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Estimating the elasticity of intertemporal substitution with leverage ☆

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ABSTRACT

Following the recent literature on intermediary asset pricing models, this paper argues that the marginal utility of wealth of financial intermediaries can be used to generate enough volatility and counter-cyclicality on the recursive preference-based stochastic discount factor. Hence, a dynamic econometric strategy of an asset pricing model with the market portfolio return and the leverage growth of financial intermediaries allows for a sensible economic estimate of the elasticity of intertemporal substitution. On the contrary, the same framework with alternative measures of consumption produces extremely poor economic results.

1. Introduction

The elasticity of the intertemporal substitution (EIS hereafter) is one of the key preference parameters of investors' intertemporal investment decisions. However, its estimation remains controversial. There is no consensus on whether it is significantly different from one or, even whether it is significantly above zero. The theoretical and empirical approaches have put either the representative consumer or the representative stockholder consumer as the center of the discussion and estimation.

Our paper steps away from the traditional use of the average households to measuring a financial intermediary stochastic discount factor (SDF hereafter). In particular, we link the SDF pricing framework with the funding capacity of financial

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intermediaries. To motivate our estimation strategy of the EIS, note that Muir (2014) argues convincingly that the expected market risk premium rises substantially in financial crises, but relatively less in economic recessions or wars. Aggregate consumption growth shows precisely the opposite behavior. This is consistent with the importance of wealth of financial intermediaries for asset prices. Adrian, Etula, and Muir (2014) argue that the marginal utility of the wealth of financial intermediaries is a more informative SDF than the marginal utility of consumption of the representative household. These authors show that a one-factor model based on shocks to the leverage of security broker-dealers prices significantly the cross-section of size, book-to-market, momentum, and bond portfolios. The performance of this new single-factor model presents similar performance to that of the traditional multi-factor models. Our results should be understood in this context. Therefore, we suggest that the estimation of the EIS using leverage may be a reasonable approach to better capture the behavior of time-varying expected returns, and the estimation of preference parameters implicitly related to that behavior. Our argument is that the representative intermediary investor should be the focus on the estimation of the EIS.

Throughout the paper, we assume that the representative economic agents, either the average household or the average financial intermediary, have recursive preferences as suggested by Epstein and Zin (1989, 1991). This is particularly useful because this setup breaks the link between risk aversion and the EIS. It is not clear, however, that the Epstein-Zin framework provides enough structure to incorporate an explicit dependency of the equilibrium price of risk on leverage, which is the proxy for the marginal utility of wealth of financial intermediaries. As we explicitly recognize later in the paper, our estimation strategy implicitly assumes that the variances of consumption growth, market portfolio return, and leverage growth are affine functions of leverage. And this is precisely because the equilibrium prices of risk depend on leverage. To justify this approach, we can think of an intertemporal capital asset pricing model (ICAPM) context within the discrete-time approximation of Campbell (1993, 1996) under the Epstein and Zin (1989, 1991) preference framework. Note that, in this context, we cannot replace the consumption growth rate by any variable. First, the state variable we employ must forecast the first or second moments of aggregate stock returns (the investment opportunity set). Second, if a given state variable forecasts positive expected aggregate returns, its innovation (the risk factor) should earn a positive risk premium. Indeed, leverage of financial intermediaries satisfy the two conditions that must characterize any state variable within an ICAPM framework. Leverage forecasts market excess returns, and innovations in financial intermediary endogenously reflect changes in underlying economic state variables. In addition, we also know that the risk premium associated with the innovations in leverage is positive and statistically different from zero.

A complementary additional way to justify this implicit assumption is to think of the structural dynamic models of corporate finance. In particular, Bhamra et al. (2010a) embed a structural model of credit risk within a dynamic consumption-based pricing model with Epstein-Zin recursive preferences. They employ a business cycle mechanism with an intertemporal macroeconomic risk to generate a common factor pricing both stock returns and corporate bonds. Their approach shows that consumption and stock market volatilities co-move with credit spreads and contributes solving both the equity risk premium and the credit spread puzzles. The Epstein-Zin preferences play a key role since the representative agent in their model must prefer uncertainty to be resolved sooner than later. In a related paper, Bhamra et al. (2010b) employ the same framework to study the time-varying behavior of capital structure, and show that leverage accounts for most of the macroeconomic risk for predicting corporate debt defaults. These papers are at least consistent with the implicit assumption employed in our estimation strategy about the dependency of consumption growth and market return on leverage.

The main contribution of this paper is to estimate the EIS using a proxy for the marginal utility wealth of financial intermediaries rather than a proxy for the marginal utility of consumption of the representative household. We substitute consumption out from the model to employ, instead, the growth of leverage of financial intermediaries. Using a dynamic asset pricing estimation strategy and the recursive preference framework, we find an estimate of the EIS, which is significantly different from zero. In particular, the estimate of the EIS is 0.943. On the other hand, when we employ different consumption-based alternatives, the results are inconsistent with a sensible and economically valid interpretation.

This paper proceeds as follows. Section 2 briefly describes the related literature and the available empirical evidence regarding the estimation of the EIS. Section 3 describes the data and Section 4 discusses the econometric approach. Then, Section 5 reports the empirical findings. Finally, Section 6 presents our conclusions.

2. Related literature and available empirical evidence

To explain the time-varying behavior of expected return, macro-finance asset pricing models incorporate a SDF that extend the basic power utility model with an extra (unobservable) variable X that varies over time, and more importantly that makes the SDF to be volatile and counter-cyclical:

$$M_{t+1} = \rho\left(\frac{C_{t+1}}{C_t}\right)^{-\gamma} X_{t+1}, \tag{1}$$

where M_{t+1} is the SDF, ρ is the subjective discount factor that captures impatience, C_{t+1} denotes aggregate consumption, γ is the coefficient of relative risk aversion, and X_{t+1} is the recession variable; this is to say, the variable that changes over recessions.[1] Under alternative specification of X, we obtain, among others, the habit-based model of Campbell and Cochrane (1999),

[1] See Cochrane (2007, 2016), and Campbell (2003) for detailed reviews of these ideas.