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Equity premia and state-dependent risks

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ABSTRACT

This paper evaluates the empirical relations between equity premia and state-dependent consumption and market risks. These relations are derived by combining the baseline CCAPM with a flexible mixture distribution that admits two regimes. We find that the response of the market equity premium to each risk is significant and state dependent. We also show, from various portfolio returns, that the responses to downside consumption risks are the most frequently significant ones, are often statistically larger than the responses to upside consumption risks, and tend to be larger for firms having smaller sizes and facing more financial distresses.

1. Introduction

A central research agenda in financial economics is the understanding of the relation between equity premia and systemic risks. In this spirit, the Consumption-based Capital Asset Pricing Model (CCAPM) establishes that the response of expected equity premia to the relevant risk corresponds to the coefficient of relative risk aversion, where this response reflects the price of risk. Here, the risk is entirely summarized by the state-independent consumption risk, that is, the covariance between asset returns and consumption change.

The CCAPM relies on fundamental economic assumptions stating that agents trade in a frictionless economy and choose consumption and stock holdings to maximize utility (e.g., Hansen & Singleton, 1982). The CCAPM also invokes auxiliary distributional assumptions stipulating that (log) consumption change and (log) stock returns are jointly governed by a normal distribution (e.g., Hansen & Singleton, 1983).

A vast literature amends the baseline economic assumptions of the CCAPM by specifying alternative agents' preferences.[3] However, the empirical implementations of these investigations usually maintain the normality assumption. Another line of research

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[3] Examples include habit formations (e.g., Campbell & Cochrane, 1999; Constantinides, 1990); social status (e.g., Bakshi & Chen, 1996); disappointments (e.g., Gul, 1991; Routledge & Zin, 2010); taste shocks (e.g., Normandin & St-Amour, 1998); and preferences for some higher moments of asset return distributions, for certain regimes, or for the timing of uncertainty resolution (e.g., Epstein & Zin, 1991; Gordon & St-Amour, 2000; Kostakis, Muhammad, & Siganos, 2012; Kraus & Litzenberger, 1976).

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preserves the conventional economic environment, but relaxes the normal distribution by specifying Markov switching processes for consumption change.[4] In this context, expected equity premia are exclusively determined by consumption risk, which then becomes state dependent.

This paper is in the vein of the latter research strategy in the sense that it retains the baseline economic assumptions of the CCAPM, but not the conventional distributional hypotheses. However, we depart from existing studies by relying on an alternative mixture distribution in order to evaluate the responses of expected equity premia not only to state-dependent consumption risks, but also to state-dependent market risks.[5] To do so in a tractable way, we define two distinct regimes from the current realizations of the market return within each state. Specifically, the unfavorable (favorable) state occurs when the market return is smaller or equal (larger) than a certain threshold. Note that this definition of the regimes is appealing given that the market return represents a systemic risk and is often selected in previous studies (e.g., Butler & Joaquin, 2002; Longin & Solnik, 2001). Moreover, the mixture distribution, which nests the normal distribution, is flexible enough to represent a broad class of distributions where the consumption change and asset returns may exhibit rich patterns of dependence across states.[6] Such dependence allows for the existence of state-dependent consumption and market risks. In particular, the downside (upside) consumption and market risks are measured from the semi-covariances capturing comovements of asset returns with consumption change and with market return in the unfavorable (favorable) state.

We next combine the mixture distribution described above with the conventional economic environment to derive an analytical solution for expected equity premia. This leads to a flexible specification of the CCAPM that nests the solution obtained from a normal distribution, and that accounts for the deviations of expected asset returns from their modes as well as for the deviations of the comovements between asset returns and consumption change across the two states. The flexible CCAPM establishes rich relations between expected equity premia and state-dependent consumption and market risks, as illustrated from plausible parametrizations of the mixture distribution. In particular, the responses of expected equity premia to the relevant risks are larger in the unfavorable state than in the favorable one. This reflects the notion that larger risk premia are required to compensate downside risks than upside risks.

Empirically, we evaluate the CCAPM with mixture distribution from monthly post-1960 U.S. data. As a start, our investigation focuses exclusively on the relations between a global-index return and state-dependent risks. We find that the estimates of the responses of expected excess market return to consumption and market risks are positive in each state, except for the upside market risk, and are always significant. This suggests that both the consumption and market risks are priced in each state. Also, the responses to downside consumption and market risks are statistically larger than the responses associated with the upside counterparts. This indicates that the responses to both consumption and market risks are state dependent. Moreover, the consumption and market risks are always positive, mostly significant, and state dependent. It is worth stressing that our findings highlighting the effects of state-dependent market risks are consistent with those obtained by regressing excess returns on downside and upside betas and various sets of control variables (e.g. Ang, Chen, & Xing, 2006; Ball & Kothari, 1989; Braun, Nelson, & Sunier, 1995).

We then pursue our analysis by considering several extentions to study the relations between portfolio returns and state-dependent risks, where portfolios are sorted by size and book-to-market. Interestingly, we find that the dominant relations are those linking expected equity premia to downside consumption risks. In particular, the estimates of the responses to downside consumption risks are more frequently significant than any other responses associated with alternative sources of risks, including market risks. In addition, the responses to downside consumption risks are often statistically larger than the responses to upside consumption risks, and tend to be larger for firms having smaller sizes and facing more financial distresses.

This paper is organized as follows. Section 2 presents the properties of the mixture distribution. Section 3 derives the relation between expected equity premia and state-dependent risks from the CCAPM with mixture distribution. Section 4 outlines the estimation method. Section 5 reports the basic results focusing on the links between a global-index return and state-dependent risks. Section 6 presents extensions to understand the behavior of returns across various portfolios. Section 7 concludes.

2. Mixture distribution

This section presents a flexible mixture distribution that nests the conventional normal distribution, which is frequently invoked to solve the CCAPM (e.g., Hansen & Singleton, 1983). The mixture distribution will prove useful to analyze rich relations between expected equity premia and state-dependent risks.[7]

Specifically, the mixture distribution admits the existence of two distinct regimes. The first regime corresponds to an unfavorable state ($s = 1$) occurring when the market return is smaller or equal to a certain threshold. The second regime is a favorable state ($s =$

[4] Examples include processes involving two states for the mean of consumption change (e.g., Cecchetti, Lam, & Mark, 1990, 1993; Veronesi, 1999); two states for the volatility of consumption change (e.g., Bonomo & Garcia, 1994); and two states for the mean as well as two states for the volatility (e.g., Kandel & Stambaugh, 1990). Markov switching processes are also used to assess the effects of commodity prices on asset returns (Balcilar, Hammoudeh, & Fru Asaba, in press; Naifar & Al Dohaiman, 2013) and the transmissions of volatility across asset returns (Khalifa, Hammoudeh, & Otranto, 2014).

[5] Only a handful of studies consider jointly alternative preferences and Markov switching processes, implying both state-dependent consumption and market risks (Bonomo, Garcia, Meddahi, & Tedongap, 2011; Calvet & Fisher, 2007; Lettau, Ludvigson, & Wachter, 2008). In comparison, our application gauges solely the consequences of relaxing the normal hypothesis for the effects of each type of state-dependent risks on expected equity premia.

[6] Empirically, the validity of the normal distribution is overwhelmingly rejected: i) the consumption change and stock returns display negative skewness and positive excess kurtosis (e.g., Balke & Fomby, 1994), ii) the market and asset returns depict negative coskewness (e.g., Harvey & Siddique, 2000), and iii) the covariances between asset returns exhibit asymmetries (e.g., Bekaert & Wu, 2000; Conrad, Gultekin, & Kaul, 1991; Kroner & Ng, 1998) given that they are substantially larger during economic contractions than during expansions (e.g. Lee, Lin, & Yang, 2011) and for downside movements of stock returns than for upside ones (e.g. Ang & Chen, 2002; Longin & Solnik, 2001).

[7] The technical details behind the derivations of the properties of the mixture distribution are relegated to the Appendix.