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The Consumption-Wealth Ratio and Asset Returns: The Euro Area, the UK and the US

Ricardo M. Sousa[$]

March 2010

Abstract

In this paper, I assess the forecasting power of the residuals of the trend relationship among consumption, aggregate wealth, and labour income for stock returns and government bond yields in the euro area, the UK and the US. I find that when stock returns are expected to be higher in the future, forward-looking investors will temporarily allow consumption to rise. As for bond returns, when government bonds are seen as a component of asset wealth, then investors react in the same manner. If, however, investors perceive the increase in bond returns as signalling a future rise in taxes or a deterioration of public finances, then they will let consumption fall temporarily below its equilibrium level.

Keywords: consumption, wealth, stock returns, bond returns.
JEL classification: E21, E44, D12.

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1. Introduction

Risk premium is generally considered as reflecting the ability of an asset to insure against consumption fluctuations (Sharpe, 1964; Lintner, 1965; Lucas, 1978; Breeden, 1979).

The empirical evidence has, however, shown that the covariance of returns across portfolios and contemporaneous consumption growth is not sufficient to justify the differences in expected returns.[1] In fact, the literature on asset pricing has concluded that inefficiencies of financial markets (Fama (1970, 1991, 1998), Fama and French (1996), Farmer and Lo (1999)), the rational response of agents to time-varying investment opportunities that is driven by variation in risk aversion (Sundaresan (1989), Constantinides (1990), Campbell and Cochrane (1999)) and in the joint distribution of consumption and asset returns (Duffee (2005), Santos and Veronesi (2006)), or by different models of economic behaviour, can justify why expected excess returns on assets appear to vary with the business cycle.

In addition, different economically motivated variables have been developed to capture time-variation in expected returns and document long-term predictability. Lettau and Ludvigson (2001) show that the transitory deviation from the common trend in consumption, aggregate wealth and labour income is a strong predictor of stock returns, as long as the expected returns to human capital and consumption growth are not too volatile. Bansal and Yaron (2004) and Bansal et al. (2005) find that the long-run risk, that is, the exposure of assets' cash flows to consumption is an important determinant of risk premium. Julliard (2004) emphasize the role of labor income risk, while Lustig and Van Nieuwerburgh (2005) show that the housing collateral ratio can shift the conditional distribution of asset prices and consumption growth. Parker and Julliard (2005) measure the risk of a portfolio by its ultimate risk to consumption, that is, the covariance of its return and consumption growth over the quarter of the return and many following quarters. Wei (2005) argues that human capital risk can generate sufficient variation in the agent's risk and explain equity returns and bond yields. Yogo (2006) and Piazzesi et al. (2007) emphasize the role of non-separability of preferences in explaining the countercyclical variation in the equity premium while Fernandez-Corugedo et al. (2007) focus on the relative price of durable goods.

Contrary to the literature on the predictability of stock returns, the evidence on the determinants of bond risk premium is roughly inexistent. Among these, one can mention: (i) the spread between the forward rate and the one-year yield (Fama and Bliss, 1987; Cochrane and Piazzesi, 2005; Ludvigson and Ng, 2005); (ii) the Treasury yield spreads (Campbell and Shiller, 1991; Silva et al., 2003; Wachter, 2006); (iii) a slow-moving habit driven by shocks to aggregate consumption (Campbell and Cochrane, 1999); (iv) shocks to inflation and to aggregate consumption (Brandt and Wang, 2003).

The current paper argues that question of predictability of *both* stock and government bond returns can be understood by combining wealth and macroeconomic data. In particular, I build upon the work of Lettau and Ludvigson (2001), and show that the transitory deviation from the common trend in consumption, aggregate wealth and labour income, *cay*, can be used to explain *both* stock and bond risk premium. In this context, the paper is close in spirit with the work of Guidolin et al. (2009) who assess the non-linear predictability in stock and bond returns.

As in Lettau and Ludvigson (2001), investors insulate future consumption from fluctuations in expected returns and, therefore, allow consumption to rise (decrease) above (below) its common trend with aggregate wealth and labour income, when they expect stock returns to be (lower) in the future.

In what concerns bond returns, first one needs to understand the way government debt is perceived by the agents. If government bonds are seen as a component of asset wealth, then investors allow consumption to rise above its equilibrium relationship with aggregate wealth and labour income when they expect an increase in government bond yields. If, however, the issuance of government debt is understood to lead to an increase of future taxes or is seen as a symptom of public finance deterioration, then investors will allow consumption to fall below its common trend with aggregate wealth and labour income when they expect government bond returns to increase.

Using data for the euro area, the UK and the US, I show that the predictive power of *cay* is particularly important for horizons spanning from 2 to 3 quarters

Following Sousa (2009), I also focus on the importance of composition of asset wealth in the context of forecasting asset returns. Specifically, I estimate the trend deviation of consumption from its common trend with financial wealth, housing wealth, and labour income, *cday*, and show that it performs better than *cay*.

The empirical evidence shows that the power of *cay* and *cday* in forecasting real stock returns is more important for the UK and the US. As for the euro area, those proxies do not seem to capture well the time-variation in stock returns.

Regarding bond bond returns, the analysis suggests that: (i) in the case of the UK, both *cay* and *cday* have an associated coefficient with positive sign in the forecasting regressions, corroborating the idea that government debt is seen as part of the investor's asset wealth; and (ii) in the case of the euro area and the US, the coefficient associated to *cay* and *cday* is negative, implying that agents perceive the rise in government bond returns rather as a deterioration of public finances and as signalling an increase in future taxation.

I also assess the robustness of our results, which show that: (i) the inclusion of additional control variables does not change the predictive power of *cay* and *cday*; and (ii) models that include *cay* and *cday* perform better than the constant expected returns benchmark model.

Finally, I show that there is evidence of synchronization of expectations about future returns: the temporary deviation of consumption from the common trend with aggregate wealth, and labour income in one country is able to capture time variation in future returns of another country. This piece of evidence opens new avenues for exploring the comovement of asset returns across financial markets.

The paper is organized as follows. Section 2 describes the theoretical approach. Section 3 presents the estimation results of the forecasting regressions for stock returns and government bond yields. Section 4 provides the robustness analysis, while Section 5 analyzes the issue of expectations' synchronization. Finally, Section 6 concludes and discusses the implications of the findings.

2. Theoretical framework

Defining W_t as aggregate wealth (given by human capital plus asset holdings), C_t as private consumption, and $R_{w,t+1}$ as the return on aggregate wealth between period t and $t+1$, the consumer's budget constraint can be written as:

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

Campbell and Mankiw (1989) show that, under the assumption that the consumption-aggregate wealth is stationary and that $\lim_{i\to\infty} \rho_w{}^i (c_{t+i} - w_{t+i}) = 0$, where $\rho_w := (W - C)/W < 1$, equation (1) can be approximated by a Taylor expansion, which gives

$$c_t - w_t = \sum_{i=1}^{\infty} \rho_w^i r_{w,t+i} - \sum_{i=1}^{\infty} \rho_w^i \Delta c_{t+i} + k_w, \qquad (2)$$

where *c:=logC*, *w:=logW*, and k_w is a constant. The aggregate return on wealth can be decomposed as

$$R_{w,t+1} = \omega_t R_{a,t+1} + (1\text{-}\omega_t) R_{h,t+1}, \qquad (3)$$

where ω_t is a time varying coefficient and $R_{a,t+1}$ is the return on asset wealth. Campbell (1996) shows that the last expression can be approximated as

$$r_{w,t} = \omega_t r_{a,t} + (1\text{-}\omega_t) r_{h,t} + k_r, \qquad (4)$$

where k_r is a constant, $r_{w,t}$ is the log return on asset wealth. Moreover, the log total wealth can be approximated as

$$\mathrm{w}_t = \omega a_t + (1\text{-}\omega)\mathrm{h}_t + k_a, \qquad (5)$$

where a_t is the log asset wealth, h_t is the log human wealth, ω is the mean of ω_t, and k_a is a constant.

Campbell (1996) and Jagannathan and Wang (1996) show that labour income, Y_t, can be thought of as the dividend on human capital, H_t. Therefore, the return to human capital can be defined as:

$$1+R_{h,t+1}=\frac{H_{t+1}+Y_{t+1}}{H_t}. \qquad (6)$$

This relation can be log-linearized around the steady state (under the assumption that the steady state human capital-labour income ratio is constant, that is, $Y/H=\rho_h^{-1}-1$, where $0<\rho_h<1$),[2] to get

$$r_{h,t+1}=(1-\rho_h)k_h+\rho_h(h_{t+1}-y_{t+1})-(h_t-y_t)+\Delta y_{t+1}, \qquad (7)$$

where *r:=log(1+R), h:=logH, y:=logY*, k_h is a constant of no interest, and the variables without time subscript are evaluated at their steady state value. Assuming that $\lim_{i\to\infty}\rho_h{}^i(h_{t+i}-y_{t+i})=0,$ the log human capital income ratio can be rewritten as a linear combination of future labour income growth and future returns on human capital:

$$h_t-y_t=\sum_{i=1}^{\infty}\rho_h^{i-1}(\Delta y_{t+i}-r_{h,t+i})+k_h. \qquad (8)$$

Replacing equation (4), (7) and (8) into (2), one obtains

$$\boldsymbol{c_t}-\omega\boldsymbol{a_t}-(1-\omega)(\boldsymbol{y_t}+\sum_{\boldsymbol{i}=1}^{\infty}\rho_{\boldsymbol{h}}^{\boldsymbol{i}-1}\Delta\boldsymbol{y}_{\mathrm{t+i}})+\sum_{\boldsymbol{i}=1}^{\infty}\rho_{\boldsymbol{w}}^{\boldsymbol{i}}\Delta\boldsymbol{c}_{\mathrm{t+i}}=$$

$$=\omega\sum_{i=1}^{\infty}\rho_w^i r_{\mathrm{a,t+i}}+(1-\omega)\sum_{i=1}^{\infty}(\rho_w^i-\rho_h^{i-1})r_{\mathrm{h,t+i}}+k, \qquad (9)$$

where k is a constant. This equation holds ex-post as a direct consequence of agent's budget constraint, but it also has to hold ex-ante. Taking time t conditional expectation of both sides, I have

$$\underbrace{\boldsymbol{c_t} - \omega \boldsymbol{a_t} - (1-\omega)\boldsymbol{y_t}}_{\boldsymbol{cay_t}} = \omega \boldsymbol{E_t} \sum_{\boldsymbol{i}=1}^{\infty} \rho_{\boldsymbol{w}}^{\boldsymbol{i}} \boldsymbol{r}_{\mathrm{a,t+i}} + (1-\omega)\boldsymbol{E_t} \sum_{\boldsymbol{i}=1}^{\infty} \rho_{\boldsymbol{h}}^{\boldsymbol{i}-1} \Delta \mathrm{y}_{\mathrm{t+i}} + \boldsymbol{E_t} \sum_{\boldsymbol{i}=1}^{\infty} \rho_{\boldsymbol{w}}^{\boldsymbol{i}} \Delta \mathrm{c}_{\mathrm{t+i}} + \eta_{\boldsymbol{t}} + \boldsymbol{k}, \tag{10}$$

where $\eta_t := (1-\omega)\sum_{i=1}^{\infty}(\rho_w^i - \rho_h^{i-1}) r_{\mathrm{h,t+i}}$, is a stationary component.

When the left hand side of equation (10) is high, consumers expect high future returns on market wealth. Based on that equation, cay_t should carry relevant information about market expectations of future asset returns, $r_{a,t+i}$. In particular, it can be used to forecast not only the stock returns, but also government bond returns and in the current work I also assess such predicting power.

Finally, the (uncovered) interest rate parity provides a link between the asset returns of the two countries, that is:

$$\boldsymbol{r_t^l} \cong \boldsymbol{r_t^j} + \Delta \boldsymbol{e_t^{j/l}}, \tag{11}$$

where $\Delta \boldsymbol{e_t^{j/l}}$ represents the change in the real effective exchange rate between country l and j. Plugging this into equation (10), one obtains

$$\boldsymbol{cay_t^l} = \omega \boldsymbol{E}_t \sum_{\boldsymbol{i}=1}^{\infty} \rho_w^{\boldsymbol{i}} (\boldsymbol{r_{a,t+i}^j} + \Delta \boldsymbol{e_t^{j/l}}) + (1-\omega)\boldsymbol{E}_t \sum_{\boldsymbol{i}=1}^{\infty} \rho_{\boldsymbol{h}}^{\boldsymbol{i}-1} \Delta \mathrm{y}_{\mathrm{t+i}}^{\boldsymbol{l}} + \boldsymbol{E_t} \sum_{\boldsymbol{i}=1}^{\infty} \rho_w^{\boldsymbol{i}} \Delta \mathrm{c}_{\mathrm{t+i}}^{\boldsymbol{l}} + \eta_{\boldsymbol{t}} + \boldsymbol{k}, \tag{12}$$

that is, cay_t^I can be a good proxy for market expectations of future financial returns in country, j, r_{t+i}^{j}, and/or future changes in the exchange rate, $\Delta e_{t+i}^{j/I}$.

Note, however, that this identity assumes that: (i) the default risk over domestic and foreign currency denominated assets is the same; (ii) there is perfect capital mobility; and (iii) there are no transaction costs.

3. Empirical results

3.1. Data

This Section provides a summary description of the data employed in the empirical analysis. A detailed description can be found in the Appendix.

In the estimations, I use quarterly data for the euro area, the U.K. and the U.S. for the period 1980:1-2007:4, and all variables are measured at constant prices and expressed in the logarithmic form of per capita terms.

In the case of the U.S., the definition of consumption follows Lettau and Ludvigson (2001), and corresponds to the expenditure in nondurable consumption goods and services excluding clothing and shoes. Data on income includes only labor income. Original data on wealth correspond to the end-period values. Therefore, I lag once the data, so that the observation of wealth in t corresponds to the value at the beginning of the period t+1. The major data sources are the Bureau of Economic Analysis from the U.S. Department of Commerce and the Flow of Funds Accounts from the Board of Governors of Federal Reserve System.

As for the U.K., the definition of consumption excludes durable and semi-durable goods, while the definitions of income and wealth are similar to those for the U.S.. The main data source is the Office for National Statistics (ONS), although for housing wealth, I also use data from Halifax plc, the Nationwide Building Society and the Office of the Deputy Prime Minister.

In the case of the euro área, consumption corresponds to private consumption and the main data source is the European Central Bank (ECB). Euro area aggregates are calculated as weighted average of euro-11 before 1999 and, thereafter, as break-corrected series covering the real-time composition of the euro area. While this has some drawbacks such as the fact that the historical data originates from the time prior to EMU when the member economies experienced different monetary policy regimes and the possibility of aggregation bias, a reasonably set of accurate estimates can be constructed from a sensible combination of financial, macroeconomic, and sectorial indicators for which there are data that goes far back in time (Beyer et al. 2001; Beyer, 2008).

3.2. The long-run relation

I first use the Augmented Dickey and Fuller (1979) and the Phillips and Perron (1988) tests to determine the existence of unit roots in the series and conclude that all the series are first-order integrated, *I(1)*. Next, I analyze the existence of cointegration among the series, using the methodology of Engle and Granger (1987), Phillips and Ouliaris (1990) and Johansen (1991), and find evidence that supports that hypothesis. Finally, I estimate the trend relationship among consumption, wealth and labour income following Davidson and Hendry (1981), Blinder and Deaton (1985), Ludvigson and Steindel (1999), and Davis and Palumbo (2001) among others.

I also disaggregate wealth into its main components - financial wealth and housing wealth – given that the impact of different assets categories on consumption can be different (Zeldes, 1989; and Poterba and Samwick, 1995). Following Saikkonen

(1991) and Stock and Watson (1993), I use a dynamic least squares (DOLS) technique, specifying the following equation

$$c_t = \mu + \beta_a a_t + \beta_y y_t + \sum_{i=-k}^{k} b_{a,i} \Delta a_{t-i} + \sum_{i=-k}^{k} b_{y,i} \Delta y_{t-i} + \varepsilon_t \qquad (13)$$

where the parameters β_a and β_y represent, respectively, the long-run elasticities of consumption with asset wealth and labour income, Δ denotes the first difference operator, α is a constant, and ε_t is the error term.[3]

Table 1.1 shows the estimates (ignoring coefficient estimates on the first differences) for the shared trend among consumption, asset wealth, *a*, and income, *y*. It can be seen that the long-run elasticities of consumption with respect to aggregate wealth are quite similar, the largest being the UK (0.17). Moreover, the disaggregation between asset wealth and labour income is statistically significant for all countries. The table also presents the unit root tests to the residuals of the cointegration relationship based on the methodologies of Engle and Granger (1987) and Johansen (1991) and shows that they are stationary (one can reject the null of a unit root).

[PLACE TABLE 1.1 HERE.]

Table 1.2 reports the estimates of the long-run elasticities of consumption with respect to financial wealth, *f*, housing wealth, *h*, and labour income, *y*. First, it shows that the disaggregation between financial and housing wealth is statistically significant (with the exception of the euro area, where housing wealth effects do not seem to be important), therefore, giving rise to the idea that consumption reacts differently by category of asset wealth. Moreover, consumption is broadly more sensitive to changes in financial wealth than to changes in housing wealth, as the elasticities of consumption with respect to financial wealth are in general larger in magnitude. Finally, the cointegration tests suggest that the residuals of the cointegration relationship among consumption, financial wealth, housing wealth and labour income are stationary.

[PLACE TABLE 1.2 HERE.]

3.3. Forecasting stock returns

Equation (10) shows that transitory deviations from the long-run relationship among consumption, aggregate wealth and income, cay_t, mainly reflect agents' expectations of future changes in asset returns.

Moreover, since I disaggregate asset wealth into its main components (financial and housing wealth) and take, therefore, into account the different composition and specificities of the asset holdings, I argue that $cday_t$ should provide a better forecast than a variable like cay_t in Lettau and Ludvigson (2001).

I look at real stock returns (denoted by SR_t) for which quarterly data are available and should provide a good proxy for the non-human component of asset wealth.

Table 2.1 summarizes the forecasting power of cay_t – the deviations of consumption from its trend relationship with asset wealth and income – for different horizons. It reports estimates from OLS regressions of the H-period real stock return, $SR_{t+1} + \ldots + SR_{t+H}$, on the lag of cay_t.

It shows that, in the case of the UK and the US, cay_t is statistically significant and the point estimate of the coefficient is relatively large in magnitude. Moreover, its sign is positive. These results are in line with the framework presented in Section 2, suggesting that investors will temporarily allow consumption to rise above its long-term relationship with asset wealth and labour income in order to smooth it and insulate it from an increase in real stock returns. Therefore, deviations in the long-term trend among c_t, a_t and y_t should be positively related to future stock returns.

It can also be seen that the trend deviations explain an important fraction of the variation in future real returns (as described by the adjusted R^2), in particular, at horizons spanning from 2 to 3 quarters.

In contrast, the results suggest that cay_t does not help explaining stock returns in the euro area.

[PLACE TABLE 2.1 HERE.]

Table 2.2 summarizes the forecasting power of $cday_t$ – the deviations of consumption from its trend relationship with financial wealth, housing wealth and income – for different horizons. It reports estimates from OLS regressions of the *H*-period real stock return, $SR_{t+1} + \ldots + SR_{t+H}$, on the lag of $cday_t$.

In accordance with the findings for cay_t, it shows that, for the UK and the US, the point estimate of the coefficient of $cday_t$ is large in magnitude and its sign is positive. These results suggest that investors will temporarily allow consumption to rise above its long-term relationship with financial wealth, housing wealth and labour income in order to smooth it and insulate it from an increase in real stock returns. Therefore, deviations in the long-term trend among c_t, f_t, h_t and y_t should be positively related to future stock returns.

In addition, $cday_t$ performs better than cay_t, also in accordance with the findings of Sousa (2009), reflecting the ability of $cday_t$ to track the changes in the composition of asset wealth. Portfolios with different compositions of assets are subject to different taxation, transaction costs or degrees of liquidity: for example, agents who hold portfolios where the exposure to housing wealth is larger bear an additional risk associated with the (il)liquidity of these assets and the high transaction costs involved in trading them up or down. Wealth composition is, therefore, an important source of risk that $cday_t$ - but not cay_t - is able to explain.

[PLACE TABLE 2.2 HERE.]

3.4. Forecasting government bond returns

I now look at the power of cay_t (Table 3.1) and $cday_t$ (Table 3.2) in predicting bond returns (proxied by the government bond yields and denoted by BR_t) for which quarterly data are available. In contrast with stocks, an increase in government debt (in particular, in the government bond return) may not be seen as a rise in wealth, but perceived as a mere signal of a future increase in taxes. As a result: (i) when agents see government debt as a component of wealth, one should expect a positive point coefficient for cay_t and/or $cday_t$ in the forecasting regressions for government bond yields; and (ii) when investors interpret the rise in government debt as a signal of future tax rises, deviations in the long-term trend among c_t, a_t and y_t – that is, cay_t – or in the long-term trend among c_t, f_t, h_t and y_t – that is, $cday_t$ – should be negatively related to future government bond returns.

Table 3.1 summarizes the forecasting power of cay_t – the deviations of consumption from its trend relationship with asset wealth and income – for different horizons. It reports estimates from OLS regressions of the H-period real government bond return, $BR_{t+1} + \ldots + BR_{t+H}$, on the lag of cay_t.

It shows that cay_t explains a fraction of the variation in future real government bond yields (as described by the adjusted R^2), in particular, at horizons spanning from 2 to 3 quarters.

Interestingly the results suggest that the sign of the coefficient of cay_t is positive for the UK , corroborating the idea that government debt is seen as part of the investor's asset wealth: agents allow consumption to rise above its equilibrium relationship with asset wealth and labour income when they expect government bond yields to increase in the future. As for the euro area and the US, agents perceive the rise in government bond returns as a deterioration of the public finances and an increase in future taxation. Consequently, they reduce consumption below its common trend with asset wealth and labour income.

[PLACE TABLE 3.1 HERE.]

Table 3.2 describes the results from forecasting regressions of $cday_t$ - the deviations of consumption from its trend relationship with financial wealth, housing wealth, and income – for different horizons. It reports estimates from OLS regressions of the *H*-period real government bond return, $BR_{t+1} + ... + BR_{t+H}$, on the lag of $cday_t$.

The results suggest that the sign of the coefficient of $cday_t$ is positive for all countries, therefore, supporting the idea that government debt is considered a component of wealth.

[PLACE TABLE 3.2 HERE.]

4. Robustness analysis

4.1. Additional control variables

In this Sub-section, I assess the robustness of the forecasting power of *cay* and *cday* in the regressions of real stock returns and government bond yields.

The literature on the predictability of stock returns has indeed suggested that some financial indicators may contain forecasting power, namely: (i) the ratios of price to dividends or earnings (Shiller, 1984; Campbell and Shiller, 1988; Fama and French, 1988); (ii) the ratio of dividends to earnings (Lamont, 1998; and (iii) the relative T-bill rate,[4] the term spread,[5] and the default spread[6] (Campbell, 1991; Hodrick, 1992; Fama and French, 1989).[7]

Table 4.1 reports the estimates from forecasting regressions of stock returns that add the dividend yield ratio ($DivYld_t$) to the set of regressors. The results show that both the point coefficient estimates of *cay* and *cday* slightly increase and their statistical significance marginally improves with respect to the findings of Tables 2.1 and 2.2. Finally, the dividend yield ratio ($DivYld_t$) seems to provide relevant information about future asset returns: it is statistically significant in practically all regressions and it improves the adjusted R-square.

[PLACE TABLE 4.1 HERE.]

Table 4.2 reports the estimates from forecasting regressions that include the inflation rate (*Inflation*) to the set of predictors of government bond yields. The results show that the point coefficient estimates of *cay* and *cday* and their statistical significance do not change with respect to the findings of Tables 3.1 and 3.2. Nevertheless, the R-square substantially rise when inflation is included in the regressions, in particular, for the euro area and the US. This, therefore, suggests that investors use government bonds to hedge against the risk of inflation.

[PLACE TABLE 4.2 HERE.]

4.2. Nested forecast comparisons

As a final robustness check, I make nested forecast comparisons, in which I compare the mean-squared forecasting error from a series of one-quarter-ahead out-of-sample forecasts obtained from a prediction equation that includes either *cay* or *cday* as the sole forecasting variables, to a variety of forecasting equations that includes a constant (as the only explanatory variable), that is, the *constant expected* returns is considered as the benchmark model.

Table 5.1 summarizes the nested forecast comparisons for the equations of the real stock returns and the government bond yields using *cay*. It shows that, in general, including *cay* in the forecasting regressions improves over the benchmark models. This is particularly important when the benchmark model is the *constant expected returns benchmark*, and, therefore, supports the existence of time-variation in expected returns.

Table 5.2 provides the nested forecast comparisons for the equations of real stock returns and the real government bond returns using *cday*. It can be seen that models that include *cday* generally have a lower mean-squared forecasting error. Moreover, the ratios are smaller that the ones presented in Table 5.1, which constitutes evidence that *cday* is able to better predict both stock returns and government bond yields than *cay*.

[PLACE TABLE 5.1 HERE.]

[PLACE TABLE 5.2 HERE.]

5. “Synchronization” of Expected Returns

Can empirical proxies that capture time-variation in expected returns in one country be used to forecast asset returns in another country? Is there evidence of “synchronization” of expectations about future returns?

This Sub-Section provides a first approach to these questions, given the correlation between house price cycles and business cycles across the euro area, the UK and the US. In addition, residents in one country can invest in assets of another country. Therefore, one can argue that the consumption-aggregate wealth ratio in one country can be used to forecast asset returns of another country.

Tables 6.1, 6.2, 6.3 and 6.4 assess the forecasting power of the US consumption-wealth ratio, cay_t^{US}, and consumption-(dis)aggregate wealth ratio, $cday_t^{US}$ for both stocks and government bond returns in the euro area and the UK.

Tables 7.1, 7.2, 7.3 and 7.4 replicate the exercise using cay_t^{UK} and $cday_t^{UK}$, and their linkages with stocks and government bond returns in the euro area and the US.

Finally, Tables 8.1, 8.2, 8.3 and 8.4 look at the forecasting power of replicate the exercise using cay_t^{EA} and $cday_t^{EA}$, for both stocks and government bond returns in the UK and the US.

Tables 6.1 and 6.2 show that cay_t^{US} and $cday_t^{US}$ explain between 1% and 2% of future stock returns in the euro area and the UK. As for Tables 6.3 and 6.4, the empirical findings suggest that $cday_t^{US}$ explain between 3% and 4% of future bond yields in the euro area and between 1% and 3% of bond yields in the UK. Nevertheless, cay_t^{US} does not seem to be able to forecast government bond yields.

[PLACE TABLE 6.1 HERE.]

[PLACE TABLE 6.2 HERE.]

[PLACE TABLE 6.3 HERE.]

[PLACE TABLE 6.4 HERE.]

Tables 7.1 and 7.2 show that $\boldsymbol{cay}_t^{UK}$ and $\boldsymbol{cday}_t^{UK}$ explain between 5% and 10% of future stock returns in the euro area and between 1% and 2% of future stock returns in the US. As for Tables 7.3 and 7.4, the empirical findings suggest that the two proxies explain future bond yields in the euro area relatively well, but perform poorly regarding future bond yields in the US.

[PLACE TABLE 7.1 HERE.]

[PLACE TABLE 7.2 HERE.]

[PLACE TABLE 7.3 HERE.]

[PLACE TABLE 7.4 HERE.]

Finally, Tables 8.1 and 8.2 show that $\boldsymbol{cay}_t^{EA}$ and $\boldsymbol{cday}_t^{EA}$ do not seem to forecast stock returns in the UK and the US. In contrast, Tables 8.3 and 8.4 show that they explain between 1% and 11% of future government bond yields in both the UK and the US.

[PLACE TABLE 8.1 HERE.]

[PLACE TABLE 8.2 HERE.]

[PLACE TABLE 8.3 HERE.]

[PLACE TABLE 8.4 HERE.]

6. Conclusion

This paper assesses the predictive power of the empirical counterpart of the trend deviations among consumption, (dis)aggregate wealth and labour income (summarized by the variables *cay* and *cday*) for *both* future stock returns and government bond yields in the euro area, the UK and the US.

It shows that when stock returns are expected to be higher (lower) in the future, forward-looking investors will allow consumption to rise (decrease) above (below) its common trend with aggregate wealth and labour income.

As for bond returns, if government bonds are seen as a component of asset wealth, then investors allow consumption to rise above its equilibrium relationship with asset wealth and labour income when they expect an increase in government bond yields. If, however, the increase in government bond returns is perceived as a symptom of public finance deterioration (and, consequently, as a rise in future taxes), then investors will allow consumption to fall below its common trend with aggregate wealth and labour income.

I show that the predictive power of *cay* and *cday* for real stock returns is important for the UK and the US, but does not seem to capture time-variation in stock returns for the euro area.

In what concerns bond returns, the analysis suggest that while in the UK government debt is seen as part of the investor's asset wealth, in the case of the euro area and the US agents perceive the rise in government bond returns as a deterioration of the public finances and an increase in future taxation.

Finally, I show that expectations about future returns seem to be “synchronized”. In particular, the consumption-(dis) aggregate wealth ratio in one country is able to predict asset returns in another country. In line with the findings of Evans and McMillan (2009), this piece of evidence opens new and challenging avenues for exploring the international comovement of asset returns.

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Appendix

A. Data Description

A.1 U.S. Data

Consumption

Consumption is defined as the expenditure in non-durable consumption goods and services. Data are quarterly, seasonally adjusted at an annual rate, measured in billions of dollars (2000 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1947:1-2008:4. The source is U.S. Department of Commerce, Bureau of Economic Analysis, NIPA Table 2.3.5.

Aggregate wealth

Aggregate wealth is defined as the net worth of households and nonprofit organizations. Data are quarterly, seasonally adjusted at an annual rate, measured in billions of dollars (2000 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1952:2-2008:4. The source of information is Board of Governors of Federal Reserve System, Flow of Funds Accounts, Table B.100, line 41 (series FL152090005.Q).

Financial wealth

Financial wealth is defined as the sum of financial assets (deposits, credit market instruments, corporate equities, mutual fund shares, security credit, life insurance reserves, pension fund reserves, equity in noncorporate business, and miscellaneous assets - line 8 of Table B.100 - series FL154090005.Q) minus financial liabilities (credit market instruments excluding home mortgages, security credit, trade payables, and deferred and unpaid life insurance premiums - line 30 of Table B.100 - series FL154190005.Q). Data are quarterly, seasonally adjusted at an annual rate, measured in billions of dollars (2000 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1952:2-2008:4. The source of information is Board of Governors of Federal Reserve System, Flow of Funds Accounts, Table B.100.

Housing wealth

Housing wealth (or home equity) is defined as the value of real estate held by households (line 4 of Table B.100 - series FL155035015.Q) minus home mortgages (line 32 of Table B.100 – series FL153165105.Q). Data are quarterly, seasonally adjusted at an annual rate, measured in billions of dollars (2000 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1952:2-2008:4. The source of information is Board of Governors of Federal Reserve System, Flow of Funds Accounts, Table B.100.

After-tax labor income

After-tax labor income is defined as the sum of wage and salary disbursements (line 3), personal current transfer receipts (line 16) and employer contributions for employee pension and insurance funds (line 7) minus personal contributions for government social insurance (line 24), employer contributions for government social insurance (line 8) and taxes. Taxes are defined as: [(wage and salary disbursements (line 3)) / (wage and salary disbursements (line 3)+ proprietor's income with inventory valuation and capital consumption adjustments (line 9) + rental income of persons with capital consumption adjustment (line 12) + personal dividend income (line 15) + personal interest income (line 14))] * (personal current taxes (line 25)). Data are quarterly, seasonally adjusted at annual rates, measured in billions of dollars (2000 prices), in per capita terms and expressed in the logarithmic form. Series comprises the period 1947:1-2008:4. The source of information is U.S. Department of Commerce, Bureau of Economic Analysis, NIPA Table 2.1..

Population
Population was defined by dividing aggregate real disposable income (line 35) by per capita disposable income (line 37). Data are quarterly. Series comprises the period 1946:1-2008:4. The source of information is U.S. Department of Commerce, Bureau of Economic Analysis, NIPA Table 2.1.

Price deflator
The nominal wealth, after-tax income, consumption, and interest rates were deflated by the personal consumption expenditure chain-type price deflator (2000=100), seasonally adjusted. Data are quarterly. Series comprises the period 1947:1-2008:4. The source of information is U.S. Department of Commerce, Bureau of Economic Analysis, NIPA Table 2.3.4., line 1.

Inflation rate
Inflation rate was computed from price deflator. Data are quarterly. Series comprises the period 1947:2-2008:4. The source of information is U.S. Department of Commerce, Bureau of Economic Analysis, NIPA Table 2.3.4, line 1.

Interest rate ("Risk-free rate")
Risk-free rate is defined as the 3-month U.S. Treasury bills real interest rate. Original data are monthly and are converted to a quarterly frequency by computing the simple arithmetic average of three consecutive months. Additionally, real interest rates are computed as the difference between nominal interest rates and the in.ation rate. The 3-month U.S. Treasury bills real interest rate series comprises the period 1947:2-2008:4, and the source of information is the H.15 publication of the Board of Governors of the Federal Reserve System.

Asset returns
Asset returns were computed using the MSCI-US Total Return Index, which measure the market performance, including price performance and income from dividend payments. I 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 1970:1-2008:4. The source of information is Morgan Stanley Capital International (MSCI).

A.2 U.K. Data

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 1963:1-2008:4. The source is Office for National Statistics (ONS).

Aggregate 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 1975:1-2008:4. The sources of information are: Fernandez-Corugedo et al. (2007) - provided by the Office for National Statistics (ONS) -, for the period 1975:1-1986:4; and the Office for National Statistics (ONS), for the period 1987:1-2008:4.

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 1970:1-2008:4. The sources of information are: Fernandez-Corugedo et al. (2007) - provided by the Office for National Statistics (ONS) -, for the period 1970:1-1986:4; and the Office for National Statistics (ONS), for the period 1987:1-2008:4.

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). 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 1975:1-2008:4. The sources of information are: Fernandez-Corugedo et al. (2007) – provided by the Office for National Statistics (ONS) -, for the period 1975:1-1986:4; and the Office for National Statistics (ONS), for the period 1987:1-2008:4. 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 1974:3-2008:4. The sources of information are: Fernandez-Corugedo et al. (2007) - provided by the Office for National Statistics (ONS) -, for the period 1974:3-1986:4; and the Office for National Statistics (ONS), for the period 1987:1-2008:4.

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 1946:4-2008:4. 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 1947:4-2008:4. 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 1947:3-2008:4. 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 1972:1-2008:4. The source of information is Office for National Statistics (ONS).

Asset returns
Asset returns were computed using the MSCI-UK Total Return Index, which measure the market performance, including price performance and income from dividend payments. I 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 1970:1-2008:4. The source of information is Morgan Stanley Capital International (MSCI).

A.3 Euro area Data
Euro area aggregates are calculated as weighted average of euro-11 before 1999 and, thereafter, as break-corrected series covering the real-time composition of the euro area. The weights are computed using GDP at irrevocable fixed conversion rates. Data are provided by the European Central Bank (ECB).

Consumption
Total final private consumption. Data are quarterly, seasonally adjusted, expressed in million of euro, and comprise the period 1980:1-2007:4. The construction principle is similar to that described for disposable income.

Aggregate wealth
Aggregate wealth is defined as the sum of net financial wealth and net housing wealth. Data are quarterly, seasonally adjusted, expressed in million of euro, and comprise the period 1980:1-2007:4.

Financial Wealth
Net financial wealth is the difference between financial assets (currency and deposits, debt securities, shares and mutual fund shares, insurance reserves, and net others) and financial liabilities (excluding mortgage loans) held by households and non-profit

institutions serving households. Original series are provided at quarterly frequency from the euro area quarterly sectorial accounts for the period 1999:1-2007:4 and at annual frequency from the monetary union financial accounts for the period 1995-1998 and from national sources for the period 1980-1994. Quarterly data before 1999 are backcasted and interpolated using quadratic smoothing and corrected for breaks. Data are quarterly, seasonally adjusted, expressed in million of euro, and comprise the period 1980:1-2007:4.

Housing Wealth
Net housing wealth is the difference between gross housing wealth and mortgage loans held by households and non-profit institutions serving households. Original series are provided at annual frequency and quarterly data are backcasted and interpolated using quadratic smoothing. Housing wealth data are at current replacement costs net of capital depreciation based on ECB estimates. Data are quarterly, seasonally adjusted, expressed in million of euro, and comprise the period 1980:1-2007:4.

Disposable Income
Total compensation of employees. From 1999:1 onwards, this series covers nominal disposable income of the real-time composition of the euro area, correcting for the breaks caused by the several enlargements, i.e. currently the observations from 2007:4 backwards are extrapolations based on growth rates calculated from the levels series compiled for the euro area 15 in 2008. For period before 1999, the nominal disposable income series for the euro area is constructed by aggregating national disposable income data for euro 11 using the irrevocable fixed exchange rates of 31 December 1998 for the period 1980:1-1998:4. Again, growth rates from this series are used to backward extend the euro area disposable income series.
The euro area seasonally adjusted real disposable income series (at 2005 constant prices) has been constructed before 1999 by aggregating national real disposable income data using the irrevocable .fixed exchange rates. As for the euro area nominal disposable income, an artificial euro area real disposable income series has also been constructed using the procedure illustrated above. Data are quarterly, seasonally adjusted, expressed in million of euro, and comprise the period 1980:1-2007:4.

Population
Population is defined as mid-year estimates of resident population of the euro area. Data are quarterly, seasonally adjusted, expressed in million of euro, and comprise the period 1980:1-2007:4.

Price deflator
All variables are expressed in real terms by using the Harmonised Index of Consumer Prices (HICP). The HICP is computed using consumption expenditure weights at irrevocable fixed conversion rates. The year base is 2005 (2005 =100). 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 1980:1-2007:4.

Inflation rate
Inflation rate was computed from price deflator. Data are quarterly. Series comprises the period 1980:1-2007:4.

Interest rate ("Risk-free rate")

Short-Term Interest Rate

For short-term interest rates from January 1999 onwards, the euro area three-month Euribor is used. Before 1999, the artificial euro area nominal interest rates used are estimated as weighted averages of national interest rates calculated with fixed weights based on 1999 GDP at PPP exchange rates. National short-term rates are three-month market rates. Data are quarterly averages, and comprise the period 1980:1-2007:4.

Asset returns

Asset returns were computed using the weighted averages of stock returns calculated with fixed weights based on 1999 GDP at PPP exchange rates. Series comprises the period 1980:1-2007:4.

List of Tables

Table 1.1 – Cointegration estimations.

$$CAY_t = c_t - \beta_1 A_t - \beta_2 Y_t$$

	A	Y	ADF t-statistic	Johansen t-statistic	
			Lags: 1	λ_{max}	λ_{trace}
Euro area	0.11***	0.80***	-3.43***	15.31*	19.63*
	(4.32)	(16.11)			
UK	0.17***	0.75***	-4.20***	31.67	42.98**
	(10.41)	(20.49)			
US	0.14***	1.05***	-2.78***	6.98	13.55
	(4.92)	(21.76)			

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 1.2 – Cointegration estimations.

$$CDAY_t = c_t - \beta_1 F_t - \beta_2 H_t - \beta_3 Y_t$$

	F	H	Y	ADF t-statistic	Johansen t-statistic	
				Lags: 1	λ_{max}	λ_{trace}
Euro area	0.11***	0.02	0.71***	-2.83***	45.14**	69.38**
	(8.80)	(1.47)	(17.25)			
UK	0.10***	0.07***	0.75***	-4.45***	26.03*	45.35*
	(11.61)	(7.56)	(22.01)			
US	0.09***	-0.04***	1.16***	-3.15***	17.68	29.12
	(5.93)	(-3.87)	(30.95)			

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 2.1 – Real stock returns, estimated effect of *CAY*.

$SR_{t+1} + SR_{t+2} + \ldots + SR_{t+H} = f(CAY_t)$, H=1, 2, 3, 4

	Forecast Horizon *H*			
	1	2	3	4
Euro area	-0.32 (-0.41) [0.00]	-0.36 (-0.44) [0.00]	-0.60 (-0.74) [0.01]	-0.84 (-1.07) [0.01]
UK	0.86** (2.23) [0.02]	1.15** (2.47) [0.04]	0.66 (1.58) [0.01]	0.35 (0.61) [0.00]
US	0.92** (1.99) [0.03]	0.70 (1.40) [0.02]	0.58 (1.13) [0.01]	0.95* (1.91) [0.07]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 2.2 – Real stock returns, estimated effect of *CDAY*.
$SR_{t+1} + SR_{t+2} + \ldots + SR_{t+H} = f(CDAY_t)$, H=1, 2, 3, 4

	Forecast Horizon *H*			
	1	2	3	4
Euro area	-1.40 (-1.61) [0.04]	-1.41 (-1.55) [0.03]	-1.54*** (-1.76) [0.05]	-1.55** (-2.14) [0.04]
UK	1.08** (2.20) [0.03]	1.29** (2.25) [0.05]	0.75 (1.54) [0.02]	0.42 (0.63) [0.00]
US	0.96* (0.88) [0.02]	0.58 (0.95) [0.01]	0.40 (0.66) [0.00]	0.91 (1.61) [0.02]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 3.1 – Real bond returns, estimated effect of *CAY*.
$BR_{t+1} + BR_{t+2} + \ldots + BR_{t+H} = f(CAY_t)$, H=1, 2, 3, 4

	Forecast Horizon *H*			
	1	2	3	4
Euro area	-0.39 (-0.55) [0.01]	-0.33 (-0.46) [0.01]	-0.24 (-0.31) [0.01]	-0.18 (-0.22) [0.00]
UK	0.06 (1.04) [0.01]	0.04 (0.71) [0.01]	0.00 (0.07) [0.00]	0.02 (0.44) [0.00]
US	-0.27 (-0.76) [0.02]	-0.31 (-0.85) [0.03]	-0.33 (-0.88) [0.03]	-0.29 (-0.83) [0.02]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 3.2 – Real bond returns, estimated effect of *CDAY*.

$BR_{t+1} + BR_{t+2} + \ldots + BR_{t+H} = f(CDAY)$, H=1, 2, 3, 4

	Forecast Horizon *H*			
	1	2	3	4
Euro area	0.07 (0.11) [0.00]	0.14 (0.19) [0.00]	0.23 (0.30) [0.00]	0.24 (0.76) [0.01]
UK	0.04 (0.77) [0.01]	0.02 (0.42) [0.00]	-0.00 (-0.00) [0.00]	0.04 (0.61) [0.00]
US	0.04 (0.11) [0.00]	0.01 (-0.03) [0.00]	-0.04 (-0.09) [0.00]	-0.00 (-0.01) [0.00]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 4.1 – Real stock returns, estimated effect of *CAY* and *CDAY*.

$SR_{t+1} = f(CAY_{t-1},..)$

$SR_{t+1} = f(CDAY_{t-1},..)$

	CAY_{t-1}	$DivYld_{t-1}$	Adj. R-square	$CDAY_{t-1}$	$DivYld_{t-1}$	Adj. R-square
Euro area	-0.35 (-0.43)	1.50 (0.36)	[0.04]	-1.71* (-1.89)	4.31 (1.03)	[0.05]
UK	1.24*** (3.79)	8.17*** (3.43)	[0.10]	1.44*** (4.27)	7.29*** (3.32)	[0.11]
US	1.04** (2.21)	4.35* (1.69)	[0.04]	0.87 (1.53)	3.50 (1.35)	[0.04]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 4.2 – Real bond returns, estimated effect of *CAY* and *CDAY*.

$BR_{t+1} = f(CAY_{t-1},..)$

$BR_{t+1} = f(CDAY_{t-1},..)$

	CAY_{t-1}	$Inflation_{t-1}$	Adj. R-square	$CDAY_{t-1}$	$Inflation_{t-1}$	Adj. R-square
Euro area	-0.63** (-2.15)	0.05*** (11.25)	[0.68]	-0.54* (1.74)	0.05*** (11.81)	[0.67]
UK	0.09 (1.59)	0.00*** (0.80)	[0.03]	0.06 (1.14)	0.00 (0.64)	[0.02]
US	0.25 (1.13)	0.04*** (6.33)	[0.46]	0.27 (1.15)	0.04*** (6.41)	[0.46]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 5.1 – One-quarter ahead forecasts of returns.
CAY model vs. model of constant returns

	Real stock returns	Real bond returns
	$MSE_{cay}/MSE_{constant}$	$MSE_{cay}/MSE_{constant}$
Euro area	0.992	1.004
UK	0.993	0.999
US	0.991	0.995

Notes: MSE – mean-squared forecasting error.

Table 5.2 – One-quarter ahead forecasts of returns.
CDAY model vs. model of constant returns

	Real stock returns	Real bond returns
	$MSE_{cday}/MSE_{constant}$	$MSE_{cday}/MSE_{constant}$
Euro area	0.975	1.011
UK	0.989	1.001
US	0.993	1.004

Notes: MSE – mean-squared forecasting error.

Table 6.1 – Euro area and UK real stock returns, estimated effect of $\boldsymbol{CAY_t^{US}}$.

$$\boldsymbol{SR^i_{t+1}} + \boldsymbol{SR^i_{t+2}} + ... + \boldsymbol{SR^i_{t+H}} = \boldsymbol{f}(\boldsymbol{CAY^{US}_{t-1}}),\ \boldsymbol{H} = 1,2,3,4,\ \mathrm{i} = \{\mathrm{EA}, \mathrm{UK}\}$$

	Explanatory variable: $\boldsymbol{CAY_t^{US}}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, $\boldsymbol{SR^{EA}_{t+H}}$	0.77 (1.35) [0.02]	0.75 (1.42) [0.02]	0.54 (0.98) [0.01]	0.47 (0.76) [0.01]
UK, $\boldsymbol{SR^{UK}_{t+H}}$	0.37 (0.81) [0.00]	0.28 (0.67) [0.00]	-0.00 (-0.01) [0.00]	0.31 (0.65) [0.00]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 6.2 – Euro area and UK real stock returns, estimated effect of $\boldsymbol{CDAY_t^{US}}$.

$$\boldsymbol{SR_{t+1}^{i}} + \boldsymbol{SR_{t+2}^{i}} + ... + \boldsymbol{SR_{t+H}^{i}} = \boldsymbol{f}(\boldsymbol{CDAY_{t-1}^{US}}), \boldsymbol{H} = 1,2,3,4, \text{i} = \{\text{EA}, \text{UK}\}$$

	Explanatory variable: $\boldsymbol{CDAY_t^{US}}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, $\boldsymbol{SR_{t+H}^{EA}}$	0.83 (1.19) [0.02]	0.80 (1.24) [0.02]	0.47 (0.74) [0.01]	0.34 (0.45) [0.00]
UK, $\boldsymbol{SR_{t+H}^{UK}}$	0.56 (1.01) [0.01]	0.36 (0.70) [0.00]	-0.04 (-0.08) [0.00]	0.41 (0.73) [0.00]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 6.3 – Euro area and UK real bond returns, estimated effect of $\boldsymbol{CAY_t^{US}}$.

$$\boldsymbol{BR_{t+1}^{i}} + \boldsymbol{BR_{t+2}^{i}} + ... + \boldsymbol{BR_{t+H}^{i}} = \boldsymbol{f}(\boldsymbol{CAY_{t-1}^{US}}), \boldsymbol{H} = 1,2,3,4, \text{i} = \{\text{EA}, \text{UK}\}$$

	Explanatory variable: $\boldsymbol{CAY_t^{US}}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, $\boldsymbol{BR_{t+H}^{EA}}$	0.03 (0.06) [0.00]	-0.01 (-0.03) [0.00]	-0.09 (-0.16) [0.00]	-0.11 (-0.43) [0.00]
UK, $\boldsymbol{BR_{t+H}^{UK}}$	0.05 (0.81) [0.01]	0.04 (0.68) [0.00]	0.01 (0.28) [0.00]	0.05 (1.00) [0.01]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 6.4 – Euro area and UK real bond returns, estimated effect of $CDAY_t^{US}$.

$$BR_{t+1}^{i} + BR_{t+2}^{i} + ... + BR_{t+H}^{i} = f(CDAY_{t-1}^{US}),\ H = 1,2,3,4,\ \mathrm{i} = \{\mathrm{EA}, \mathrm{UK}\}$$

	Explanatory variable: $CDAY_t^{US}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, BR_{t+H}^{EA}	0.52 (1.13) [0.04]	0.51 (1.11) [0.04]	0.49 (1.02) [0.03]	0.55 (1.15) [0.04]
UK, BR_{t+H}^{UK}	0.07 (1.20) [0.01]	0.06 (1.23) [0.01]	0.04 (0.72) [0.00]	0.10 (1.68) [0.03]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 7.1 – Euro area and US real stock returns, estimated effect of CAY_t^{UK}.

$$SR_{t+1}^{i} + SR_{t+2}^{i} + ... + SR_{t+H}^{i} = f(CAY_{t-1}^{UK}),\ H = 1,2,3,4,\ \mathrm{i} = \{\mathrm{EA}, \mathrm{US}\}$$

	Explanatory variable: CAY_t^{UK}			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, SR_{t+H}^{EA}	1.58*** (2.91) [0.09]	1.63*** (4.13) [0.10]	1.63*** (4.36) [0.10]	1.21*** (2.59) [0.05]
US, SR_{t+H}^{US}	0.72* (1.66) [0.02]	1.08** (2.31) [0.04]	0.66 (1.29) [0.01]	0.65 (1.10) [0.01]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 7.2 – Euro area and US real stock returns, estimated effect of $CDAY_t^{UK}$.

$$SR_{t+1}^{i} + SR_{t+2}^{i} + ... + SR_{t+H}^{i} = f(CDAY_{t-1}^{UK}), H = 1,2,3,4, \mathrm{i} = \{\mathrm{EA}, \mathrm{US}\}$$

	Explanatory variable: $CDAY_t^{UK}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, SR_{t+H}^{EA}	1.74*** (2.64) [0.10]	1.85*** (3.54) [0.11]	1.78*** (3.70) [0.10]	1.30** (2.41) [0.05]
US, SR_{t+H}^{US}	0.78 (1.54) [0.02]	1.07** (1.95) [0.03]	0.51 (0.88) [0.01]	0.48 (0.74) [0.01]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 7.3 – Euro area and US real bond returns, estimated effect of CAY_t^{UK}.

$$BR_{t+1}^{i} + BR_{t+2}^{i} + ... + BR_{t+H}^{i} = f(CAY_{t-1}^{UK}), H = 1,2,3,4, \mathrm{i} = \{\mathrm{EA}, \mathrm{US}\}$$

	Explanatory variable: CAY_t^{UK}			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, BR_{t+H}^{EA}	-0.40 (-0.98) [0.03]	-0.44 (-1.04) [0.03]	-0.47 (-1.08) [0.04]	-0.46 (-1.04) [0.04]
US, BR_{t+H}^{US}	0.14 (0.36) [0.01]	0.06 (0.14) [0.00]	0.02 (0.10) [0.00]	0.04 (0.09) [0.00]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 7.4 – Euro area and US real bond returns, estimated effect of $CDAY_t^{UK}$.

$$BR_{t+1}^{i} + BR_{t+2}^{i} + ... + BR_{t+H}^{i} = f(CDAY_{t-1}^{UK}), H = 1,2,3,4, \mathrm{i} = \{\mathrm{EA}, \mathrm{US}\}$$

	Explanatory variable: $CDAY_t^{UK}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
Euro area, BR_{t+H}^{EA}	-0.38 (-0.93) [0.02]	-0.39 (-0.89) [0.02]	-0.38 (-0.84) [0.02]	-0.33 (-0.72) [0.02]
US, BR_{t+H}^{US}	0.13 (0.37) [0.00]	0.07 (0.17) [0.00]	0.03 (0.07) [0.00]	0.06 (0.15) [0.00]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 8.1 – UK and US real stock returns, estimated effect of CAY_t^{EA}.

$$SR_{t+1}^{i} + SR_{t+2}^{i} + ... + SR_{t+H}^{i} = f(CAY_{t-1}^{EA}), H = 1,2,3,4, \text{i} = \{\text{UK,US}\}$$

	Explanatory variable: CAY_t^{EA}			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
UK, SR_{t+H}^{UK}	-0.49 (-0.87) [0.00]	-0.62 (-1.19) [0.01]	-0.87 (-1.51) [0.01]	-0.71 (-1.17) [0.01]
US, SR_{t+H}^{US}	-0.46 (-0.61) [0.00]	-0.81 (-1.12) [0.01]	-0.94 (1.32) [0.02]	-1.31** (-2.03) [0.03]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 8.2 – UK and US real stock returns, estimated effect of $CDAY_t^{EA}$.

$$SR_{t+1}^{i} + SR_{t+2}^{i} + ... + SR_{t+H}^{i} = f(CDAY_{t-1}^{EA}), H = 1,2,3,4, \text{i} = \{\text{UK,US}\}$$

	Explanatory variable: $CDAY_t^{EA}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
UK, SR_{t+H}^{UK}	-0.85 (0.76) [0.01]	-0.88 (-1.45) [0.01]	-1.01 (-1.44) [0.02]	-0.65 (-0.98) [0.01]
US, SR_{t+H}^{US}	-0.98 (-1.04) [0.02]	-1.22 (1.59) [0.02]	-1.26* (-1.72) [0.03]	-1.45** (-2.37) [0.06]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 8.3 – UK and US real bond returns, estimated effect of CAY_t^{EA}.

$$BR_{t+1}^{i} + BR_{t+2}^{i} + ... + BR_{t+H}^{i} = f(CAY_{t-1}^{EA}), H = 1,2,3,4, \text{i} = \{\text{UK,US}\}$$

	Explanatory variable: CAY_t^{EA}			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
UK, BR_{t+H}^{UK}	-0.20*** (-2.89) [0.07]	-0.14** (-2.36) [0.04]	-0.10 (-1.55) [0.02]	-0.61 (-0.77 [0.01]
US, BR_{t+H}^{US}	0.61 (1.49) [0.06]	0.73 (1.56) [0.08]	0.85 (0.10) [0.11]	0.84 (1.51) [0.11]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

Table 8.4 – UK and US real bond returns, estimated effect of $CDAY_t^{EA}$.

$$BR_{t+1}^{i} + BR_{t+2}^{i} + ... + BR_{t+H}^{i} = f(CDAY_{t-1}^{EA}), H = 1,2,3,4, \text{i} = \{\text{UK,US}\}$$

	Explanatory variable: $CDAY_t^{EA}$			
Dependent variable:	Forecast Horizon *H*			
	1	2	3	4
UK, BR_{t+H}^{UK}	-0.26*** (-3.65) [0.10]	-0.20*** (-2.63) [0.06]	-0.16* (-1.82) [0.04]	-0.13 (-1.16) [0.03]
US, BR_{t+H}^{US}	0.29 (0.51) [0.01]	0.39 (0.61) [0.02]	0.48 (0.67) [0.03]	0.44 (0.59) [0.03]

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** - statistically significant at the 10%, 5%, and 1% level, respectively.

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1 See, for instance, Hansen and Singleton (1982), Mankiw and Shapiro (1986), Breeden et al. (1989), Campbell (1996), Cochrane (1996) and Fama and French (1992).

[2] Baxter and Jermann (1997) calibrate *Y/H* = 4.5%, implying ρ_h = 0.975.

[3] The parameters β_a and β_y should in principle equal $R_aA/(Y+R_aA)$ and $Y/(Y+R_aA)$, 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). Therefore, we decided to write β_a and β_y, instead of α_a and α_y to distinguish long-run elasticities of the definition of consumption from long-run elasticities of total consumption.

[4] The relative T-bill rate is the 30-day Treasury bond yield minus its 12-month moving average.

[5] The term spread is the 10-year Treasury bond yield minus the 1-year Treasury bond yield.

[6] The default spread is the difference between the BAA and AAA corporate bond rates.

7 Goddard et al. (2008) analyze the role of dividends in the value model using firm-level evidence.

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