Estimating the positive and negative jumps of asset returns via Kalman filtering. Change point detection for the case of Nasdaq index.

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Abstract

The positive and negative jumps underlying the Nasdaq daily log returns are estimated. These jumps correspond to the arrival of the positive and negative news in the market, are not observable and are modeled as hidden variables. In order to estimate the jumps, the basic discrete time-homogeneous linear Kalman filter is used, i.e., all the noises involved are assumed to be white noises and mutually uncorrelated. Since the estimated jumps have to be non-negative, the method of the associated pdfs truncation, according to the non-negativity constraints, is applied. In order to overcome the resulting (due to truncation) estimation errors, the truncation is accompanied by appropriate scaling. The fitting of the model after truncation and scaling is justified through the examination of the resulting returns fitting to the empirical returns. Finally we provide retrospective single and multiple change point estimation for the resultant return jumps, as well as for their (hidden) negative and positive return components. The change points are searched in the covariance structure using parametric and nonparametric approaches.

Keywords: Positive-negative return jumps, Kalman filter, pdf truncation, change point detection

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