

A Time-Varying Jump Tail Risk Measure Using High-frequency Options Data*

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Abstract

This study proposes a procedure for measuring daily jump tail risks obtained from high-frequency option data. The essentially nonparametric measure is difficult to construct if we use daily closing quotes and prices of the short-dated and deep-out-of-the-money options. Previous studies usually assume that the time-varying shape parameters of risk-neutral jump tails in asset returns change at a weekly frequency to mitigate the impact of noise. The high-frequency options data, which needs data cleaning, help relax the constancy assumption to more general cases such that the shape parameter can change at a daily frequency. In application to the high-frequency options data on the Nikkei 225 market index, we confirm that our daily tail risk measure is reasonably coherent with the existing measures from previous research and reveals relatively large spikes on particular days during the week associated with tail events. Our empirical analyses of the short-term predictability of variance risk premium (VRP), obtained as the difference between the option-based risk-neutral and the statistically expected future return variation, suggest that the daily tail risk measure, which is a jump tail risk component of VRP, has significant predictive power for future VRP, and that the inclusion of the diffusive and jump risk components of VRP as separate predictors yields the forecast improvement.

JEL Classification Number: C22, C52, C53, C58, G17

Key words: Implied jump variation Time-varying jump tails, High-frequency data, Out-of-the-money options, Variance risk premium.

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