Asymptotic Inference for Common Factor Models in the Presence of Jumps

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Abstract

Financial and economic time series data often exhibit infrequent but large magnitudes of jumps. Such jumps may be considered as outliers that are independent of the underlying data generating processes and contaminate inference for them.

In this study, the effects of such jumps on asymptotic inference for large-dimensional common factor models are investigated. We first derive upper bounds of jump magnitudes with which the standard asymptotic inference goes through. Second, we propose a jump correction method that is based on a series-by-series outlier detection algorithm without accounting for the factor structure. It is shown that, by implementing this method, the standard asymptotic normality for the factor model is available unless outliers occur at common dates. Finally, we provide a test that investigates whether jumps at a common date are independent outliers or they are a jump of the factors.

A Monte Carlo experiment confirms that the proposed jump correction method retrieves good finite sample properties. The proposed test shows good size and power. We apply these methods to daily log-returns on 25 currencies against the U.S. dollar in the recent financial crisis period. A few common jumps are identified and our tests show that the factor related to the Swiss franc and the Japanese yen has no jumps, but the factor related to currencies with less liquidity has strong evidence of jumps.