Recursive Preferences, Consumption Smoothing and Risk Premium

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Abstract

This paper combines recursive preferences and the consumer's budget constraint to derive a relationship where the importance of the long-run risks can help explaining asset returns. Using data for sixteen OECD countries, we find that when the consumption growth, the consumption-wealth ratio and its first-differences are used as conditioning information, the resulting factor model explains a large fraction of the variation in real stock returns. The model captures: (i) the preference of investors for a smooth consumption path as implied by the intertemporal budget constraint; and (ii) the large equity risk premium that agents demand when they fear a reduction in long-run economic prospects.

Keywords: Recursive preferences, intertemporal budget constraint, expected returns, asset pricing, long-run risks.

JEL classification: E21, E24, G12.

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1 Introduction

The natural economic explanation for differences in expected returns across assets is differences in risk. Breeden (1979) argues that the risk premium on an asset is determined by its ability to insure against consumption fluctuations and Sharpe (1964) shows that the exposure of asset returns to movements in aggregate consumption explains differences in risk premium.

However, identifying the economic sources of risks remains an important issue because differences in the contemporaneous covariance between asset returns and consumption growth across portfolios have not proved to be sufficient to justify the variation that we observe in expected returns (Mankiw and Shapiro, 1986; Breeden et al., 1989; Campbell, 1996; Cochrane, 1996).

Several papers tried to shed more light on this question and many economically motivated variables have been developed to capture time-variation in risk premium and to document asset returns' predictability (Campbell and Shiller, 1988; Fama and French, 1988; Lettau and Ludvigson, 2001; Sousa, 2010a, 2012a; Ren et al., 2014).

Within the representative agent representation, two main lines of investigation have been successfully explored. The first approach focuses on the consumer's intertemporal budget constraint and makes use of data on consumption, (dis)aggregate wealth and labour income to obtain empirical proxies that track variation in expectations about future returns (i.e. *cay* by Lettau and Ludvigson (2001), and *cday* by Sousa (2010a)). The second approach is based on the concept of long-run risk (Epstein and Zin, 1989), and introduces predictability in aggregate consumption growth as a result of the persistence of cash-flows news. Low-frequency movements and time-varying uncertainty in aggregate consumption growth are, therefore, key ingredients for understanding risk premium.[1]

In this paper, we try to combine both lines of investigation in a single asset pricing model. More specifically, we combine recursive preferences, the intertemporal budget constraint and the homogeneity property of the Bellman equation to derive a relationship between the long-run risks and future asset returns. Then, we show that the implied stochastic discount factor can be expressed as a function of the consumption growth, the consumption-aggregate wealth ratio, and its first-differences. Finally, we assess empirically whether such link carries relevant information for forecasting risk premium.[2]

[1] Another strand of the literature introduces time-varying risk-aversion in preferences and is based on the external habit model of Campbell and Cochrane (1999), which was designed to show that equilibrium asset prices can match the data in a world without predictability in cash-flows. Sousa (2012b) tests the assumption of constant relative risk aversion (CRRA) using macroeconomic data, and shows that the representative agent may indeed display habit-formation preferences.

[2] An interesting application of Epstein-Zin-Weil preferences can be found in Rapach and Wohar (2009). The authors describe the dynamics of asset returns by means of a vector autoregressive process and find that U.S. investors display sizable mean intertemporal hedging demands for domestic stocks and small mean intertemporal hedging demands for

Using data for a panel of sixteen OECD countries over, approximately, the last fifty years, we find that: (*i*) the long-run risks are an important determinant of real stock returns; and (*ii*) when the long-run risks are used as conditioning information, the resulting linear factor model explains a large fraction of the variation in real stock returns. In particular, at the 4-quarter horizon, the predictive ability of the model is stronger for Australia, Belgium and US (both 9%), Canada (13%), Finland (15%), Denmark (17%), France (21%) and UK (24%). The results are robust to the inclusion of additional control variables and show that our model outperforms the existing ones in the literature.

The model is able to predict asset returns due to its ability to track time-varying risk premium. The model captures: (*i*) the preference of investors for a smooth path for consumption as implied by the intertemporal budget constraint; and (*ii*) the fact that agents demand a large equity risk premium when they fear a deterioration of long-term economic prospects.[3] Therefore, the long-run risks account for a substantial fraction of the time-series variation that we observe in asset returns.

The paper is organized as follows. Section 2 presents the theoretical approach. Section 3 describes the data and discusses the empirical results. Section 4 concludes and discusses the implications of the findings.

2 Recursive Preferences and Intertemporal Budget Constraint

Consider a representative agent economy in which wealth is tradable. Defining W_t as time t aggregate wealth (human capital plus asset wealth), C_t as time t 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

$$W_{t+1} = R_{t+1} \left(W_t - C_t \right) \quad \forall t \tag{1}$$

where W_t is total wealth and $R_{w,t}$ is the return on wealth, that is,

$$R_{t+1} := \left(1 - \sum_{i=1}^{N} w_{it} \right) R^f + \sum_{i=1}^{N} w_{it} R_{it+1} = R^f + \sum_{i=1}^{N} w_{it} \left(R_{it+1} - R^f \right) \tag{2}$$

where w_i is the wealth share invested in the ith risky asset and R^f is the risk-free rate.

foreign stocks and bonds.

[3] In this context, some authors argue that portfolio outcomes can be improved by accounting for the nonlinearity of the behaviour of stock markets (Jawadi, 2008, 2009; Jawadi et al., 2009). This can, in turn, be explained by the asymmetric response of investors to good and bad news, the interaction between arbitrage and noise traders, the existence of market frictions, the presence of transaction costs, the occurrence of stock market crises or the time-variation in the joint distribution of market returns and predetermined information variables (Adcock et al., 2012).

With recursive preferences (Epstein and Zin, 1989), the optimal value of the utility, V, at time t will be a function of the wealth W_t and takes the form

$$V(W_t) \equiv \max_{\{C,w\}} \left\{ (1-\delta) C_t^{\frac{1-\gamma}{\theta}} + \delta \left(E_t \left[V(W_{t+1})^{1-\gamma} \right] \right)^{\frac{1}{\theta}} \right\}^{\frac{\theta}{1-\gamma}} \tag{3}$$

where δ is the rate of time preference, γ is the relative risk aversion, ψ is the intertemporal elasticity of substitution, E_t is the conditional expectation operator, and $\theta := \frac{1-\gamma}{1-1/\psi}$.

By homogeneity, $V(W_t) \equiv \phi_t W_t$ for some ϕ_t and, given the structure of the problem, consumption is also proportional to W_t, that is $C_t = \varphi_t W_t$.

The first-order condition for C_t can be written as

$$\delta E_t \left[\phi_{t+1}^{1-\gamma} R_{t+1}^{1-\gamma} \right]^{\frac{1}{\theta}} = (1-\delta) \left(\frac{\varphi_t}{1-\varphi_t} \right)^{\frac{1-\gamma}{\theta}-1}. \tag{4}$$

Using homogeneity, equation(3) becomes:

$$\begin{aligned} \phi_t &= \max \left\{ (1-\delta) \left(\frac{C_t}{W_t} \right)^{\frac{1-\gamma}{\theta}} + \delta \left(E_t \left[\phi_{t+1}^{1-\gamma} R_{t+1}^{1-\gamma} \right] \right)^{\frac{1}{\theta}} \left(1 - \frac{C_t}{W_t} \right)^{\frac{1-\gamma}{\theta}} \right\}^{\frac{\theta}{1-\gamma}} \\ &= (1-\delta)^{\frac{\theta}{1-\gamma}} \left(\frac{C_t}{W_t} \right)^{1-\frac{\theta}{1-\gamma}}. \end{aligned}$$

Plugging the solution for ϕ_t in the first-order condition (4), one can derive the Euler equation for the return on wealth

$$1 = E_t \left[\delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\frac{\theta}{\psi}} R_{t+1}^\theta \right] \quad \forall t. \tag{5}$$

The first-order condition for w_{it} can be written as

$$E_t \left[\left(\frac{C_{t+1}}{C_t} \right)^{-\frac{\theta}{\psi}} R_{t+1}^{\theta-1} R_{it+1} \right] = E_t \left[\left(\frac{C_{t+1}}{C_t} \right)^{-\frac{\theta}{\psi}} R_{t+1}^{\theta-1} \right] R^f \quad \forall t, i. \tag{6}$$

From the Euler equation (5) and the definition of return on wealth (2), we have

$$1 = E_t \left[\delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\frac{\theta}{\psi}} R_{t+1}^{\theta-1} \left(R^f + \sum_{i=1}^N w_{it} \left(R_{it+1} - R^f \right) \right) \right] \quad \forall t.$$

Using (6), the equilibrium risk free rate is such that:

$$1/R^f = E_t \left[\delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\frac{\theta}{\psi}} R_{t+1}^{\theta-1} \right] \quad \forall t.$$

Finally, multiplying both sides of (6) by δ^θ and using the last result to remove R^f, the Euler equation for any risky asset i becomes:

$$E_t \left[\delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\frac{\theta}{\psi}} R_{t+1}^{\theta-1} R_{it+1} \right] = 1 \quad \forall t, i. \tag{7}$$

From equation (1), one obtains

$$R_{t+1}^{-1} = \frac{W_t}{W_{t+1}} - \frac{C_t}{W_{t+1}} = \frac{C_t}{C_{t+1}} \left(\frac{W_t}{C_t} \frac{C_{t+1}}{W_{t+1}} - \frac{C_{t+1}}{W_{t+1}} \right)$$

and consequently,

$$R_{t+1}^{\theta-1} = e^{(\theta-1)\Delta c_{t+1}} \left[e^{\Delta cw_{t+1}} - e^{cw_{t+1}} \right]^{1-\theta}$$

where $cw_t := \log (C_t/W_t)$. and $\Delta c_{t+1} = \ln \left(\frac{C_{t+1}}{C_t} \right)$.

Putting the last result into equation (7), we have

$$E_t \left\{ \delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cw_{t+1}} - e^{cw_{t+1}} \right]^{1-\theta} \left(R_{it+1} - R^f \right) \right\} = 0$$

where the stochastic discount factor, m_t is:[4]

$$m_{t+1} = \delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cw_{t+1}} - e^{cw_{t+1}} \right]^{1-\frac{1-\gamma}{1-1/\psi}} \tag{8}$$

In order to estimate the last equation, we need a proxy for cw. Following Lettau and Ludvigson (2001)

$$cw_t \approx \kappa + cay_t.$$

Consequently, the empirical moment function can be expressed as

$$E_t \left\{ \delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cay_{t+1}} - e^{\kappa + cay_{t+1}} \right]^{1-\frac{1-\gamma}{1-1/\psi}} \left(R_{it+1} - R_{t+1}^f \right) \right\} = 0$$

or

$$E \left[g \left(\mathrm{R}_t^e, \frac{C_{t+1}}{C_t}, \Delta cay_{t+1}, cay_{t+1}; \mu, \gamma, \alpha, \kappa, \psi \right) \right] = 0. \tag{9}$$

Similarly, equation (8) can be written as:

$$m_{t+1} = \delta^\theta \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cay_{t+1}} - e^{\kappa + cay_{t+1}} \right]^{1-\frac{1-\gamma}{1-1/\psi}}. \tag{10}$$

Our pricing kernel consists of three terms. The first term - which includes $\frac{C_{t+1}}{C_t}$ - reflects the concern of agents with consumption risk in that payoffs are valued more highly in states of the world in which consumption growth is low. The second term - which includes cay_{t+1} - reflects the preference of agents for a smooth consumption path, i.e. agents allow consumption to rise (fall) temporarily above (below) its equilibrium level when they expect higher (lower) future returns. Finally, the third term - which includes Δcay_{t+1} - captures the changes in expectations about future returns Thus, in this paper, we combine recursive preferences with the intertemporal budget constraint and use the homogeneity of

[4] Appendices A and B provide the derivation of the stochastic discount factor.

the Bellman equation to derive a relationship between asset returns, consumption growth ($\frac{C_{t+1}}{C_t}$), the consumption-wealth ratio (cay) and the first-differences of the consumption wealth ratio (Δcay).

Denoting the vector of factors by f_{t+1}, and combining recursive preferences with cay to recover the return on wealth, we get:

$$f_{t+1} = (\frac{C_{t+1}}{C_t}, cay_{t+1}, \Delta cay_{t+1})'. \tag{11}$$

Following Cochrane (1996) and Ferson and Harvey (1999), the asset pricing model' factors can be scaled with the conditioning variables. Similarly, Ferson et al. (1987) and Harvey (1989) suggest to scale the conditional betas in the linear regression model. This implies that we obtain the following linear three-factor model:

$$m_{t+1} \approx b_0 + b_1 \frac{C_{t+1}}{C_t} + b_2 cay_{t+1} + b_3 \Delta cay_{t+1}. \tag{12}$$

Finally, as in other asset pricing frameworks of the empirical finance literature (Lettau and Ludvigson, 2001; Yogo, 2006; Piazzesi et al., 2007), our model implies that the pricing kernel is closely tied to macroeconomic data and that a group of macroeconomic regressors capture expectations that agents have about future returns, that is:

$$E_t r_{t+i} \approx a_0 + a_1 \frac{C_t}{C_{t-1}} + a_2 cay_t + a_3 \Delta cay_t, \qquad i = 1, ..., H. \tag{13}$$

Consequently, future asset returns are predicted by both the consumption-wealth ratio, cay, and its first-differences, Δcay.[5,6] As Lettau and Ludvigson (2001) show, cay captures the preference of investors for a smooth path for consumption as implied by the intertemporal budget constraint. Thus, Δcay tracks (either positive or negative) changes in the expectations that agents have about future returns. Moreover, by combining these features with recursive preferences (Epstein and Zin, 1989), our model implies that a large equity risk premium will be demanded when economic prospects deteriorate and, therefore, the long-run risks help pricing risky assets.

[5] Sousa (2012a) explores the forecasting power of the wealth-to-income ratio for both future stock returns and government bond yields. The author shows that that when the wealth-to-income ratio falls, investors demand a higher stock risk premium. A similar relationship can be found for government bond yields when investors display a non-Ricardian manner or perceive government bonds as complements for stocks. In contrast, when agents behave in a Ricardian way or see stocks and government bonds as good substitutes, a fall in the wealth-to-income ratio is associated with a fall in future bond premium.

[6] The Hansen and Jagannathan (1997) distance test and its improvement in finite samples (Ren and Shimotsu, 2009) allow one to test the cross-sectional properties of asset pricing models. Such assessment of this paper's model is challenged by the lack of data on international portfolio returns.

3 Recursive Preferences and Risk Premium

3.1 Data

In the estimation of the long-run relationships among consumption, (dis)aggregate wealth and labour income, we use post-1960 quarterly data covering about the last fifty years for 16 countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Spain, Sweden, the UK, the US).

The consumption data are the private consumption expenditure and were taken from the database of the NiGEM model of the NIESR Institute, the Main Economic Indicators (MEI) of the Organization for Economic Co-Operation and Development (OECD) and DRI International. The labour income data correspond to the compensation series of the NIESR Institute. In the case of the US, the labour income series was constructed following Lettau and Ludvigson (2001). The wealth data were taken from the national central banks or the Eurostat.

The stock return data were computed using the share price index and the dividend yield ratio provided by the International Financial Statistics (IFS) of the International Monetary Fund (IMF) and the Datastream.

Finally, the population series were taken from the OECD's MEI and interpolated (from annual data). All series were expressed in logs of real per capita terms with the obvious exception of real stock returns. The series were seasonally adjusted using the X-12 method where necessary and the time frames were chosen based on the availability of reliable data for each country.

3.2 Linking Consumption, Asset Wealth and Labour Income

As a preliminary step, we test for unit roots in consumption, aggregate wealth and labour income using the Augmented Dickey-Fuller and the Phillips-Perron tests. These show that the three variables are integrated of order one. Then, we apply the Engle-Granger test for cointegration. Finally, following Stock and Watson (1993) we estimate the equation below with dynamic least squares (DOLS):

$$c_t = \mu + \beta_a a_t + \beta_y y_t + \sum_{i=-k}^{k} b_{a,i} \Delta a_{t-i} + \sum_{i=-k}^{k} b_{y,i} \Delta y_{t-i} + \varepsilon_t, \tag{14}$$

where c_t corresponds to consumption, a_t denotes asset wealth, y_t is the labour income, the parameters β_a and β_y represent, respectively, the long-run elasticities of consumption with respect to asset wealth and labor income, Δ denotes the first difference operator, μ is a constant, k is the number of the leads and the lags of the first-differences of the explanatory variables, and ε_t is the error term.

Since the impact of different assets' categories on consumption can vary (Poterba and Samwick, 1995; Sousa, 2010a; Ren et al., 2014), we also disaggregate wealth into its main components: financial wealth and housing wealth. For instance, Sousa (2013a) argues that the wealth-to-income ratio predicts not only stock returns but also government bond yields. Ren et al. (2014) also consider the role of household capital (i.e. the sum of housing wealth and durable goods) in forecasting risk premium. Arouri et al. (2012) investigate the persistence of the volatility of an asset class, namely, precious metals (i.e. gold, silver, platinum and palladium). The authors show that while platinum is not a good hedging instrument during bear markets or episodes of crisis, gold can be a good hedge during market downturns in the light of its safe haven status. Arouri and Nguyen (2010) suggest that, conditional on the activity sector, the reaction of stock returns to changes in oil prices is different. Moreover, the introduction of an oil asset into a diversified portfolio of stocks significantly improves the risk-return tradeoff. Similarly, Arouri et al. (2011) uncover the existence of a significant volatility spillover between oil and sector stock returns, which may be crucial for the benefits of diversification and the effectiveness of hedging. Rapach and Wohar (2009) uncover relevant intertemporal hedging demands for stocks and bonds. From a different perspective, Castro (2011a) evaluates the impact of fiscal rules and Castro (2013) analyses the macroeconomic determinants of the banking credit risk. Therefore, we specify the following equation

$$c_t = \mu + \beta_f f_t + \beta_u u_t + \beta_y y_t + \sum_{i=-k}^{k} b_{f,i} \Delta f_{t-i} + \sum_{i=-k}^{k} b_{u,i} \Delta u_{t-i} + \sum_{i=-k}^{k} b_{y,i} \Delta y_{t-i} + \varepsilon_t, \tag{15}$$

where c_t corresponds to consumption, f_t denotes financial wealth, u_t is the housing wealth, y_t is the labour income, 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, Δ denotes the first difference operator, μ is a constant, k is the number of the leads and the lags of the first-differences of the regressors, and ε_t is the error term.

Table 1 shows the estimates for the shared trend among consumption, asset wealth, and income, cay_t, and the Newey-West (1987) corrected t-statistics appear in parenthesis.[7] It can be seen that, despite some heterogeneity, the long-run elasticities of consumption with respect to aggregate wealth and labour income imply roughly shares of one third and two thirds for asset wealth and human wealth, respectively, in aggregate wealth. This is particularly true for Australia, Canada, Finland, France, Ireland, the UK and the US. Moreover, the disaggregation between asset wealth and labour income is statistically significant for all countries (with the exceptions of Finland and Italy).

[7] We set $k = 1$ in the DOLS models and the number of the lags used in the various NeweyWest estimators is set to 4. The results are qualitatively and quantitatively similar in the case of alternative choices.

[INSERT TABLE 1 HERE.]

In line with the work of Sousa (2010a), Table 2 reports the estimates of the long-run elasticities of consumption with respect to financial wealth, housing wealth and labour income, with the Newey-West (1987) corrected t-statistics appearing in parenthesis. First, both financial wealth and housing wealth are statistically significant for almost all countries. Moreover, consumption is, in general, more sensitive to financial wealth than to housing wealth, as the elasticities of consumption with respect to financial wealth are larger in magnitude. Second, it tells us that consumption is very responsive to financial wealth in the case of Belgium (0.11), Canada (0.30), Finland (0.14), Germany (0.31), Italy (0.24), Sweden (0.12) and the UK (0.17). Third, the long-run elasticity of consumption with respect to housing wealth is particularly strong for Australia (0.27), France (0.10), Ireland (0.13) and the Netherlands (0.10). This result is consistent with the findings of Sousa (2010b), who shows that while financial wealth effects associated with a monetary policy contraction are of short duration, housing wealth effects are very persistent. Similarly, Mallick and Mohsin (2007a, 2007b, 2010), Rafiq and Mallick (2008) and Granville and Mallick (2009) highlight an important short-run impact of monetary policy on consumption and real economic activity, while Castro (2011b) emphasizes the role played by nonlinearity.[8] Ren and Yuan (2012) show that residential investment leads GDP and housing changes impact on collateral constraints.

[INSERT TABLE 2 HERE.]

3.3 Forecasting Real Stock Returns

The model derived in Section 2 and expressed by (11) shows that both the transitory deviation from the long-run relationship among consumption, aggregate wealth and income, cay_t, and its first-differences, Δcay_t, are important conditioning variables that provide information about agents' expectations of future changes in asset returns. Moreover, given the disaggregation of asset wealth into its main components (financial and housing wealth), we argue that $cday_t$ and $\Delta cday_t$ should help improving the forecasts for asset returns.

[8] From a different perspective, Boubakri et al. (2012) show that the establishment of a political connection increases firms' performance and risk-taking as access to credit becomes easier. Boubakri et al. (2013) provide evidence corroborating the importance of political institutions to corporate decision-making. In particular, the authors show that sound political institutions are positively linked with corporate risk-taking and close ties to the government lead to less conservative investments.

We look at real stock returns (denoted by r_t) for which quarterly data are available and should provide a good proxy for the non-human component of asset wealth. Tables 3a and 3b summarize the forecasting power of cay and Δcay at different horizons. They reports estimates from OLS regressions of the H-period real stock return, $r_{t+1} + \ldots + r_{t+H}$, on the lag of cay_t and the lag of its first-difference, Δcay.

The empirical findings show that cay_t is statistically significant for a reasonable number of countries and the point estimate of the coefficient is large in magnitude. Moreover, its sign is positive. These results suggest that investors will temporarily allow consumption to rise above its equilibrium level 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.

As for Δcay, the evidence is somewhat weaker, as it is statistically significant for a few countries. However, it can be seen that the two variables explain an important fraction of the variation in future real returns (as described by the adjusted R-square), in particular, at horizons spanning from three to four quarters. In fact, at the four quarter horizon, cay_t explains 23% (UK), 21% (France), 17% (Denmark), 15% (Finland), 13% (Canada) and 9% (Australia, Belgium and US) of the real stock return. In contrast, its forecasting power is poor for countries such as Germany, Ireland, Spain and Sweden.

[INSERT TABLE 3a HERE.]

[INSERT TABLE 3b HERE.]

Tables 4a and 4b summarize the forecasting power of $cday_t$ and its first-difference, $\Delta cday_t$, at different horizons. It reports estimates from OLS regressions of the H-period real stock return, $r_{t+1} + \ldots + r_{t+H}$, on the lag of $cday_t$ and its first-difference, $\Delta cday_t$.

In accordance with the findings for cay_t, it shows that $cday_t$ is statistically significant for almost all countries, the point estimate of the coefficient is large in magnitude and its sign is positive. Therefore, deviations in the long-term trend among c_t, f_t, u_t and y_t should be positively linked with future stock returns.

In addition, it can be seen that the trend deviations explain a substantial fraction of the variation in future real returns. At the four quarter horizon, $cday_t$ and $\Delta cday_t$ explain 24% (Belgium and France and UK), 19% (Canada), 14% (Denmark), 7% (Australia and Netherlands), 5% (US) and 4% (Finland) of the real stock return. However, it does not seem to exhibit forecasting power for countries such as Germany, Ireland, and Spain.

The $cday_t$ variable tends to perform better than cay_t, also in accordance with the findings of Sousa (2010a), 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 degrees of liquidity, taxation, or transaction costs. For example, agents who hold portfolios where the exposure to housing wealth is larger face an additional risk associated with the (il)liquidity of these assets and the transaction costs involved in trading them. Wealth composition is, therefore, an important source of risk that $cday_t$ – but not cay_t – is able to capture (Sousa, 2010a, 2012a; Ren et al., 2014).

[INSERT TABLE 4a HERE.]

[INSERT TABLE 4b HERE.]

3.4 Additional Control Variables

In this section, we take into account other potential explanatory variables. In this context, Campbell and Shiller (1988), Fama and French (1988) and Lamont (1998) show that the ratios of price to dividends or earnings or the ratio of dividends to earnings have predictive power for stock returns.[9]

Tables 5a and 5b report the adjusted R-square statistics for two models: (i) in Panel A, the model includes cay_t only; and (ii) in Panel B, the model includes, in addition to cay_t and Δcay_t, the lagged stock returns, r_{t-1}, and the lag of the dividend yield ratio, dy.

It can be seen, that the model that includes cay_t only underperforms our model (which adds Δcay as a regressor). In fact, at the four quarter horizon, cay_t explains 20% (France), 18% (UK), 17% (Canada), 15% (Denmark), 14% (Finland), 8% (Belgium and US) and 7% (Australia) of the real stock return, which is lower than our previous findings.

When we consider additional control variables, the results show that the statistical significance of cay_t and Δcay_t does not change with respect to the findings of Tables 4a and 4b where only cay and Δcay were included as explanatory variables. Moreover, the lag of the dependent variable is not statistically significant, a feature that is in accordance with the forward-looking behaviour of stock returns. Finally, the dividend yield ratio, dy, seems to provide relevant information about future asset returns since it is statistically significant in practically all regressions and it improves the adjusted R-square.

[9] While we focus on a set of financial control variables, other authors analyzed the role played by macroeconomic variables. For instance, Rapach et al. (2005) examine the predictability of stock returns and show that interest rates are the most consistent and reliable predictor. More recently, Jordan et al. (2013) explore the impact of economic links via trade and Vivian and Wohar (2013) assess the predictive power of the output gap.

A similar conclusion can be drawn from Tables 6a and 6b, where we present the predictive ability - as measured by their adjusted R-square statistics - of two models: (i) in Panel A, the model includes $cday_t$ only; and (ii) in Panel B, the model includes, in addition to $cday_t$ and $\Delta cday_t$, the lagged stock returns, r_{t-1}, and the lag of the dividend yield ratio, dy. The empirical findings corroborate the idea that $cday$ predicts better future stock returns than cay. In addition, our model beats the performance of the model that includes $cday$ only. In fact, at the four quarter horizon, $cday_t$ and $\Delta cday_t$ explain 26% (Belgium), 22% (France and UK), 17% (Canada), 13% (Denmark), 7% (Australia), 6% (Netherlands), 4% (Finland and US) of the real stock return, which is again lower than the adjusted R-square statistics associated with our model. In the same spirit, Sousa (2010a) finds that expectations about future returns are somewhat "synchronized", as the temporary deviation of consumption from the common trend with financial wealth, housing wealth and labour income in one country is able to capture time variation in another country's future returns.

[INSERT TABLE 5a HERE.]

[INSERT TABLE 5b HERE.]

[INSERT TABLE 6a HERE.]

[INSERT TABLE 6b HERE.]

3.5 Nested Forecast Comparisons

Inoue and Kilian (2005) argue that data mining, dynamic misspecification and unmodelled structural change under the null do not explain why in-sample tests would reject the null of no-predictability more often than out-of-sample tests. Consequently, in-sample and out-of-sample tests are equally reliable (in asymptotic terms) under the null of no-predictability. Similarly, Rapach and Wohar (2006) also provide a critical assessment of in-sample and out-of-sample evidence of stock return predictability.

With these caveats in mind and as a final robustness exercise, we make nested forecast comparisons, in which we 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 and Δcay or $cday$ and $\Delta cday$ (estimated using data for the entire sample) as the only forecasting variables, to a variety of forecasting equations that do not include these variables.

We consider two benchmark models: the autoregressive benchmark and the constant expected returns benchmark. In the autoregressive benchmark, we compare the mean-squared forecasting error from a regression that includes just the lagged asset return as a predictive variable to the mean-squared error from regressions that include, in addition, cay and Δcay or $cday$ and $\Delta cday$. In the constant expected returns benchmark, we compare the mean-squared forecasting error from a regression that includes a constant to the mean-squared error from regressions that include, in addition, cay and Δcay or $cday$ and $\Delta cday$.

A summary of the nested forecast comparisons for the equations of the real stock returns using, respectively, cay and Δcay or $cday$ and $\Delta cday$ is provided in Tables 7 and 8. Including cay and Δcay in the forecasting regressions improves asset return predictability vis-a-vis the benchmark models. This is especially true in the case of the of the constant expected returns benchmark, supporting the evidence that reports time-variation in expected returns.

In addition, the models that include $cday$ and $\Delta cday$ generally have a lower mean-squared forecasting error. Moreover, the ratios are smaller that the ones presented in Table 7, reflecting the better predicting ability for stock returns of $cday$ and $\Delta cday$ relative to cay and Δcay.

[INSERT TABLE 7 HERE.]

[INSERT TABLE 8 HERE.]

3.6 "Look-ahead" bias?

A potential econometric issue associated with the forecasting regressions shown so far is the so called "look-ahead" bias (Brennan and Xia, 2005). This may arise when the coefficients of cay_t and $cday_t$ are estimated using the full data sample, i.e. using a fixed cointegrating vector. As a result, we present the results from an exercise where both cay_t and $cday_t$ are reestimated every period, using only the data that are available at the time of the forecast (i.e. we consider a reestimated cointegrating vector). As argued by Lettau and Ludvigson (2001), this technique faces the difficulty that it could understate the forecasting power of the regressor, thereby, making it more difficult for cay_t and $cday_t$ to display predictive ability even though they may characterize well the theoretical model describing risk premium.

With this caveat in mind, we provide in Tables 9a, 9b, 10a and 10b a summary of the forecasting regressions over different time horizons, where the coefficients of cay_t and $cday_t$ are first estimated using the smallest number of observations and, then one observation is added at each time and the coefficients are recursively estimated. In this way, cay_t and $cday_t$ are reestimated using data available at the time of the forecast and we tackle the potential "look-ahead" bias.

The results confirm the predictive ability of cay_t and $cday_t$. Indeed, for the majority of countries, both cay_t and $cday_t$ remain significant and the coefficient estimates are still large in magnitude. Moreover, the performance of the models (as described by the adjusted R-square statistics) remains unchanged. In fact, at the four quarter horizon, cay_t explains 27% (Belgium), 22% (France), 14% (Netherlands and US), 12% (UK), 11% (Finland) and 10% (Canada and Denmark) of the variation in real stock returns. As for $cday_t$, it captures 24% (France), 21% (Belgium), 20% (Canada), 18% (UK), 10% (Denmark and Netherlands) and 7% (Australia) of the behaviour of real stock returns over the next four quarters. Consequently, these empirical findings suggest that the predictive power of cay_t and $cday_t$.is not the outcome of the presence of a "look ahead" bias.

[INSERT TABLE 9a HERE.]

[INSERT TABLE 9b HERE.]

[INSERT TABLE 10a HERE.]

[INSERT TABLE 10b HERE.]

4 Conclusion

This paper uses the representative consumer's budget constraint, combines it with recursive preferences and the homogeneity of the Bellman Equation and derives a relationship between the expected asset returns, the consumption growth, the consumption-aggregate wealth ratio, and the first-order differences of this ratio. Then, we explore this relationship to check whether it carries relevant information for predicting time-variation in future stock returns.

When we use the consumption growth, the consumption-aggregate wealth ratio and its first-order differences as conditioning variables, we obtain an asset pricing model that improves asset return predictability vis-a-vis other benchmark models. Moreover, the conditional factor model proposed is robust to the inclusion of additional control variables and in the context of nested forecasting comparisons.

Using data for 16 OECD countries covering broadly the last fifty years, we show that the predictive ability of the model with regard to future real stock returns is stronger for Australia, Belgium, Canada, Denmark, Finland, UK and US. In the case of Germany, Ireland, and Spain, the evidence suggests that the model does not capture well the time-variation in risk premium.

The success of the model in terms of forecasting asset returns is explained by its ability to capture the preference of investors for "smoothing out" transitory movements in their asset wealth and their demand for a large risk premium when they fear a deterioration in long-term economic prospects.

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Appendix

A Combining Recursive Preferences and the Intertemporal Budget Constraint

With recursive preferences, the utility function is defined recursively as

$$U_t = \left\{ (1-\delta) C_t^{\frac{1-\gamma}{\theta}} + \delta \left(E_t \left[U_{t+1}^{1-\gamma} \right] \right)^{\frac{1}{\theta}} \right\}^{\frac{\theta}{1-\gamma}} \tag{16}$$

where C_t is the consumption, δ is the rate of time preference, γ is the relative risk aversion, $\theta := \frac{1-\gamma}{1-1/\psi}$, ψ is the intertemporal elasticity of substitution,and E_t is the rational expectation operator.

The budget constraint is

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

where W is total wealth and R_t is the return on wealth, that is,

$$R_{t+1} := \left(1 - \sum_{i=1}^{N} w_{it} \right) R^f + \sum_{i=1}^{N} w_{it} R_{it+1} = R^f + \sum_{i=1}^{N} w_{it} \left(R_{it+1} - R^f \right) \tag{17}$$

where w_i is the wealth share invested in the i^{th} risky asset and R^f is the risk-free rate.

The recursive structure of the utility function makes it straightforward to write down the Bellman equation, despite its non-linearity. The optimal value of the utility, V, at time t will be a function of the wealth W_t. From equation (14), we have that the Bellman equation takes the form

$$V(W_t) \equiv \max_{\{C,w\}} \left\{ (1-\delta) C_t^{\frac{1-\gamma}{\theta}} + \delta \left(E_t \left[V(W_{t+1})^{1-\gamma} \right] \right)^{\frac{1}{\theta}} \right\}^{\frac{\theta}{1-\gamma}}.$$

By homogeneity,

$$V(W_t) \equiv \phi_t W_t$$

for some ϕ_t. Therefore, the first-order condition C_t will be

$$\begin{aligned} (1-\delta) C_t^{\frac{1-\gamma}{\theta}-1} &= \delta \left(E_t \left[V(W_{t+1})^{1-\gamma} \right] \right)^{\frac{1}{\theta}-1} E_t \left[V(W_{t+1})^{-\gamma} \phi_{t+1} R_{t+1} \right] \\ &= \delta \left(E_t \left[\phi_{t+1}^{1-\gamma} W_{t+1}^{1-\gamma} \right] \right)^{\frac{1}{\theta}-1} E_t \left[\phi_{t+1}^{1-\gamma} W_{t+1}^{-\gamma} R_{t+1} \right] \\ &= \delta E_t \left[\phi_{t+1}^{1-\gamma} R_{t+1}^{1-\gamma} \right]^{\frac{1}{\theta}} (W_t - C_t)^{\frac{1-\gamma}{\theta}-1}. \end{aligned} \tag{18}$$

where we simplified terms before writing the first line and used the budget constraint to substitute out W_{t+1} in the last line.

Given the structure of the problem, consumption is also proportional to W_t, that is $C_t = \omega_t W_t$. Therefore the last equation can be rewritten as

$$
\begin{aligned}
(1-\delta)\,\omega_t^{\frac{1-\gamma}{\theta}-1} &= \delta E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{1-\gamma}\right]^{\frac{1}{\theta}}(1-\omega_t)^{\frac{1-\gamma}{\theta}-1} \\
\rightarrow \delta E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{1-\gamma}\right]^{\frac{1}{\theta}} &= (1-\delta)\left(\frac{\omega_t}{1-\omega_t}\right)^{\frac{1-\gamma}{\theta}-1} \qquad (19)
\end{aligned}
$$

We can now rewrite the Bellman equation using homogeneity and the last result as

$$
\begin{aligned}
\phi_t &= \max\left\{(1-\delta)\left(\frac{C_t}{W_t}\right)^{\frac{1-\gamma}{\theta}} + \delta\left(E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{1-\gamma}\right]\right)^{\frac{1}{\theta}}\left(1-\frac{C_t}{W_t}\right)^{\frac{1-\gamma}{\theta}}\right\}^{\frac{\theta}{1-\gamma}} \\
&= \max\left\{(1-\delta)\,\omega_t^{\frac{1-\gamma}{\theta}} + \delta\left(E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{1-\gamma}\right]\right)^{\frac{1}{\theta}}(1-\omega_t)^{\frac{1-\gamma}{\theta}}\right\}^{\frac{\theta}{1-\gamma}} \\
&= (1-\delta)^{\frac{\theta}{1-\gamma}}\left\{\omega_t^{\frac{1-\gamma}{\theta}} + \left(\frac{\omega_t}{1-\omega_t}\right)^{\frac{1-\gamma}{\theta}-1}(1-\omega_t)^{\frac{1-\gamma}{\theta}}\right\}^{\frac{\theta}{1-\gamma}} \\
&= (1-\delta)^{\frac{\theta}{1-\gamma}}\,\omega_t^{1-\frac{\theta}{1-\gamma}} = (1-\delta)^{\frac{\theta}{1-\gamma}}\left(\frac{C_t}{W_t}\right)^{1-\frac{\theta}{1-\gamma}}
\end{aligned}
$$

where the budget constraint is used to replace W_{t+1} in the first line and, in the third line, the max operator is removed since $\delta E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{1-\gamma}\right]^{\frac{1}{\theta}}$ is replaced with its value coming from the first-order condition (16). Plugging the solution for ϕ_t in the first-order condition (16) we can derive the Euler equation for the return on wealth

$$
\begin{aligned}
1 &= \frac{\delta}{1-\delta}E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{1-\gamma}\right]^{\frac{1}{\theta}}\left(\frac{W_t}{C_t}-1\right)^{\frac{1-\gamma}{\theta}-1} = \delta E_t\left[\left(\frac{C_{t+1}}{W_{t+1}}\right)^{1-\gamma-\theta}R_{t+1}^{1-\gamma}\right]^{\frac{1}{\theta}}\left(\frac{W_t}{C_t}-1\right)^{\frac{1-\gamma}{\theta}-1} \\
&= \delta E_t\left[\left(\frac{C_{t+1}}{W_{t+1}}\right)^{1-\gamma-\theta}\left(\frac{W_t}{C_t}-1\right)^{1-\gamma-\theta}R_{t+1}^{1-\gamma}\right]^{\frac{1}{\theta}} \\
&= \delta E_t\left\{\left[\frac{C_{t+1}}{C_t}\left(\frac{W_t-C_t}{W_{t+1}}\right)\right]^{1-\gamma-\theta}R_{t+1}^{1-\gamma}\right\}^{\frac{1}{\theta}} = \delta E_t\left\{\left[\frac{C_{t+1}}{C_t}R_{t+1}^{-1}\right]^{1-\gamma-\theta}R_{t+1}^{1-\gamma}\right\}^{\frac{1}{\theta}} \\
&\rightarrow 1 = E_t\left[\delta^{\theta}\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta}\right] \quad \forall t \qquad (20)
\end{aligned}
$$

The first-order condition for w_{it} is

$$\begin{aligned}
E_t\left[\phi_{t+1}^{1-\gamma}R_{t+1}^{-\gamma}\left(W_t-C_t\right)^{-\gamma}\left(R_{it+1}-R^f\right)\right] &= 0\\
E_t\left[\left(\frac{C_{t+1}}{W_{t+1}}\right)^{1-\gamma-\theta}R_{t+1}^{-\gamma}\left(R_{it+1}-R^f\right)\right] &= 0\\
E_t\left[\left(\frac{C_{t+1}}{W_{t+1}}\right)^{1-\gamma-\theta}\left(\frac{W_t}{C_t}-1\right)^{1-\gamma-\theta}R_{t+1}^{-\gamma}\left(R_{it+1}-R^f\right)\right] &= 0\\
E_t\left\{\left[\frac{C_{t+1}}{C_t}R_{t+1}^{-1}\right]^{1-\gamma-\theta}R_{t+1}^{-\gamma}\left(R_{it+1}-R^f\right)\right\} &= 0\\
E_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}\left(R_{it+1}-R^f\right)\right] &= 0
\end{aligned}$$

$$\therefore E_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}R_{it+1}\right]=E_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}\right]R^f\quad\forall t,i \tag{21}$$

where, in the fourth line, the budget constraint is used to substitute out W_{t+1}. From the Euler equation (18) and the definition of return on wealth (15) we have

$$1=E_t\left[\delta^\theta\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}\left(R^f+\sum_{i=1}^{N}w_{it}\left(R_{it+1}-R^f\right)\right)\right]\quad\forall t$$

and using (19) to substitute out $E_t\left\{\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}R_{it+1}\right\}$ and simplifying we have that the equilibrium risk free rate is such that:

$$1/R^f=E_t\left[\delta^\theta\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}\right]\quad\forall t.$$

Multiplying both sides of (19) by δ^θ and using the last result to remove R^f, we have the Euler equation for any risky asset i :

$$E_t\left[\delta^\theta\left(\frac{C_{t+1}}{C_t}\right)^{-\frac{\theta}{\psi}}R_{t+1}^{\theta-1}R_{it+1}\right]=1\quad\forall t,i.$$

B From the Intertemporal Budget Constraint to the Stochastic Discount Factor

From the intertemporal budget constraint

$$R_{t+1}^{-1} = \frac{W_t}{W_{t+1}} - \frac{C_t}{W_{t+1}} = \frac{C_t}{C_{t+1}} \left(\frac{W_t}{C_t} \frac{C_{t+1}}{W_{t+1}} - \frac{C_{t+1}}{W_{t+1}} \right), \tag{22}$$

we have

$$R_{t+1}^{\theta-1} = e^{(\theta-1)\Delta c_{t+1}} \left[e^{\Delta cw_{t+1}} - e^{cw_{t+1}} \right]^{1-\theta}, \tag{23}$$

where $cw_t := \log(C_t/W_t)$.

Putting the last result into the Euler equation, we obtain

$$E_t \left\{ \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cw_{t+1}} - e^{cw_{t+1}} \right]^{1-\theta} \left(R_{it+1} - R^f \right) \right\} = 0, \tag{24}$$

where the stochastic discount factor is

$$M_{t+1} \propto \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cw_{t+1}} - e^{cw_{t+1}} \right]^{1-\frac{1-\gamma}{1-1/\psi}} . \tag{25}$$

Alternatively, we need a proxy for cw .If we follow Lettau and Ludvigson (2001), we have

$$cw_t \approx \kappa + cay_t. \tag{26}$$

Therefore

$$M_{t+1} \propto \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \left[e^{\Delta cay_{t+1}} - e^{cay_{t+1}} \right]^{1-\frac{1-\gamma}{1-1/\psi}} ,$$

which is equation (10).

List of Tables

Table 1: The long-run relationship between consumption, asset wealth and labour income.

Australia	$cay_t := c_t - \underset{(13.39)}{0.35^{***}} a_t - \underset{(8.03)}{0.54^{***}} y_t$	Ireland	$cay_t := c_t - \underset{(9.60)}{0.37^{***}} a_t - \underset{(10.07)}{0.46^{***}} y_t$
Austria	$cay_t := c_t - \underset{(2.92)}{0.04^{***}} a_t - \underset{(24.80)}{0.93^{***}} y_t$	Italy	$cay_t := c_t - \underset{(1.03)}{0.09} a_t - \underset{(10.00)}{1.42^{***}} y_t$
Belgium	$cay_t := c_t - \underset{(3.20)}{0.08^{***}} a_t - \underset{(19.13)}{0.96^{***}} y_t$	Japan	$cay_t := c_t - \underset{(3.31)}{0.08^{***}} a_t - \underset{(22.05)}{0.90^{***}} y_t$
Canada	$cay_t := c_t - \underset{(13.16)}{0.36^{***}} a_t - \underset{(10.82)}{0.56^{***}} y_t$	Netherlands	$cay_t := c_t - \underset{(9.87)}{0.11^{***}} a_t - \underset{(25.80)}{0.84^{***}} y_t$
Denmark	$cay_t := c_t - \underset{(6.10)}{0.08^{***}} a_t - \underset{(19.62)}{0.63^{***}} y_t$	Spain	$cay_t := c_t - \underset{(1.67)}{0.06^{*}} a_t - \underset{(16.10)}{0.76^{***}} y_t$
Finland	$cay_t := c_t - \underset{(6.88)}{0.38^{***}} a_t - \underset{(0.98)}{0.13} y_t$	Sweden	$cay_t := c_t + \underset{(-1.04)}{0.02} a_t - \underset{(22.76)}{0.86^{***}} y_t$
France	$cay_t := c_t - \underset{(16.95)}{0.25^{***}} a_t - \underset{(18.03)}{0.55^{***}} y_t$	UK	$cay_t := c_t - \underset{(14.14)}{0.33^{***}} a_t - \underset{(12.39)}{0.63^{***}} y_t$
Germany	$cay_t := c_t - \underset{(1.71)}{0.13^{*}} a_t - \underset{(35.01)}{1.16^{***}} y_t$	US	$cay_t := c_t - \underset{(22.58)}{0.32^{***}} a_t - \underset{(41.12)}{0.72^{***}} y_t$

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

Table 2: The long-run relationship between consumption, financial wealth, housing wealth and labour income.

Australia	$cday_t := c_t - \underset{(10.26)}{0.07^{***}} f_t - \underset{(9.63)}{0.27^{***}} u_t - \underset{(10.44)}{0.55^{***}} y_t$	Ireland	$cday_t := c_t + \underset{(9.31)}{0.14^{***}} f_t - \underset{(3.25)}{0.14^{***}} u_t - \underset{(9.93)}{0.53^{***}} y_t$
Austria	$cday_t := c_t + \underset{(3.71)}{0.05^{***}} f_t + \underset{(-1.08)}{0.02} u_t - \underset{(19.94)}{0.96^{***}} y_t$	Italy	$cday_t := c_t - \underset{(17.30)}{0.26^{***}} f_t + \underset{(-0.67)}{0.02} u_t - \underset{(8.75)}{0.69^{***}} y_t$
Belgium	$cday_t := c_t + \underset{(-11.82)}{0.28^{***}} f_t + \underset{(6.41)}{0.06^{**}} u_t - \underset{(32.61)}{1.48^{***}} y_t$	Japan	$cday_t := c_t - \underset{(5.85)}{0.12^{***}} f_t + \underset{(-3.66)}{0.07^{***}} u_t - \underset{(12.04)}{0.75^{***}} y_t$
Canada	$cday_t := c_t - \underset{(14.43)}{0.30^{***}} f_t - \underset{(2.98)}{0.06^{***}} u_t - \underset{(11.37)}{0.49^{***}} y_t$	Netherlands	$cday_t := c_t - \underset{(11.83)}{0.06^{***}} f_t - \underset{(1.19)}{0.02} u_t - \underset{(20.37)}{0.95^{***}} y_t$
Denmark	$cday_t := c_t - \underset{(2.89)}{0.02^{***}} f_t - \underset{(0.31)}{0.01} u_t - \underset{(19.11)}{0.70^{***}} y_t$	Spain	$cday_t := c_t - \underset{(5.60)}{0.08^{***}} f_t - \underset{(0.93)}{0.02} u_t - \underset{(13.80)}{0.67^{***}} y_t$
Finland	$cday_t := c_t - \underset{(12.09)}{0.14^{***}} f_t + \underset{(-1.00)}{0.04} u_t + \underset{(6.53)}{0.69^{***}} y_t$	Sweden	$cday_t := c_t - \underset{(13.48)}{0.09^{***}} f_t + \underset{(-14.64)}{0.19^{***}} u_t - \underset{(42.98)}{0.80^{***}} y_t$
France	$cday_t := c_t - \underset{(17.22)}{0.08^{***}} f_t - \underset{(4.23)}{0.10^{***}} u_t - \underset{(22.74)}{0.62^{***}} y_t$	UK	$cday_t := c_t - \underset{(19.97)}{0.17^{***}} f_t + \underset{(3.25)}{0.07} u_t - \underset{(16.35)}{0.76^{***}} y_t$
Germany	$cday_t := c_t - \underset{(22.10)}{0.31^{***}} f_t - \underset{(3.41)}{0.09^{***}} u_t - \underset{(9.60)}{0.33^{***}} y_t$	US	$cday_t := c_t - \underset{(2.66)}{0.04^{***}} f_t + \underset{(-0.46)}{0.02} u_t - \underset{(22.53)}{1.21^{***}} y_t$

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

Table 3a

Forecasting regressions for real stock returns (using cay).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Australia					Denmark			
cay_t	0.54	0.96*	1.39**	1.77**	cay_t	0.44***	0.91***	1.40***	1.91***
(t-stat)	(1.47)	(1.82)	(2.24)	(2.48)	(t-stat)	(3.08)	(3.75)	(4.19)	(4.58)
Δcay_t	1.65**	2.11*	1.58	2.61	Δcay_t	-0.42	-0.70	-0.72	-1.14*
(t-stat)	(2.15)	(1.66)	(1.03)	(1.42)	(t-stat)	(-1.42)	(-1.60)	(-1.37)	(-1.73)
$\bar{R}^2$	[0.07]	[0.14]	[0.07]	[0.09]	$\bar{R}^2$	[0.09]	[0.12]	[0.14]	[0.17]
	Austria					Finland			
cay_t	0.56	1.06	1.61*	2.07*	cay_t	0.87**	1.85***	2.85***	3.82***
(t-stat)	(1.35)	(1.49)	(1.67)	(1.69)	(t-stat)	(2.39)	(3.37)	(4.01)	(4.30)
Δcay_t	-0.26	-0.44	-0.98	-0.57	Δcay_t	-2.29	-3.57*	-3.77	-3.85
(t-stat)	(-0.36)	(-0.39)	(-0.68)	(-0.28)	(t-stat)	(-1.58)	(-1.79)	(-1.44)	(-1.12)
$\bar{R}^2$	[0.02]	[0.03]	[0.03]	[0.04]	$\bar{R}^2$	[0.07]	[0.11]	[0.13]	[0.15]
	Belgium					France			
cay_t	1.68***	2.84***	3.20***	2.71**	cay_t	1.71***	3.41***	4.87***	6.30***
(t-stat)	(4.02)	(3.83)	(2.87)	(2.12)	(t-stat)	(3.15)	(4.09)	(4.79)	(5.44)
Δcay_t	0.46	1.32	2.77	4.38**	Δcay_t	-1.96**	-1.84	-1.85	-2.65
(t-stat)	(0.52)	(0.89)	(1.51)	(2.05)	(t-stat)	(-2.12)	(-1.39)	(-1.08)	(-1.32)
$\bar{R}^2$	[0.10]	[0.13]	[0.12]	[0.09]	$\bar{R}^2$	[0.10]	[0.14]	[0.18]	[0.21]
	Canada					Germany			
cay_t	0.66***	1.08***	1.20**	1.18*	cay_t	-0.27	-0.52	-0.77	-1.12*
(t-stat)	(2.89)	(2.80)	(2.28)	(1.82)	(t-stat)	(-1.01)	(-1.22)	(-1.42)	(-1.72)
Δcay_t	0.63	2.09**	3.39**	3.48**	Δcay_t	0.38	0.73	1.43	1.60
(t-stat)	(1.03)	(1.95)	(2.41)	(2.25)	(t-stat)	(0.94)	(0.98)	(1.50)	(1.37)
$\bar{R}^2$	[0.07]	[0.12]	[0.13]	[0.10]	$\bar{R}^2$	[0.01]	[0.02]	[0.03]	[0.03]

Table 3b

Forecasting regressions for real stock returns (using cay).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Ireland					Spain			
cay_t	0.13	-0.18	-0.64	-0.48	cay_t	-0.38	0.04	0.10	-0.02
(t-stat)	(0.20)	(-0.16)	(-0.45)	(-0.30)	(t-stat)	(-0.40)	(0.03)	(0.08)	(-0.01)
Δcay_t	0.92	1.63	0.91	-0.81	Δcay_t	-0.31	-0.42	-0.81	0.84
(t-stat)	(0.98)	(0.92)	(0.40)	(-0.30)	(t-stat)	(-0.13)	(-0.13)	(-0.21)	(0.20)
$\bar{R}^2$	[0.01]	[0.01]	[0.00]	[0.00]	$\bar{R}^2$	[0.00]	[0.00]	[0.00]	[0.00]
	Italy					Sweden			
cay_t	0.24	0.43	0.60	0.86	cay_t	0.05	0.03	-0.22	-0.59
(t-stat)	(0.96)	(1.13)	(1.27)	(1.56)	(t-stat)	(0.19)	(0.07)	(-0.37)	(-0.83)
Δcay_t	-0.17	0.10	1.55	1.12	Δcay_t	-0.03	1.01	3.31	3.29
(t-stat)	(-0.15)	(0.05)	(0.60)	(0.36)	(t-stat)	(-0.03)	(0.65)	(1.38)	(1.22)
$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.03]	$\bar{R}^2$	[0.00]	[0.01]	[0.05]	[0.03]
	Japan					UK			
cay_t	0.77*	1.19*	1.35	1.46	cay_t	1.00***	1.89***	2.63***	3.07***
(t-stat)	(1.83)	(1.68)	(1.44)	(1.28)	(t-stat)	(3.71)	(3.90)	(4.09)	(4.31)
Δcay_t	0.16	0.82	0.52	1.33	Δcay_t	-0.47	-0.14	0.35	2.09
(t-stat)	(0.29)	(0.84)	(0.43)	(0.82)	(t-stat)	(-0.69)	(-0.14)	(0.28)	(1.56)
$\bar{R}^2$	[0.04]	[0.05]	[0.03]	[0.03]	$\bar{R}^2$	[0.10]	[0.15]	[0.19]	[0.23]
	Netherlands					US			
cay_t	0.66*	1.40**	2.28***	2.87***	cay_t	0.87	1.69***	2.36***	3.08***
(t-stat)	(1.73)	(2.46)	(3.10)	(3.26)	(t-stat)	(2.66)	(2.96)	(3.10)	(3.37)
Δcay_t	-0.01	-0.86	-1.28	-0.86	Δcay_t	-0.83	-0.77	-0.77	-1.39
(t-stat)	(-0.02)	(-0.94)	(-1.14)	(-0.59)	(t-stat)	(-1.12)	(-0.70)	(-0.57)	(-0.93)
$\bar{R}^2$	[0.02]	[0.03]	[0.05]	[0.06]	$\bar{R}^2$	[0.04]	[0.06]	[0.07]	[0.09]

Table 4a

Forecasting regressions for real stock returns (using $cday$).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Australia					Denmark			
$cday_t$	0.56	1.04*	1.63**	2.18**	$cday_t$	0.40***	0.83***	1.27***	1.73***
(t-stat)	(1.38)	(1.77)	(2.19)	(2.42)	(t-stat)	(2.81)	(3.39)	(3.81)	(4.16)
$\Delta cday_t$	0.90	0.61	-0.52	0.44	$\Delta cday_t$	-0.36	-0.58	-0.55	-0.91
(t-stat)	(1.31)	(0.50)	(-0.35)	(0.25)	(t-stat)	(-1.26)	(-1.39)	(-1.07)	(-1.42)
$\bar{R}^2$	[0.04]	[0.04]	[0.05]	[0.07]	$\bar{R}^2$	[0.08]	[0.11]	[0.13]	[0.14]
	Austria					Finland			
$cday_t$	0.41	0.76	1.14	1.47	$cday_t$	0.87*	1.57**	2.12**	2.61**
(t-stat)	(1.06)	(1.12)	(1.25)	(1.25)	(t-stat)	(1.73)	(1.93)	(2.06)	(2.00)
$\Delta cday_t$	-0.11	-0.18	-0.66	-0.31	$\Delta cday_t$	0.50	1.31	1.89	1.78
(t-stat)	(-0.17)	(-0.16)	(-0.47)	(-0.15)	(t-stat)	(0.34)	(0.64)	(0.68)	(0.50)
$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.02]	$\bar{R}^2$	[0.03]	[0.04]	[0.04]	[0.04]
	Belgium					France			
$cday_t$	2.38***	4.37***	5.75***	6.40***	$cday_t$	2.15***	4.35***	6.33***	8.34***
(t-stat)	(4.45)	(5.88)	(7.26)	(7.45)	(t-stat)	(3.37)	(4.47)	(5.41)	(6.47)
$\Delta cday_t$	-0.63	-0.98	-0.59	0.23	$\Delta cday_t$	-2.25**	-2.61**	-3.29**	-4.61**
(t-stat)	(-0.87)	(-0.99)	(-0.48)	(0.14)	(t-stat)	(-2.34)	(-1.97)	(-2.04)	(-2.47)
$\bar{R}^2$	[0.18]	[0.24]	[0.27]	[0.24]	$\bar{R}^2$	[0.10]	[0.14]	[0.20]	[0.24]
	Canada					Germany			
$cday_t$	1.26***	2.29***	2.87***	3.17***	$cday_t$	-1.41**	-1.84*	-1.78	-1.74
(t-stat)	(4.54)	(4.64)	(4.05)	(3.43)	(t-stat)	(-2.18)	(-1.82)	(-1.33)	(-1.04)
$\Delta cday_t$	-0.25	0.55	1.80	1.87	$\Delta cday_t$	-0.22	-0.71	-0.64	-0.73
(t-stat)	(-0.42)	(0.54)	(1.36)	(1.23)	(t-stat)	(-0.30)	(-0.62)	(-0.43)	(-0.43)
$\bar{R}^2$	[0.12]	[0.20]	[0.22]	[0.19]	$\bar{R}^2$	[0.06]	[0.05]	[0.03]	[0.02]

Table 4b

Forecasting regressions for real stock returns (using *cday*).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Ireland					Spain			
$cday_t$	0.21	-0.06	-0.56	-0.26	$cday_t$	-0.44	1.22	3.44	5.03*
(t-stat)	(0.32)	(-0.05)	(-0.42)	(-0.17)	(t-stat)	(-0.33)	(0.70)	(1.46)	(1.68)
$\Delta cday_t$	0.74	1.38	0.47	-1.46	$\Delta cday_t$	-1.22	-2.99	-4.85*	-3.79
(t-stat)	(0.83)	(0.80)	(0.20)	(-0.50)	(t-stat)	(-0.76)	(-1.20)	(-1.65)	(-1.22)
$\bar{R}^2$	[0.01]	[0.01]	[0.00]	[0.00]	$\bar{R}^2$	[0.02]	[0.02]	[0.05]	[0.04]
	Italy					Sweden			
$cday_t$	0.70	1.20	1.62	2.32*	$cday_t$	1.17**	2.53***	3.49***	3.93***
(t-stat)	(1.21)	(1.39)	(1.58)	(1.93)	(t-stat)	(2.10)	(3.04)	(3.68)	(3.75)
$\Delta cday_t$	-0.67	0.80	1.57	-1.27	$\Delta cday_t$	-2.16***	-2.36	-0.24	0.38
(t-stat)	(-0.36)	(0.24)	(0.34)	(-0.23)	(t-stat)	(-2.65)	(-1.56)	(-0.11)	(0.15)
$\bar{R}^2$	[0.02]	[0.02]	[0.03]	[0.03]	$\bar{R}^2$	[0.08]	[0.10]	[0.11]	[0.11]
	Japan					UK			
$cday_t$	0.72*	1.18	1.39	1.58	$cday_t$	1.20*	2.42***	3.60***	4.45***
(t-stat)	(1.70)	(1.61)	(1.43)	(1.36)	(t-stat)	(3.25)	(4.57)	(5.48)	(5.46)
$\Delta cday_t$	0.19	0.81	0.63	1.38	$\Delta cday_t$	-0.88	-1.34	-1.70	-0.85
(t-stat)	(0.32)	(0.80)	(0.53)	(0.85)	(t-stat)	(-1.47)	(-1.48)	(-1.49)	(-0.69)
$\bar{R}^2$	[0.04]	[0.04]	[0.03]	[0.04]	$\bar{R}^2$	[0.09]	[0.14]	[0.21]	[0.24]
	Netherlands					US			
$cday_t$	0.73**	1.60***	2.56***	3.22***	$cday_t$	0.66	1.49*	2.19*	3.03**
(t-stat)	(1.96)	(2.84)	(3.48)	(3.61)	(t-stat)	(1.29)	(1.75)	(1.94)	(2.21)
$\Delta cday_t$	-0.15	-1.08	-1.49	-1.11	$\Delta cday_t$	-0.44	-1.00	-1.00	-2.17
(t-stat)	(-0.28)	(-1.24)	(-1.38)	(-0.78)	(t-stat)	(-0.52)	(-0.73)	(-0.57)	(-1.15)
$\bar{R}^2$	[0.02]	[0.04]	[0.06]	[0.07]	$\bar{R}^2$	[0.01]	[0.03]	[0.04]	[0.05]

Table 5a

Forecasting regressions for real stock returns (using cay): additional control variables.
The dependent variable is H-period real return $r_{t+1}+ ... + r_{t+H}$.

Panel A presents the forecasting regressions where cay is the only predictor. In Panel B, they also include the first-difference of cay, lagged returns (r_{t-1}) and the dividend yield (dy) (where available).

	Forecast Horizon H					Forecast Horizon H			
	1	2	3	4		1	2	3	4
	Australia					Denmark			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.04]	[0.05]	[0.06]	[0.07]	$\bar{R}^2$	[0.07]	[0.11]	[0.14]	[0.15]
	Panel B: cay, Δcay, r_{t-1} and dy					Panel B: cay, Δcay and r_{t-1}			
$\bar{R}^2$	[0.10]	[0.13]	[0.16]	[0.19]	$\bar{R}^2$	[0.24]	[0.20]	[0.21]	[0.19]
	Austria					Finland			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.02]	[0.03]	[0.03]	[0.04]	$\bar{R}^2$	[0.04]	[0.07]	[0.11]	[0.14]
	Panel B: cay, Δcay and r_{t-1}					Panel B: cay, Δcay, r_{t-1} and dy			
$\bar{R}^2$	[0.03]	[0.04]	[0.04]	[0.04]	$\bar{R}^2$	[0.09]	[0.20]	[0.27]	[0.29]
	Belgium					France			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.11]	[0.11]	[0.12]	[0.08]	$\bar{R}^2$	[0.07]	[0.13]	[0.18]	[0.20]
	Panel B: cay, Δcay, r_{t-1} and dy					Panel B: cay, Δcay, r_{t-1} and dy			
$\bar{R}^2$	[0.19]	[0.26]	[0.31]	[0.32]	$\bar{R}^2$	[0.14]	[0.19]	[0.17]	[0.19]
	Canada					Germany			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.07]	[0.11]	[0.07]	[0.17]	$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.02]
	Panel B: cay, Δcay, r_{t-1} and dy					Panel B: cay, Δcay, r_{t-1} and dy			
$\bar{R}^2$	[0.14]	[0.20]	[0.20]	[0.17]	$\bar{R}^2$	[0.05]	[0.10]	[0.13]	[0.12]

Table 5b

Forecasting regressions for real stock returns (using *cay*): additional control variables.

The dependent variable is H-period real return $r_{t+1}+...+r_{t+H}$.

Panel A presents the forecasting regressions where cay is the only predictor. In Panel B, they also include the first-difference of cay, lagged returns (r_{t-1}) and the dividend yield (dy) (where available).

	Forecast Horizon H					Forecast Horizon H			
	1	2	3	4		1	2	3	4
	Ireland					Spain			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.00]	[0.00]	[0.00]	[0.00]	$\bar{R}^2$	[0.00]	[0.00]	[0.00]	[0.00]
	Panel B: cay, Δcay and r_{t-1}					Panel B: cay, Δcay and r_{t-1}			
$\bar{R}^2$	[0.01]	[0.01]	[0.00]	[0.00]	$\bar{R}^2$	[0.01]	[0.02]	[0.04]	[0.02]
	Italy					Sweden			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.02]	$\bar{R}^2$	[0.00]	[0.00]	[0.00]	[0.00]
	Panel B: cay, Δcay, r_{t-1} and dy					Panel B: cay, Δcay, r_{t-1} and dy			
$\bar{R}^2$	[0.21]	[0.28]	[0.36]	[0.40]	$\bar{R}^2$	[0.21]	[0.31]	[0.38]	[0.41]
	Japan					UK			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.05]	[0.05]	[0.04]	[0.04]	$\bar{R}^2$	[0.09]	[0.15]	[0.15]	[0.18]
	Panel B: cay, Δcay, r_{t-1} and dy					Panel B: cay, Δcay, r_{t-1} and dy			
$\bar{R}^2$	[0.06]	[0.08]	[0.08]	[0.09]	$\bar{R}^2$	[0.08]	[0.15]	[0.20]	[0.28]
	Netherlands					US			
	Panel A: cay only					Panel A: cay only			
$\bar{R}^2$	[0.02]	[0.02]	[0.04]	[0.05]	$\bar{R}^2$	[0.03]	[0.06]	[0.07]	[0.08]
	Panel B: cay, Δcay, r_{t-1} and dy					Panel B: cay, Δcay, r_{t-1} and dy			
$\bar{R}^2$	[0.10]	[0.20]	[0.27]	[0.32]	$\bar{R}^2$	[0.06]	[0.08]	[0.10]	[0.11]

Table 6a

Forecasting regressions for real stock returns (using *cday*): additional control variables.

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

Panel A presents the forecasting regressions where cay is the only predictor. In Panel B, they also include the first-difference of cay, lagged returns (r_{t-1}) and the dividend yield (dy) (where available)

	Forecast Horizon H					Forecast Horizon H			
	1	2	3	4		1	2	3	4
	Australia					Denmark			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.03]	[0.04]	[0.05]	[0.07]	$\bar{R}^2$	[0.06]	[0.10]	[0.12]	[0.13]
	Panel B: $cday$, $\Delta cday$, r_{t-1} and dy					Panel B: $cday$, $\Delta cday$ and r_{t-1}			
$\bar{R}^2$	[0.08]	[0.11]	[0.15]	[0.18]	$\bar{R}^2$	[0.23]	[0.18]	[0.19]	[0.17]
	Austria					Finland			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.02]	$\bar{R}^2$	[0.03]	[0.03]	[0.04]	[0.04]
	Panel B: $cday$, $\Delta cday$ and r_{t-1}					Panel B: $cday$, $\Delta cday$, r_{t-1} and dy			
$\bar{R}^2$	[0.03]	[0.03]	[0.03]	[0.02]	$\bar{R}^2$	[0.06]	[0.21]	[0.17]	[0.13]
	Belgium					France			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.18]	[0.24]	[0.28]	[0.26]	$\bar{R}^2$	[0.07]	[0.14]	[0.19]	[0.22]
	Panel B: $cday$, $\Delta cday$, r_{t-1} and dy					Panel B: $cday$, $\Delta cday$, r_{t-1} and dy			
$\bar{R}^2$	[0.22]	[0.30]	[0.34]	[0.34]	$\bar{R}^2$	[0.12]	[0.17]	[0.24]	[0.30]
	Canada					Germany			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.07]	[0.19]	[0.19]	[0.17]	$\bar{R}^2$	[0.06]	[0.05]	[0.03]	[0.02]
	Panel B: $cday$, $\Delta cday$, r_{t-1} and dy					Panel B: $cday$, $\Delta cday$, r_{t-1} and dy			
$\bar{R}^2$	[0.17]	[0.25]	[0.28]	[0.25]	$\bar{R}^2$	[0.08]	[0.09]	[0.08]	[0.07]

Table 6b

Forecasting regressions for real stock returns (using *cday*): additional control variables.

The dependent variable is H-period real return $r_{t+1}+ ... + r_{t+H}$.

Panel A presents the forecasting regressions where cay is the only predictor. In Panel B, they also include the first-difference of cay, lagged returns (r_{t-1}) and the dividend yield (dy) (where available)

	Forecast Horizon H					Forecast Horizon H			
	1	2	3	4		1	2	3	4
	Ireland					Spain			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.00]	[0.00]	[0.00]	[0.00]	$\bar{R}^2$	[0.00]	[0.00]	[0.01]	[0.03]
	Panel B: $cday$, $\Delta cday$ and r_{t-1}					Panel B: $cday$, $\Delta cday$ and r_{t-1}			
$\bar{R}^2$	[0.01]	[0.01]	[0.00]	[0.01]	$\bar{R}^2$	[0.02]	[0.04]	[0.10]	[0.09]
	Italy					Sweden			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.01]	[0.02]	[0.02]	[0.03]	$\bar{R}^2$	[0.03]	[0.08]	[0.11]	[0.11]
	Panel B: $cday$, $\Delta cday$, r_{t-1} and dy					Panel B: $cday$, $\Delta cday$, r_{t-1} and dy			
$\bar{R}^2$	[0.13]	[0.21]	[0.31]	[0.37]	$\bar{R}^2$	[0.18]	[0.24]	[0.28]	[0.30]
	Japan					UK			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.05]	[0.05]	[0.04]	[0.04]	$\bar{R}^2$	[0.06]	[0.12]	[0.17]	[0.22]
	Panel B: $cday$, $\Delta cday$, r_{t-1} and dy					Panel B: $cday$, $\Delta cday$, r_{t-1} and dy			
$\bar{R}^2$	[0.05]	[0.07]	[0.08]	[0.21]	$\bar{R}^2$	[0.13]	[0.17]	[0.21]	[0.26]
	Netherlands					US			
	Panel A: $cday$ only					Panel A: $cday$ only			
$\bar{R}^2$	[0.02]	[0.03]	[0.05]	[0.06]	$\bar{R}^2$	[0.01]	[0.02]	[0.03]	[0.04]
	Panel B: $cday$, $\Delta cday$, r_{t-1} and dy					Panel B: $cday$, $\Delta cday$, r_{t-1} and dy			
$\bar{R}^2$	[0.18]	[0.32]	[0.37]	[0.38]	$\bar{R}^2$	[0.02]	[0.03]	[0.02]	[0.04]

Table 7

Forecasting regressions for real stock returns (using *cay*): nested forecast comparisons. MSE represents the mean-squared forecasting error.

	$\text{MSE}_{\text{cay}+\Delta\text{cay}}/\text{MSE}_{\text{constant}}$	$\text{MSE}_{\text{cay}+\Delta\text{cay}}/\text{MSE}_{\text{AR}}$
Australia	0.97	0.98
Austria	1.01	1.01
Belgium	0.96	0.94
Canada	0.99	0.99
Denmark	0.97	0.99
Finland	0.98	1.00
France	0.98	1.00
Germany	1.07	1.07
Ireland	1.02	1.02
Italy	1.01	1.01
Japan	0.88	0.88
Netherlands	1.00	1.00
Spain	0.93	0.95
Sweden	1.01	1.01
UK	1.00	1.00
US	0.99	0.99

Table 8

Forecasting regressions for real stock returns (using *cday*): nested forecast comparisons.

MSE represents the mean-squared forecasting error.

	$\mathrm{MSE}_{\mathrm{cday}+\Delta\mathrm{cday}}/\mathrm{MSE}_{\mathrm{constant}}$	$\mathrm{MSE}_{\mathrm{cday}+\Delta\mathrm{cday}}/\mathrm{MSE}_{\mathrm{AR}}$
Australia	0.98	0.99
Austria	1.02	1.02
Belgium	0.92	0.93
Canada	0.97	0.96
Denmark	0.98	1.00
Finland	1.01	1.00
France	0.97	1.00
Germany	1.04	1.05
Ireland	1.02	1.02
Italy	1.00	1.01
Japan	0.89	0.88
Netherlands	1.00	1.00
Spain	0.93	0.94
Sweden	0.97	0.98
UK	1.00	1.01
US	0.96	0.99

Table 9a

Forecasting regressions for real stock returns (using reestimated *cay*).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Australia					Denmark			
cay_t	0.54	0.96*	1.39**	1.77**	cay_t	0.33**	0.70***	1.10***	1.55***
(t-stat)	(1.47)	(1.82)	(2.24)	(2.48)	(t-stat)	(2.47)	(3.12)	(3.56)	(3.93)
Δcay_t	1.65**	2.11*	1.58	2.61	Δcay_t	-0.39	-0.65	-0.69	-1.13*
(t-stat)	(2.15)	(1.66)	(1.03)	(1.42)	(t-stat)	(-1.32)	(-1.51)	(-1.29)	(-1.72)
$\bar{R}^2$	[0.07]	[0.14]	[0.07]	[0.09]	$\bar{R}^2$	[0.05]	[0.07]	[0.08]	[0.10]
	Austria					Finland			
cay_t	0.32	0.78*	1.35**	1.96***	cay_t	0.87**	1.79***	2.70***	3.55***
(t-stat)	(1.15)	(1.70)	(2.23)	(2.54)	(t-stat)	(2.26)	(3.07)	(3.61)	(3.76)
Δcay_t	-0.54	-1.13	-1.58	-1.53	Δcay_t	-1.60	-2.42	-2.18	-1.87
(t-stat)	(-1.08)	(-1.33)	(-1.37)	(-1.01)	(t-stat)	(-0.97)	(-1.03)	(-0.72)	(-0.47)
$\bar{R}^2$	[0.01]	[0.03]	[0.04]	[0.06]	$\bar{R}^2$	[0.05]	[0.08]	[0.10]	[0.11]
	Belgium					France			
cay_t	0.82***	1.53***	2.10***	2.52***	cay_t	1.80***	3.62***	5.23***	6.81***
(t-stat)	(4.05)	(4.94)	(5.39)	(5.53)	(t-stat)	(3.17)	(4.15)	(4.94)	(5.68)
Δcay_t	0.39	0.78	1.62	2.65**	Δcay_t	-2.12**	-2.25*	-2.47	-3.38*
(t-stat)	(0.55)	(0.74)	(1.45)	(1.95)	(t-stat)	(-2.30)	(-1.74)	(-1.42)	(-1.68)
$\bar{R}^2$	[0.15]	[0.21]	[0.25]	[0.27]	$\bar{R}^2$	[0.10]	[0.14]	[0.18]	[0.22]
	Canada					Germany			
cay_t	0.68***	1.12***	1.27**	1.27*	cay_t	-0.27	-0.56	-0.88	-1.27**
(t-stat)	(2.89)	(2.85)	(2.38)	(1.94)	(t-stat)	(-1.00)	(-1.29)	(-1.60)	(-1.95)
Δcay_t	0.60	2.05*	3.34**	3.41**	Δcay_t	0.58	1.12	1.93*	2.14*
(t-stat)	(0.97)	(1.90)	(2.36)	(2.17)	(t-stat)	(1.29)	(1.38)	(1.80)	(1.63)
$\bar{R}^2$	[0.08]	[0.13]	[0.13]	[0.10]	$\bar{R}^2$	[0.02]	[0.03]	[0.04]	[0.05]

Table 9b

Forecasting regressions for real stock returns (using reestimated *cay*).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Ireland					Spain			
cay_t	0.17	-0.10	-0.52	-0.33	cay_t	-0.75	-1.08	-1.54	-2.07
(t-stat)	(0.28)	(-0.09)	(-0.37)	(-0.20)	(t-stat)	(-0.98)	(-1.02)	(-1.11)	(-1.17)
Δcay_t	0.90	1.59	0.88	-0.82	Δcay_t	0.44	0.38	-0.20	0.67
(t-stat)	(0.96)	(0.90)	(0.39)	(-0.31)	(t-stat)	(0.20)	(0.12)	(-0.05)	(0.16)
$\bar{R}^2$	[0.01]	[0.01]	[0.00]	[0.00]	$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.02]
	Italy					Sweden			
cay_t	0.24	0.43	0.60	0.86	cay_t	-0.11	-0.28	-0.67	-1.17
(t-stat)	(0.96)	(1.13)	(1.27)	(1.56)	(t-stat)	(-0.37)	(-0.55)	(-1.03)	(-1.54)
Δcay_t	-0.17	0.10	1.55	1.12	Δcay_t	0.06	1.44	4.78*	5.05
(t-stat)	(-0.15)	(0.05)	(0.60)	(0.36)	(t-stat)	(0.06)	(0.77)	(1.63)	(1.50)
$\bar{R}^2$	[0.01]	[0.01]	[0.02]	[0.03]	$\bar{R}^2$	[0.00]	[0.01]	[0.06]	[0.06]
	Japan					UK			
cay_t	0.76*	1.15*	1.28	1.36	cay_t	0.80***	1.55***	2.12***	2.38***
(t-stat)	(1.79)	(1.64)	(1.37)	(1.19)	(t-stat)	(3.68)	(4.02)	(4.16)	(4.40)
Δcay_t	0.17	0.85	0.56	1.39	Δcay_t	-0.44	-0.18	0.43	2.21
(t-stat)	(0.30)	(0.86)	(0.46)	(0.85)	(t-stat)	(-0.64)	(-0.17)	(0.33)	(1.52)
$\bar{R}^2$	[0.04]	[0.04]	[0.03]	[0.03]	$\bar{R}^2$	[0.06]	[0.10]	[0.13]	[0.16]
	Netherlands					US			
cay_t	0.95***	1.93***	2.86***	3.53***	cay_t	0.98***	1.94***	2.77***	3.62***
(t-stat)	(3.07)	(4.14)	(4.67)	(4.86)	(t-stat)	(3.60)	(4.15)	(4.43)	(4.86)
Δcay_t	-0.25	-0.98	-1.32	-1.13	Δcay_t	-0.95	-0.96	-1.21	-1.94
(t-stat)	(-0.63)	(-1.53)	(-1.61)	(-1.07)	(t-stat)	(-1.43)	(-0.98)	(-1.02)	(-1.51)
$\bar{R}^2$	[0.06]	[0.10]	[0.13]	[0.14]	$\bar{R}^2$	[0.07]	[0.09]	[0.11]	[0.14]

Table 10a

Forecasting regressions for real stock returns (using reestimated *cday*).

The dependent variable is H-period real return $r_{t+1} + ... + r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Australia					Denmark			
$cday_t$	0.56	1.04*	1.63**	2.18**	$cday_t$	0.33**	0.69***	1.08***	1.50***
(t-stat)	(1.38)	(1.77)	(2.19)	(2.42)	(t-stat)	(2.44)	(3.01)	(3.40)	(3.76)
$\Delta cday_t$	0.90	0.61	-0.52	0.44	$\Delta cday_t$	-0.33	-0.56	-0.56	-0.99
(t-stat)	(1.31)	(0.50)	(-0.35)	(0.25)	(t-stat)	(-1.14)	(-1.36)	(-1.07)	(-1.54)
$\bar{R}^2$	[0.04]	[0.04]	[0.05]	[0.07]	$\bar{R}^2$	[0.04]	[0.07]	[0.08]	[0.10]
	Austria					Finland			
$cday_t$	0.27	0.67	1.19*	1.76**	$cday_t$	0.67	2.12**	2.61**	1.96
(t-stat)	(0.95)	(1.44)	(1.91)	(2.19)	(t-stat)	(1.35)	(2.06)	(2.00)	(1.51)
$\Delta cday_t$	-0.48	-1.04	-1.46	-1.46	$\Delta cday_t$	0.64	1.89	1.78	0.98
(t-stat)	(-0.97)	(-1.24)	(-1.26)	(-0.93)	(t-stat)	(0.43)	(0.68)	(0.50)	(0.27)
$\bar{R}^2$	[0.01]	[0.02]	[0.03]	[0.04]	$\bar{R}^2$	[0.02]	[0.04]	[0.04]	[0.02]
	Belgium					France			
$cday_t$	0.92***	1.75***	2.46***	2.98***	$cday_t$	2.27***	4.61***	6.75***	8.91***
(t-stat)	(3.36)	(4.24)	(5.03)	(5.54)	(t-stat)	(3.36)	(4.48)	(5.51)	(6.65)
$\Delta cday_t$	-0.10	-0.36	-0.23	0.17	$\Delta cday_t$	-2.30**	-2.78**	-3.60**	-5.03***
(t-stat)	(-0.20)	(-0.51)	(.0.27)	(0.15)	(t-stat)	(-2.39)	(-2.12)	(-2.21)	(-2.67)
$\bar{R}^2$	[0.12]	[0.17]	[0.20]	[0.21]	$\bar{R}^2$	[0.10]	[0.15]	[0.20]	[0.24]
	Canada					Germany			
$cday_t$	1.31***	2.40***	3.02***	3.35***	$cday_t$	-1.41**	-1.84*	-1.78	-1.74
(t-stat)	(4.70)	(4.82)	(4.23)	(3.58)	(t-stat)	(-2.18)	(-1.82)	(-1.33)	(-1.04)
$\Delta cday_t$	-0.26	0.53	1.78	1.83	$\Delta cday_t$	-0.22	-0.71	-0.64	-0.73
(t-stat)	(-0.44)	(0.52)	(1.35)	(1.21)	(t-stat)	(-0.30)	(-0.62)	(-0.43)	(-0.43)
$\bar{R}^2$	[0.13]	[0.20]	[0.23]	[0.20]	$\bar{R}^2$	[0.06]	[0.05]	[0.03]	[0.02]

Table 10b

Forecasting regressions for real stock returns (using reestimated *cday*).

The dependent variable is H-period real return $r_{t+1}+\ldots+r_{t+H}$.

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

Newey-West (1987) corrected t-statistics appear in parenthesis.

	Forecast Horizon H					Forecast Horizon H			
Regressor	1	2	3	4	Regressor	1	2	3	4
	Ireland					Spain			
$cday_t$	0.27	0.05	-0.40	-0.06	$cday_t$	-0.53	0.48	2.47	4.04
(t-stat)	(0.41)	(0.04)	(-0.30)	(-0.04)	(t-stat)	(-0.43)	(0.26)	(0.97)	(1.28)
$\Delta cday_t$	0.72	1.33	0.44	-1.47	$\Delta cday_t$	-1.26	-2.78	-4.66*	-3.71
(t-stat)	(0.80)	(0.77)	(0.18)	(-0.50)	(t-stat)	(-0.80)	(-1.10)	(-1.53)	(-1.15)
$\bar{R}^2$	[0.01]	[0.01]	[0.00]	[0.00]	$\bar{R}^2$	[0.02]	[0.02]	[0.04]	[0.03]
	Italy					Sweden			
$cday_t$	0.69	1.20	1.63	2.32*	$cday_t$	1.09*	2.32***	3.08***	3.27***
(t-stat)	(1.19)	(1.38)	(1.58)	(1.93)	(t-stat)	(1.80)	(2.57)	(3.00)	(2.86)
$\Delta cday_t$	-0.71	0.73	1.52	-1.31	$\Delta cday_t$	-1.90**	-1.80	0.54	0.96
(t-stat)	(-0.38)	(0.22)	(0.33)	(-0.23)	(t-stat)	(-2.29)	(-1.09)	(0.22)	(0.34)
$\bar{R}^2$	[0.02]	[0.02]	[0.02]	[0.03]	$\bar{R}^2$	[0.06]	[0.07]	[0.08]	[0.07]
	Japan					UK			
$cday_t$	0.73*	1.18	1.37	1.55	$cday_t$	1.05**	2.17***	3.29***	4.07***
(t-stat)	(1.71)	(1.62)	(1.43)	(1.33)	(t-stat)	(2.25)	(3.62)	(5.34)	(5.50)
$\Delta cday_t$	0.18	0.83	0.62	1.42	$\Delta cday_t$	-0.86	-1.38	-1.78	-1.04
(t-stat)	(0.33)	(0.86)	(0.53)	(0.90)	(t-stat)	(-1.46)	(-1.52)	(-1.62)	(-0.83)
$\bar{R}^2$	[0.04]	[0.05]	[0.03]	[0.04]	$\bar{R}^2$	[0.06]	[0.11]	[0.16]	[0.18]
	Netherlands					US			
$cday_t$	0.92***	1.86***	2.72***	3.29***	$cday_t$	0.24	0.68	0.83	1.09
(t-stat)	(2.63)	(3.41)	(3.78)	(3.91)	(t-stat)	(0.43)	(0.74)	(0.70)	(0.79)
$\Delta cday_t$	-0.28	-0.94	-1.22	-1.06	$\Delta cday_t$	-0.17	-0.53	-0.20	-1.04
(t-stat)	(-0.68)	(-1.40)	(-1.43)	(-0.97)	(t-stat)	(-0.22)	(-0.40)	(-0.12)	(-0.57)
$\bar{R}^2$	[0.05]	[0.08]	[0.10]	[0.10]	$\bar{R}^2$	[0.00]	[0.01]	[0.01]	[0.01]