Risk Measures and Portfolio Optimization Under Regime Switching Models

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ABSTRACT

In this paper, we model asset returns as a Markov switching processes to capture important features such as heavy tails, persistence, and nonlinear dynamics. We compute the probability distribution function of h–period-ahead simple and aggregate returns, which we use to approximate the Value-At-Risk (VaR). Because the VaR approximation under a Markov switching model requires numerical methods, we also propose an upper bound on the h–period-ahead VaR that is very easy to calculate. We derive a closed-form solution for the h–period-ahead Expected Shortfall risk measure and we characterize the mean-variance dynamic efficient frontier of the simple and aggregate linear portfolio. Using daily observations on S&P 500 and TSE Index futures contracts, we find that the efficient frontier of the h–period-ahead optimal portfolio is time varying, and in 73.56% of the sample the conditional optimal portfolio performs better then the unconditional one. However, when we lengthen the horizon h, the performance and the efficient frontier of the conditional optimal portfolio converge to those of the unconditional one.

JEL Classification: C22, C52, G19

Keywords: Markov switching model; characteristic function; probability distribution; Value-At-Risk; Expected Shortfall; simple return; aggregate return; upper bound VaR; Mean-Variance portfolio.

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