



Human capital, household capital and asset returns [☆]



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ABSTRACT

Sousa (2010a) shows that the residuals from the common trend among consumption, financial wealth, housing wealth and human capital, $cday$, can predict quarterly stock market returns better than cay from Lettau and Ludvigson (2001), which considers aggregate wealth instead. In this paper, we use a more appropriate proxy of human capital, which alleviates the potential correlation between the residuals and the regressors and makes the estimation more precise. In addition, we extend housing wealth to household capital by taking durable goods into consideration. The new predictor is proposed accordingly. Empirically, we find that our predictor is superior to the other alternatives.

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1. Introduction

The predictability of asset returns using macroeconomic variables is one of the most important research areas in finance. Many predictors have been intensively studied. More recently, a lot of economically motivated predictors have been proposed, for example, the ratio of housing wealth to human capital (Lustig and van Nieuwerburgh, 2005), the composition risk (Piazzesi et al., 2007; Yogo, 2006), the trend deviation of the long-run relationship between nondurable consumption, non-asset income, wealth and the relative price of durables to nondurables (Fernandez-Corugedo et al., 2007), the residuals of the trend relationship between housing wealth and labor income (Sousa and wealth, 2010b), as well as the ratio of asset wealth to human capital (Sousa, 2012a,b,c).

Of all the predictors in the literature, the transitory deviation from the common trend in consumption, asset wealth and human capital (Lettau and Ludvigson, 2001), cay , is one of the most

successful. Economic intuition is that investors who want to smooth their consumption adjust their current consumption if they expect transitory movements in their asset wealth caused by variations in expected returns. When the expected return rises, a forward-looking investor increases his current consumption. Conversely, when the expected return declines, he decreases it. Sousa (2010a) argues that some components of asset wealth have different characteristics and that it is appropriate to disaggregate them from asset wealth. Using US and UK data, he shows that the residuals from the common trend among consumption, financial wealth, housing wealth and human capital, $cday$, can predict quarterly stock market returns better than cay proposed by Lettau and Ludvigson (2001). Moreover, Afonso and Sousa (2011) find that cay and $cday$ are not market-restricted as they can also predict stock returns in other OECD countries.

The construction of cay or $cday$ involves human capital. Unobservable human capital plays important role in recent asset pricing models, for example, Julliard (2004) and Wei (2005). However, how to proxy it has not been paid enough attention. The first contribution of this paper is that we improve the prediction abilities of cay and $cday$ by addressing this proxy issue properly.

From a microeconomic perspective, economists have proposed variables such as labor inputs with various adjustments (Denison, 1967), adult literacy rates and school enrollment ratios (Azariadis and Drazen, 1990; Romer, 1990), and, the most popular, average years of schooling (Islam, 1995; O'Neill, 1995; Barro, 2001) to

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specify human capital stocks. From a macroeconomic perspective, human capital is usually defined as the present value of future labor income and is measured in the aggregate (Auerbach et al., 1992; Auerbach et al., 1994). As Macklem (1997) mentions, the macro or aggregate approach has two important advantages: first, it facilitates our understanding of the joint statistical properties of shocks in income and interest rates; second, at the macro level, the data requirements are much less onerous, making this approach easily applicable to different countries.

Both Lettau and Ludvigson (2001) and Sousa (2010a) take the macro approach and substitute human capital (logarithmic value) with a linear function of current labor income (logarithmic value). Although this substitution is supported by economic theory and data, it is not appropriate to use it to construct *cay* or *cday* as both *cay* and *cday* are obtained using the “dynamic least squares” (DLS) regression proposed by Stock and Watson (1993). The DLS specification adds leads and lags of the first difference of the right-hand side variables to a standard “ordinary least squares” (OLS) regression to eliminate the effects of regressor endogeneity on the distribution of the least squares estimator. However, if human capital is substituted by a linear function of current labor income, it causes a correlation between the residuals of the regression and the leads and the lags of the first difference components. This correlation jeopardizes the good finite-sample properties of the DLS estimators. In order to eliminate it, we follow Macklem (1997) using a Markov chain to calculate the sum of the expected present value of labor incomes, and treat this as a proxy for human capital. This produces better estimators.

The second contribution of this paper is a closer examination of the importance of wealth composition, as first emphasized by Sousa (2010a). Sousa (2010a) disaggregates aggregate wealth into financial wealth, human capital and housing wealth, and finds a superior predictor of financial asset returns over *cay*. Similar to housing wealth, durable goods (such as clothing and furniture) also have these special characteristics unlike financial wealth. They are different from financial wealth with respect to liquidity, utility from ownership rights, and the different distributions across income groups, among others. Many researchers have examined these differences, for instance, Hess (1973), Mankiw (1982), Grossman and Laroque (1990), Caballero (1993) and Hong (1996). Moreover, the value of durable goods is increasing rapidly. Recently, it accounts for around 7% of aggregate wealth. Therefore, we define the sum of durable goods and housing wealth as household capital and disaggregate them from aggregate wealth.

So, we use the expected present value of labor incomes as a proxy for human capital, and estimate the transitory deviation from the common trend in consumption, financial wealth, human capital and household capital. We define this transitory deviation as a new predictor, *cadh*. *cadh* should outperform *cay* and *cday* because the parameters are estimated more precisely and durable goods are taken into consideration in cointegrating.

Empirically, we collect US quarterly data from 1952 to 2011, and split it into two subsamples. The first is from the first quarter of 1952 to the fourth quarter of 1976; the second is from the first quarter of 1977 to the fourth quarter of 2011. The reason for doing this is that the cointegrating vectors among consumption, financial wealth, human capital and household capital are different for these two subsamples. The difference of the cointegrating vectors reflects the change in the long-run elasticities of consumption with respect to financial wealth, household capital, and human capital. Specifically, the elasticities with respect to financial wealth and human capital increase and decrease respectively, while the elasticity with respect to household capital remains relatively unchanged.

Finally, we compare the predictive power of *cadh*, *cay* and *cday*. We find that in the first subsample, our predictor can explain at

most 12% variation over the next 8 quarters for in-sample forecasting while *cay* and *cday* explain, at most, 7% and 9% variation, respectively. In the second subsample, the numbers increase to 31%, 26% and 27%, respectively. Moreover, we show that the superiority of our predictors is due to both good measure of human capital and usage of household capital. For out-of-sample forecasting, all three predictors improve the mean squared error (MSE) compared with the constant return model, and the improvements are significant. While, our predictor is the best in terms of MSE.

The rest of this paper is organized as follows: Section 2 describes our estimation model; Section 3 reports the empirical analysis; and Section 4 concludes.

2. A new measure of the consumption-aggregate wealth ratio

As shown by Lettau and Ludvigson (2001), the budget constraint of a consumer in a representative agent economy is

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

where W_t denotes aggregate wealth at time t , C_t denotes consumption at time t and $R_{w,t+1}$ is the return on aggregate wealth between period t and period $t + 1$.

Campbell and Mankiw (1989) show that when the consumption-wealth ratio is stationary, the budget constraint can be approximated by a first-order Taylor expansion:

$$\Delta W_{t+1} \approx k + r_{w,t+1} + (1 - 1/\phi_w)(c_t - w_t),$$

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

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

Taking the conditional expectation on both sides of Eq. (1), we obtain

$$c_t - w_t = E_t \sum_{i=1}^{\infty} \phi_w^i (r_{w,t+i} - \Delta c_{t+i}), \quad (2)$$

where E_t is the expectation operator conditional on information available at time t .

Following Sousa (2010a), we decompose aggregate wealth as

$$W_t = F_t + D_t + H_t, \quad (3)$$

where F_t is financial wealth and H_t is human capital, as in Sousa (2010a). However, we define D_t as household capital, the sum of housing wealth and durable goods. Durable goods, such as cars and furniture, can provide a service flow for several years. Hence they constitute part of aggregate wealth. Quantitatively, durable goods account for 7% of aggregate wealth in 2011, according to the Bureau of Economic Analysis. Qualitatively, durable goods are similar to housing in liquidity, utility from ownership and income distribution. Hence we put them together and denote them household capital.

Eq. (3) can be approximated as

$$w_t \approx \alpha_f f_t + \alpha_d d_t + (1 - \alpha_f - \alpha_d) h_t, \quad (4)$$

where α_f and α_d equal, respectively, the steady-state share of financial wealth holdings in total wealth, F/W , and the steady-state share of household capital holdings in total wealth, D/W .

The return to aggregate wealth can be decomposed into three components:

$$1 + R_{w,t} \approx \alpha_f (1 + R_{f,t}) + \alpha_d (1 + R_{d,t}) + (1 - \alpha_f - \alpha_d) (1 + R_{h,t}). \quad (5)$$

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