Fluctuation Reduction of Value-at-Risk Estimation and Its Applications

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Abstract

Value-at-Risk (VaR) is a fundamental tool for risk management and is also associated with the capital requirements of banks. Banks need to adjust their capital levels for satisfying the Basel Capital Accord. On the other hand, managements do not like to change the capital levels too often. To achieve a balance, this study proposes an approach to reduce the fluctuation of VaR estimation. The first step is to fit a time series model to the underlying asset returns and obtain the convenient VaR process. A new VaR (NVaR) estimation of the convenient VaR process is then determined by applying change-point detection algorithms and a proposed combination scheme. The capital levels computed from the NVaR process are capable of satisfying the Basel Accord and reducing the fluctuation of capital levels simultaneously. On the basis of the NVaR process, a novel one-step ahead VaR estimation is proposed by using the technique of statistical control charts. The return processes of 30 companies on the list of S&P 500 from 2005 to 2014 are employed for our empirical investigation. Numerical results indicate that the proposed method has satisfactory performance.

Keywords：Basel II, capital requirements, change-point detection, statistical control chart, Value-at-Risk.