	0.038***	0.032***

Symbols *, **, *** represent significance at 1%, 5% and 10% level, respectively.

In sum, our estimation indicates that the boom-bust cycle of asset markets does not cause a structural break in the long-term relation between consumption and stock wealth, and the short-term speed of adjustment remains relatively unaffected. Moreover, our results are in contrast with the work of Lettau and Ludvigson (2004), where the authors argue that for the U.S. the sample instability comes from the large appreciations of the stock markets during the nineties, while in our case, the data for the U.K. suggest that the sample instability should be attributed to the oil shocks taken place during the seventies.

3.5 (A)Symmetric behavior

We next investigate wether consumption reacts asymmetrically to wealth shocks.[18]

There are several reasons for why we should observe an asymmetric behavior: (*i*) because of the assumption of diminishing marginal utility of wealth, risk averse agents would value increases in wealth

[18] For a detailed discussion on the causes of asymmetric wealth effects on consumption, see, for example, Apergis and Miller (2004).

less highly than equivalent decreases; (*ii*) the asymmetric behavior may be reinforced by certain features of capital gains taxation[19]; (*iii*) consumers might face liquidity constraints (Mishkin, 1976). Note, however, that this issue doesn't still gather a consensus, since the empirical evidence is quite inconclusive.[20]

With these caveats in mind, we examine whether consumption reacts asymmetrically to changes in financial wealth and house wealth, specifying the following models:

$$\Delta c_t = \upsilon + \sum_{j=0}^{q} \delta_j \Delta f^{+}_{t-j} + \sum_{j=0}^{q} \lambda_j \Delta f^{-}_{t-j} + \varepsilon_t, \tag{14}$$

$$\Delta c_t = \upsilon + \sum_{j=0}^{q} \delta_j \Delta u^{+}_{t-j} + \sum_{j=0}^{q} \lambda_j \Delta u^{-}_{t-j} + \varepsilon_t, \tag{15}$$

where $\Delta f^+ = \Delta f$ if $\Delta f \geqslant 0$, and $\Delta f^+ = 0$ otherwise, while $\Delta f^- = \Delta f$ if $\Delta f < 0$, and $\Delta f^- = 0$ otherwise; and $\Delta u^+ = \Delta u$ if $\Delta u \geqslant 0$, and $\Delta u^+ = 0$ otherwise, while $\Delta u^- = \Delta u$ if $\Delta u < 0$, and $\Delta u^- = 0$ otherwise. Thus, $\Delta f^+(\Delta f^-)$ denotes the positive (negative) movement of financial wealth; $\Delta u^+(\Delta u^-)$ denotes the positive (negative) movement of housing wealth. The null hypothesis states that the response of consumption to changes in financial (or housing) wealth is symmetric if the sum of the coefficients of a positive financial (or housing) wealth movement is equal to that of a negative movement, namely: $H_0 : \sum_{j=0}^{q} \delta_j = \sum_{j=0}^{q} \lambda_j$. Tables 4 and 5 present the Wald tests of symmetry of the financial and housing wealth shocks, respectively.

In the case of financial wealth, the negative shocks appear to have a greater magnitude in the short-run, while in the long-run, the positive shocks dominate. In the case of housing wealth, the negative shocks have, for all periods, a greater magnitude than the positive shocks. Moreover, for some periods ($q = 4$ and $q = 8$), the positive shocks in housing wealth have a negative effect on consumption, although the coefficient is very small. In sum, the Wald tests reject the idea of an asymmetric response of consumption with respect to positive (and negative) financial (and housing) wealth shocks for all the different lags considered.

[19] Specifically, the sale of an asset to finance increased consumption triggers a taxable event, but there is no corresponding taxable event for a consumer wishing to curtail consumption as the prices of asset fall. Note, however, that the effect of taxation is present even if the consumer intends to hold the asset indefinitely, as, for example, any stock which has risen in value embodies a tax liability, creating a distinction between the gross market value of the stock and its net value to the consumer who owns it.

[20] Shirvani and Wilbratte (2000) found that, for Germany, Japan, and the U.S., the wealth effects of the stock market on consumer spending are unequal, having a more powerful negative than positive impact, and indicating that market declines are in general of greater concern than increases, a worrisome finding for the current market as a source of potential instability. Chen *et al.* (2003), on the contrary, show that for Korea and Taiwan consumption responds positively more significantly in a stock market upturn than it responds negatively in downturns.

Table 4: Wald Tests of Symmetry of Financial Wealth Shocks.

Lags	$\sum_{j=0}^{q}\delta_j$	$\sum_{j=0}^{q}\lambda_j$	Wald Test
q=2	0.007	0.022**	0.500
	(0.464)	(2.449)	
q=4	0.014	0.014*	0.995
	(1.348)	(2.918)	
q=6	0.015**	0.011*	0.680
	(2.104)	(3.340)	
q=8	0.015**	0.008*	0.339
	(2.271)	(3.356)	

The table presents the estimated coefficients of the financial wealth shocks.

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

t-statistics appear in parentheses.

p-values are presented in the column "Wald test".

Table 5: Wald Tests of Symmetry of Housing Wealth Shocks.

Lags	$\sum_{j=0}^{q}\delta_j$	$\sum_{j=0}^{q}\lambda_j$	Wald Test
q=2	0.016	0.030	0.742
	(1.028)	(0.939)	
q=4	-0.001	0.033	0.297
	(-0.073)	(1.397)	
q=6	0.002	0.018	0.480
	(0.221)	(1.053)	
q=8	-0.003	0.019	0.238
	(-0.467)	(1.360)	

The table presents the estimated coefficients of the housing wealth shocks.

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

t-statistics appear in parentheses.

p-values are presented in the column "Wald test".

4 Does the (Dis)Aggregation of Wealth help to predict better Asset Returns and Consumption Growth?

We have argued that significant loading of the long-run relationship among consumption, (dis)aggregate wealth and income reflects agents' expectations of future changes in asset returns - in accordance with equation (10) - and should forecast asset returns. Moreover, since we disaggregate wealth into its main components (financial and housing wealth) and take, therefore, into account the different specificities of the asset holdings, we argue that $\widehat{cday_t}$ should provide a better forecast than a specification that doesn't consider this issue, like $\widehat{cay_t}$ in Lettau and Ludvigson (2001).

4.1 Forecasting quarterly asset returns

Following the methodology of Lettau and Ludvigson (2001), we look at total asset returns - in our case, from the MSCI Total Return Index - for which quarterly data are available and which should provide a good proxy for nonhuman components of asset wealth.

We denote r_t the log real return of the index in consideration and $r_{f,t}$ the log real yield rate of 3-month Treasury Bill (the "risk-free" rate). The log excess return is $r_t - r_{f,t}$.

Figure 2 plots the standardized trend deviation, $\widehat{cday_t}$, and the excess return on the MSCI Total Return Index over the period spanning 1975:Q1 and 2003:Q4. It shows a diversity of episodes during which positive (negative) trend deviations preceded large positive (negative) excess returns. Moreover, large fluctuations in the trend deviation tend to precede spikes in returns.

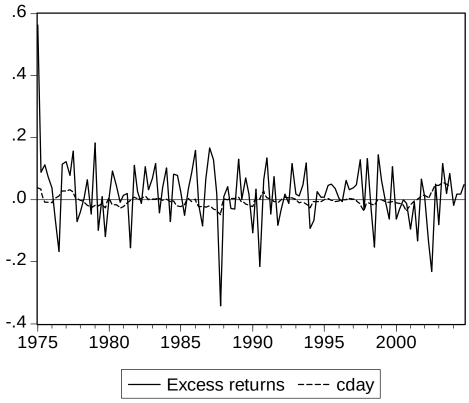

Figure 2: Excess returns and trend deviations.

We now move on to assess the forecasting power of $\widehat{cday}_t$, the deviations of consumption from its trend relationship with financial wealth, housing wealth and income, which is summarized in Table 6; and to compare it with $\widehat{cay}_t$, the deviations of consumption from its trend relationship with aggregate wealth and income, which is summarized in Table 7. Both tables report estimates from OLS regressions of log quarterly excess returns (and log quarterly real returns) on lagged variables named at the head of a column. Newey-West (1987) corrected t-statistics appear in parentheses below the coefficient estimate.

Table 6: Forecasting quarterly asset returns using $\widehat{\text{cday}}$.

#	Constant (t-statistic)	lag (t-statistic)	$\widehat{cday}_t$ (t-statistic)	$\bar{R}^2$
		Real Returns		
1	0.012	0.091		0.00
	(1.236)	(0.837)		
2	-2.101***		1.440***	0.06
	(-1.945)		(1.959)	
3	-2.022***	-0.053	1.387***	0.06
	(-1.957)	(-0.607)	(1.971)	
		Excess Returns		
4	0.007	0.079		0.00
	(0.744)	(0.836)		
5	-2.412*		1.646*	0.08
	(-2.057)		(2.063)	
6	-2.383*	-0.022	1.627*	0.07
	(-2.067)	(-0.327)	(2.073)	

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

Table 7: Forecasting quarterly asset returns using $\widehat{cay}$.

#	Constant (t-statistic)	lag (t-statistic)	$\widehat{cay}_t$ (t-statistic)	$\bar{R}^2$
		Real Returns		
1'	0.012	0.091		0.00
	(1.236)	(0.837)		
2'	0.442**		0.861**	0.02
	(2.498)		(2.336)	
3'	0.482**	-0.120	0.939**	0.02
	(2.572)	(-1.456)	(2.420)	
		Excess Returns		
4'	0.007	0.079		0.00
	(0.744)	(0.836)		
5'	0.508*		1.008*	0.03
	(2.956)		(2.812)	
6'	0.544*	-0.095	1.080*	0.03
	(3.014)	(-1.463)	(2.883)	

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

Tables 6 and 7 show that the regressions of returns on one lag of the dependent variable (rows 1, 1', for real returns; and 4 and 4', for excess returns) are quite weak. This model predicts a negligible percentage of next quarter's variation both of real returns and excess returns. By contrast, the trend deviation explains a substantial fraction of the variation in next quarter's return (rows 2, 2', for real returns and 5 and 5', for excess returns). Moreover, it explains better next quarter's excess return than next quarter's real return: not only the $\bar{R}^2$ are greater, but also the coefficients are significant at a lower percentage level. It is also shown that $\widehat{cday}$ helps to predict better future returns than $\widehat{cay}$: in the estimation of excess returns, $\widehat{cday}$ explains 6% of the variation in next quarter (row 2), while $\widehat{cay}$ explains only 2% (row 2'); in the estimation of real returns, $\widehat{cday}$ explains 8% of the variation in next quarter (row 5), while $\widehat{cay}$ explains only 3% (row 5'). Additionally, in both cases, the estimated coefficients using $\widehat{cday}$ are greater than those using $\widehat{cay}$. In fact, the predictive impact of $\widehat{cday}$ on future returns is economically larger than that of $\widehat{cay}$: the point estimate of the coefficient on $\widehat{cday}$ is about 1.440 for real returns (0.861 in the case of $\widehat{cay}$) and about 1.646 for excess returns (1.008 in the case of $\widehat{cay}$). To understand this units, note that the variables comprised in $\widehat{cday}$ are in per-capita terms, measured in millions of 2001 pounds, and that $\widehat{cday}$ itself has a standard deviation of about 0.018299. Thus, a one-standard-deviation increase in $\widehat{cday}$ leads to, approximately, a 78.7 basis points rise in the expected real return on MSCI Total Return Index and a 90 basis points increase in the expected excess returns, this is, respectively, a 3.18% and a 3.65% increase at an annual rate. Finally, regressions of real returns and excess returns on their own lags and on one lag of trend deviation (rows 3 and 6, using $\widehat{cday}$ and 3' and 6' using $\widehat{cay}$), produce basically the same results as the previous regressions: the $\bar{R}^2$ and the estimated coefficients remain unchanged and the predictive power of $\widehat{cday}$ is still greater than that of $\widehat{cay}$, in accordance with the results found by Lettau and Ludvigson (2001).

These results accord well with the economic intuition from the framework presented in Section 2. If returns on assets are expected to decline in the future, investors who desire to smooth consumption paths will allow consumption to fall temporarily below its long-term relationship with financial wealth, housing wealth and labor income in an attempt to insulate future consumption from lower returns, and vice versa. Thus, investors' optimizing behavior suggests that deviations in the long-term trend among c, f, u and y should be positively related to future asset returns, consistent with what we find.

4.2 Long-horizon forecasts

We also examine the relative predictive power of $\widehat{cday}$ for returns at longer horizons and compare it with $\widehat{cay}$. The theory behind equation (10) makes clear that the consumption-(dis)aggregate wealth ratio should track longer-term decisions in asset markets rather than provide accurate short-term forecasts of booms and crashes.

In principle, $\widehat{cday}$ could be a long-horizon forecaster of consumption growth, asset returns, or both. Tables 8, 9 and 10 present the results of single-equation regressions of consumption growth, and real returns and excess returns, over horizons spanning 1 to 24 quarters, on trend deviation $\widehat{cday}$ and compare them with $\widehat{cay}$. In the estimation of the regressions of consumption growth, the dependent variable is the H-period consumption growth rate $\Delta c_{t+1} + ... + \Delta c_{t+H}$; in the estimation of the regressions of excess returns, the dependent variable is the H-period log excess return on the MSCI Total Return Index, $r_{t+1} - r_{f,t+1} + .. + r_{t+H} - r_{f,t+H}$; in the estimation of the regressions of real returns, the dependent variable is the H-period log real return on the MSCI Total Return Index, $r_{t+1} + r_{t+H}$. For each regression, the tables report the estimated coefficient on the included explanatory variable(s), the adjusted R^2 statistic, and the Newey-West correct t-statistic for the hypothesis that the coefficient is zero.

Consistent with the estimation of the cointegrated VAR summarized in Table 1, the results shown in Table 8 suggest that $\widehat{cday}$ has some predictive power for future consumption growth, mainly, for horizons up to 5 quarters. The individual coefficients are statistically significant and the adjusted R^2 reaches a peak of 0.11 over a 3 quarter horizon. Moreover, the estimations based on $\widehat{cday}$ are perform better than those based on $\widehat{cay}$: the individual coefficients are not statistically significant and the R^2 statistic is smaller.

Table 8: Long-run horizon regressions for consumption growth.

		Forecast Horizon H								
Row	Regressor	1	2	3	4	5	8	12	16	24
		Consumption Growth, using $\widehat{cday}_t$								
1	$\widehat{cday}_t$	-0.10*	-0.15*	-0.27*	-0.30**	-0.34**	-0.31	-0.38	-0.49***	-0.39
	(t-statistic)	(-2.75)	(-2.73)	(-3.22)	(-2.39)	(-2.01)	(-1.35)	(-1.56)	(-1.81)	(-1.16)
	$\bar{R}^2$	[0.04]	[0.06]	[0.11]	[0.09]	[0.08]	[0.03]	[0.03]	[0.04]	[0.01]
		Consumption Growth, using $\widehat{cay}_t$								
2	$\widehat{cay}_t$	0.00	0.06	0.07	0.14	0.17	0.32	0.17	0.00	-0.19
	(t-statistic)	(-0.13)	(1.09)	(1.01)	(1.49)	(0.13)	(2.15)	(0.81)	(-0.01)	(-0.56)
	$\bar{R}^2$	[0.00]	[0.01]	[0.00]	[0.02]	[0.03]	[0.06]	[0.00]	[0.00]	[0.00]

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

Table 9 reports results from forecasting of the log real returns on the MSCI Total Return Index. It is shown that $\widehat{cday}$ has a significant forecasting power for future real returns, being particularly strong at short (3 and 4 quarters) to intermediate (12 quarters) horizons, with the adjusted R^2 statistic ranging between 0.04 and 0.06. In comparison, $\widehat{cay}$ performs worse: the coefficient estimates are less statistically significant, smaller in magnitude and, for the same horizons, the adjusted R^2 statistic ranges between 0.03 and 0.04.

Table 10 reports results from forecasting of the log excess returns on the MSCI Total Return Index, which roughly replicate those found in the previous Table, although it seems $\widehat{cday}$ is better at predicting excess returns than real returns. It is shown that $\widehat{cday}$ has a significant forecasting power for excess returns, and performs better than $\widehat{cay}$: its forecasting power is particularly strong at short (3 and 4 quarters) to intermediate (12 and 16 quarters) horizons, with the adjusted R^2 statistic ranging between 0.08 and 0.09; in comparison, $\widehat{cay}$ performs worse, since the coefficient estimates are less statistically significant, smaller in magnitude and, for the same horizons, the adjusted R^2 statistic ranges between 0.03 and 0.05.

Table 9: Long-run horizon regressions for real returns.

Row	Regressor	Forecast Horizon H								
		1	2	3	4	5	8	12	16	24
		Real Returns, using $\widehat{cday}_t$								
1	$\widehat{cday}_t$	0.76**	1.44**	2.10**	2.15**	2.01**	2.86***	4.44***	4.28***	1.78
	(t-statistic)	(1.98)	(2.25)	(2.46)	(2.43)	(2.21)	(1.87)	(1.96)	(1.66)	(0.68)
	$\bar{R}^2$	[0.03]	[0.04]	[0.06]	[0.05]	[0.04]	[0.04]	[0.05]	[0.03]	[0.00]
		Real Returns, using $\widehat{cay}_t$								
2	$\widehat{cay}_t$	0.68**	1.22**	1.65**	1.84**	1.85***	1.54	-0.84	-4.27**	-6.33*
	(t-statistic)	(1.99)	(2.06)	(2.05)	(2.08)	(1.84)	(1.18)	(-0.45)	(-2.14)	(-2.67)
	$\bar{R}^2$	[0.01]	[0.03]	[0.04]	[0.04]	[0.03]	[0.00]	[0.01]	[0.05]	[0.12]

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

Table 10: Long-run horizon regressions for excess returns.

Row	Regressor	Forecast Horizon H								
		1	2	3	4	5	8	12	16	24
		Excess Returns, using $\widehat{cday}_t$								
1	$\widehat{cday}_t$	0.93**	1.71**	2.47*	2.63*	2.59*	3.82*	5.92*	6.04*	4.30***
	(t-statistic)	(2.25)	(2.50)	(2.78)	(2.89)	(2.97)	(2.62)	(3.35)	(2.74)	(1.81)
	$\bar{R}^2$	[0.03]	[0.06]	[0.09]	[0.09]	[0.07]	[0.07]	[0.10]	[0.08]	[0.03]
		Excess Returns, using $\widehat{cay}_t$								
2	$\widehat{cay}_t$	0.75**	1.30**	1.78**	2.05**	2.12**	2.06***	0.18	-2.77	-4.45***
	(t-statistic)	(2.18)	(2.25)	(2.35)	(2.53)	(2.27)	(1.67)	(0.10)	(-1.31)	(-1.73)
	$\bar{R}^2$	[0.02]	[0.03]	[0.05]	[0.05]	[0.05]	[0.03]	[0.00]	[0.02]	[0.06]

Symbols *, ** and *** represent significance at a 1%, 5% and 10% level, respectively.

In sum, our results suggest that the disaggregation of wealth into its main components is an important issue in the context of forecasting future asset returns. Not only $\widehat{cday}$ performs better than $\widehat{cay}$ for short horizons, but its relative predictive power is also greater for larger periods. Unlike Lettau and Ludvigson (2001), our results also suggest that $\widehat{cday}$ has some predictive power for future consumption growth; as in their work, our results suggest that lagged returns predict a negligible percentage of next quarter's variation both of real returns and excess returns.

5 Conclusions

This paper uses the representative consumer's budget constraint to derive an equilibrium relation between the trend deviations among consumption, (dis)aggregate wealth and labor income (summarized by the variable $cday$) and expected future asset returns, and explores predictive power of the empirical counterpart of these trend deviations ($\widehat{cday}$) for future asset returns.

Using data for the U.K. for the period 1975:Q1 - 2003:Q4, we show that: (*i*) financial wealth effects are significantly different from housing wealth effects; (*ii*) changes in financial wealth are mainly transitory, while changes in housing wealth are better understood as permanent; (*iii*) the relationship among consumption, (dis)aggregate wealth and labor income was relatively stable over time; (*iv*) consumption doesn't react asymmetrically to positive and negative financial (or housing) wealth shocks.

The main finding of the paper is that $\widehat{cday}$ has high predictive power for future market returns (especially, over short and intermediate horizons) and it performs better than a variable like $\widehat{cay}$ suggested by Lettau and Ludvigson (2001), which doesn't take into account the issue of the disaggregation of wealth. Additionally, $\widehat{cday}$ has also some forecasting power for future consumption growth.

The advantage of $\widehat{cday}$ as predictor of asset returns is its ability to track the different characteristics of assets, which an aggregate measure of wealth ignores: if consumption is above its trend relationship, then agents expect higher financial asset returns or higher housing asset returns, this is, they expect higher average asset returns. Therefore, disaggregating wealth unto its main components (financial and housing wealth) is important within the context of forecasting future asset returns.

An important policy implication of our results is that large fluctuations in financial assets need not be associated with large subsequent movements in consumption: the model implies that households smooth out transitory variation in their financial, so that when consumption is currently below(above) its trend relationship with financial wealth, housing wealth and labor income, they have already factored the expectation of lower(higher) returns into today's consumption. In contrast, a great component of the variation of housing wealth is permanent, which implies that large swings in housing assets may be associated with large future changes in consumption. This is particularly important, since it implies that governments and central banks need to look carefully to the behaviors of financial and housing markets when defining macroeconomic stabilizing policies.

This work is, however, only a first approach to the subject. Therefore, there are several limitations: some are theoretical; other are methodological.

From the theoretical point of view, we can refer three limitations. First, we analyze the impact of wealth on consumption, but ignore its impact on investment. Our approach corresponds to a partial equilibrium perspective, not to a general equilibrium picture. Following Ludvigson and Steindel (1999) and Mehra (2001), we treat the interest rate and wealth as exogenous variables, when a general equilibrium' analysis would require them to be endogenous. Lantz and Sartre (2001) analyze this question, showing that consumption doesn't react directly to wealth changes, but instead both consumption and wealth react to changes in productivity. Since the effect of these changes on those variables is not linear, there is the possibility that consumption and wealth move in opposite directions. Second, our formulation ignores the labor income risk and its importance within the context of forecasting asset returns, an issue which has been dealt recently by Julliard (2004). Third, our specification implicitly assumes that agents consume a single numeraire good. In contrast, Lustig and Van Nieuwervurgh (2004), and Piazzesi *et al.* (2003) present models in which agents care about the composition of a consumption basket that includes housing services, an issue which has important implications for forecasting asset returns.

By the other hand, from a methodological point of view, we used the ADF tests and the methodology of Engle and Granger (1987) to detect, respectively, the existence of unit roots and cointegration. However, we should note that these methodologies have limitations: the ADF tests are not powerful when compared with alternative tests, and suffer from sample dimension bias, issues that can lead to the tendency for rejecting excessively the null hypothesis, when it is true, and not to reject it, when it is false; by its turn, the methodology proposed by Engle and Granger is criticized because of its weak power, for the potential bias of the long-run estimates in finite samples and the impossibility of applying statistical inference to the long-run parameters using t-statistics (Harris, 1995). These limitations have led to the development of alternative tests that allow more robust results. Harris (1995) and Maddala and Kim (1998) present a detailed description of the panoply of alternative tests.

Finally, this work is only a starting point for future research. A potentiality to analyze in the future is the role of financial deregulation/liberalization. Bayoumi (1993) and Caporale and Williams (1997), among others, point out the importance of these processes for the credit expansion and the elimination of liquidity restrictions that they provide; Bonser-Neal and Dewenter (1999) emphasize the effects of level of development of financial markets on the savings rate; and Bekaert *et al.* (2001) emphasize their importance for economic growth. Therefore, it would be important to approach the importance of these processes on the magnitude of wealth effects, an aspect that is analyzed in a recent work of Boone *et al.* (2001) and what are their implications for forecasting asset returns. Second, it would be also important to analyze the importance of the concentrated nature of the wealth on the verification of modest wealth effects and its impact on the dynamics of wealth distribution. Finally, although literature emphasizes the role played by wealth on non-durable consumption expenditure, it would also be interesting to analyze its role on durables consumption expenditure.

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Appendix

A Data Description

Consumption

Consumption is defined as total consumption (ZAKV) less consumption of durable (UTIB) and semi-durable goods (UTIR). Data are quarterly, seasonally adjusted at an annual rate, measured in millions of pounds (2001 prices), in per capita and expressed in the logarithmic form. Series comprises the period 1963:Q1 - 2003:Q4. The source is Office for National Statistics (ONS).

Wealth

Aggregate wealth is defined as the net worth of households and nonprofit organizations, this is, the sum of financial wealth and housing wealth. Data are quarterly, seasonally adjusted at an annual rate, measured in millions of pounds (2001 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1975:Q1 - 2004:Q1. The sources of information are: Fernandez-Corugedo *et al.* (2003), for the period 1975:Q1 - 1986:Q4; Office for National Statistics (ONS), for the period 1987:Q1 - 2004:Q1.

Financial wealth

Financial wealth is defined as the net financial wealth of households and nonprofit organizations (NZEA). Data are quarterly, seasonally adjusted at an annual rate, measured in millions of pounds (2001 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1970:Q1 - 2004:Q1. The sources of information are: Fernandez-Corugedo *et al.* (2003), for the period 1970:Q1 - 1986:Q4; Office for National Statistics (ONS), for the period 1987:Q1 - 2004:Q1.

Housing wealth

Housing wealth is defined as the housing wealth of households and nonprofit organizations and is computed as the sum of tangible assets in the form of residential buildings adjusted by changes in house prices (CGRI), the dwellings (of private sector) of gross fixed capital formation (GGAG) and Council house sales (CTCS). Original data is annual. Quarterly data was interpolated from original data using the following methodology: at the end of each year, any difference between Housing Wealth and CGRI is split into four and evenly distributed over the four quarters in that year (e.g. one quarter of the difference is put in the first quarter of the year, half in the second quarter, three quarters in the third, and the full difference in the fourth). Data are, therefore, quarterly, seasonally adjusted at an annual rate, measured in millions of pounds (2001 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1975:Q1 - 2004:Q1. The sources of information are: Fernandez-Corugedo *et al.* (2003), for the period 1975:Q1 - 1986:Q4; Office for National Statistics (ONS), for the period 1987:Q1 - 2004:Q1. For data on house prices, the sources of information are: Office of the Deputy Prime Minister (ODPM), Halifax Plc and the Nationwide Building Society.

After-tax labor income

After-tax labor income is defined as the sum of wages and salaries (ROYJ), social benefits (GZVX), self employment (ROYH), other benefits (RPQK + RPHS + RPHT - ROYS - GZVX + AIIV), employers social contributions (ROYK) less social contributions (AIIV) and taxes. Taxes are defined as [taxes on income (RPHS) and other taxes (RPHT)] x [(wages and salaries (ROYJ) + self employment (ROYH)) / (wages and salaries (ROYJ) + self employment (ROYH) + other income (ROYL - ROYT + NRJN - ROYH)]. Data are quarterly, measured in millions of pounds (2001 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1974:Q3 - 2003:Q4. The sources of information are: Fernandez-Corugedo *et al.* (2003), for the period 1974:Q3 - 1986:Q4; Office for National Statistics (ONS), for the period 1987:Q1 - 2003:Q4.

Population

Population is defined as mid-year estimates of resident population of the United Kingdom (DYAY) in millions. Original data are available as an annual series. The data are interpolated to quarterly frequencies, computing the annual population growth rate and the applying the average quarterly population growth rate every quarter. Series comprises the period 1946:Q4 - 2003:Q4. The source of information is Office for National Statistics (ONS).

Price deflator

The nominal consumption, wealth, financial wealth, housing wealth, labor income and interest rates were deflated by the All Items-Retail Prices Index (CHAW) (January 13 1987 = 100). Data are quarterly. Series comprises the period 1947:Q4 - 2004:Q4. The source of information is Office for National Statistics (ONS).

Inflation rate

Inflation rate was computed from price deflator. Data are quarterly. Series comprises the period 1947:Q3 - 2004:Q4. The source of information is Office for National Statistics (ONS).

Interest rate ("Risk-free rate")

Risk-free rate is defined as the quarterly real yield rate of 3-month Treasury Bills (AJRP). Original data are available as an annual series. Quarterly data are computed applying the average quarterly real yield rate every quarter. Series comprises the period 1972:Q1 - 2004:Q4. The source of information is Office for National Statistics (ONS).

Asset returns

Asset returns were computed using the MSCI Total Return Index for the UK, which measure the market performance, including price performance and income from dividend payments. We use the index which includes gross dividends, this is, approximating the maximum possible dividend reinvestment. The amount reinvested is the dividend distributed to individuals resident in the country of the company, but does not include tax credits. Series comprises the period 1970:Q1 - 2004:Q4. The source of information is Morgan Stanley Capital International (MSCI).

B Tests of the existence of unit roots and cointegration

Table B1: ADF tests to the variables' cointegration order (variables in levels).

	Augmented-Dickey Fuller t-Statistic[(a)]							Critical values[(d)]	
	Lag=0[(b)]	Lag=1	Lag=2	Lag=3	Lag=4	Lag=8	Lag=12[(c)]	5% Level	1% Level
c_t	-2.18	-2.11	-2.35	-2.14	-2.06	-2.43	-3.06*	-2.89	-3.49
f_t	-1.80	-1.85	-1.30	-1.71	-0.94	-1.70	-2.73	-2.89	-3.49
u_t	-0.53	-2.56	-2.54	-2.68	-2.27	-2.50	-1.88	-2.89	-3.49
y_t	-3.18*	-2.69	-2.60	-2.47	-2.62	-3.23*	-2.08	-2.89	-3.49

Symbols * and ** denote rejection of the null hypothesis at a significance level of 1 and 5%, respectively.

(b) ADF test with k=0 corresponds to DF (Dickey-Fuller) test.

(c) The choice of k=12 corresponds to the number of lags suggested by the rule of Schwert (1989):

$k = \text{Int}\left\{c(T/100)^{1/d}\right\}$, with k corresponding to the number of lags, T, the number of observations of the sample, c=12 and d=4.

(d) Critical values suggested by MacKinnon (1991).

Table B2: ADF tests to the variables' cointegration order (variables in first-order differences).

	Augmented-Dickey Fuller t-Statistics[(a)]							Critical values[(d)]	
	Lag=0[(b)]	Lag=1	Lag=2	Lag=3	Lag=4	Lag=8	Lag=12[(c)]	5% Level	1% Level
Δc_t	-12.07**	-6.51**	-5.86**	-5.05**	-4.33**	-2.55	-2.78	-2.89	-3.49
Δf_t	-9.90**	-8.47**	-6.15**	-6.27**	-5.20**	-2.60	-2.70	-2.89	-3.49
Δu_t	-3.45*	-3.24*	-3.05*	-3.37*	-2.99**	-2.73	-2.57	-2.89	-3.49
Δy_t	-11.68**	-8.15**	-6.58**	-5.27**	-4.06**	-4.44**	-3.97**	-2.89	-3.49

(a) Symbols * and ** denote rejection of the null hypothesis at a significance level of 1 and 5%, respectively.

(b) ADF test with k=0 corresponds to DF (Dickey-Fuller) test.

(c) The choice of k=12 corresponds to the number of lags suggested by the rule of Schwert (1989):

$k = \text{Int}\left\{c(T/100)^{1/d}\right\}$, with k corresponding to the number of lags, T, the number of observations of the sample, c=12 and d=4.

(d) Critical values suggested by MacKinnon (1991).

Table B3: Test of cointegration using the methodology of Engle and Granger (1987).

	Augmented-Dickey Fuller t-Statistics[(a)]							Critical values[(d)]	
	Lag=0[(b)]	Lag=1	Lag=2	Lag=3	Lag=4	Lag=8	Lag=12[(c)]	5% Level	1% Level
$\hat{c}day_t$	-3.88**	-3.54**	-3.39*	-2.96*	-2.61	-2.10	-2.71	-2.89	-3.49

(a) Symbols * and ** denote rejection of the null hypothesis at a significance level of 1 and 5%, respectively.

(b) ADF test with k=0 corresponds to DF (Dickey-Fuller) test.

(c) The choice of k=12 corresponds to the number of lags suggested by the rule of Schwert (1989):

$k = \text{Int}\left\{c(T/100)^{1/d}\right\}$, with k corresponding to the number of lags, T, the number of observations of the sample, c=12 and d=4.

(d) Critical values suggested by MacKinnon (1991).

C Tests of stability

Table C1: Tests of stability in the cointegrated VAR.

	Ave-LM	Exp-LM	Sup-LM
$H_0 : \beta_t = \beta_0$	5.226	4.525	15.354
$H_0 : \gamma_t = \gamma_0$	6.425*	3.616	9.962
Joint test	11.652*	8.632*	24.664*

*represent significance at 5% level.

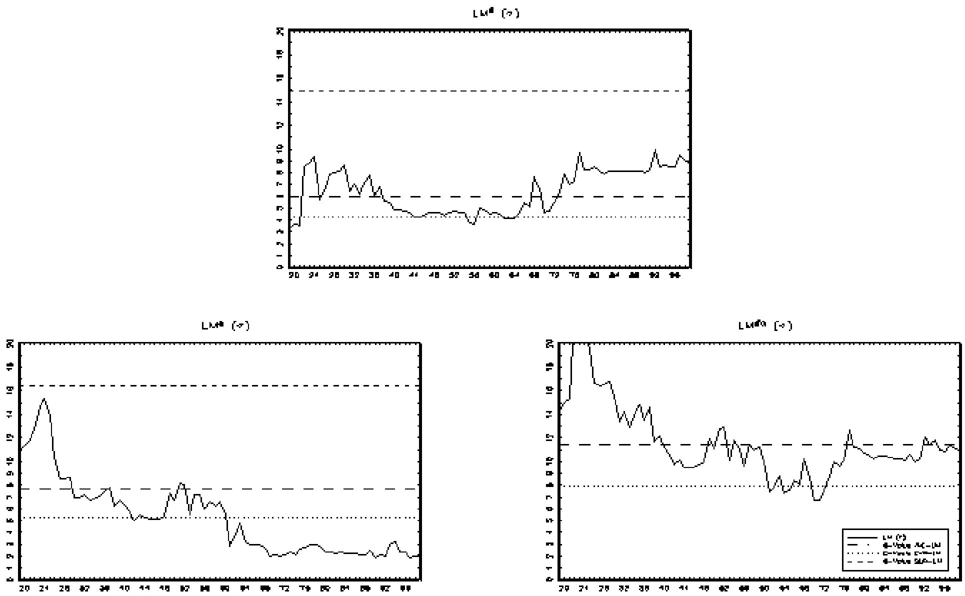

Figure C1: LM statistics of Seo (1998) for the U.K.' consumption function.

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