PERIOD VALUE AT RISK: ITS DEFINITION AND ESTIMATION

[1]CHUNHUIXU, [2]YANLI HUO, [3]TAKAYUKI SHIINA

[1]Department of Risk Science in Finance and Management, Chiba Institute of Technology, Chiba75-0016, JAPAN.
[2]Department of Financial Engineering, China Jiliang University, Hangzhou, China.
[3]Department of Industrial and Management Systems Engineering, Waseda University, Tokyo, Japan.
E-mail: xchunhui@yahoo.co.jp

Abstract - Risk measurement is the base for risk management, research on quantitative risk measurement began from the 1950s [3], there proposed various kind of risk indicators, the most popular three risk indicators are the Variance, VaR([2]) and Conditional Value at Risk ([4]). Refer to [1] for a survey of market risk measures.
We proposed and defined the notion of Period Value at Risk (PVaR) in [5], for measuring market risk of an investment over a period of time, it is different with conventional risk indicators which measure the risk of an investment at a future time, such as VaR, CVaR or variance. A Monte Carlo simulation method was suggested for estimating PVaR numerically [6], because it is difficult to get an analytical expression of PVaR in general. We know that PVaR is an appropriate for investment situations where the time that investors liquidate their investments is flexible within some future time interval, as advocated in [7].
The Monte Carlo simulation method proposed is an effective way for estimating PVaR, however, its estimation precision can not be quantified. This study will suggest another simulation based method for estimating PVaR numerically, the estimation error of this method can be quantified. We show that the proposed estimator of PVaR follows the t-distribution, and the estimation precision is a function of the number of simulation. Basing on this result, we suggest a method to compute the estimation error given a number of simulation, and a method to determine the number of simulation needed for meeting the requirement on estimation error.
Numerical computation experiments are introduced for illustrating the proposed method.

Keywords - Financial Market Risk, Risk Measure, Value at Risk, Stochastic Process, Monte Carlo simulation.

REFERENCES

[1] Dowd, K.(2002). An Introduction to Market risk Measurement. John Wiley and Sons.
[2] Choudhry, M. and Tanna, K.(2006). An Introduction to Value-at-Risk. John Wiley and Sons.
[3] Markowitz, H.(1952). Portfolio selection. Journal of Finance, Vol. 7, pp. 77-91.
[4] Rockafellar, R.T. and Uryasev, S.(2000). Optimization of Conditional Value-At-Risk. Journal of Risk, 2(3), pp. 21-41.
[5] Xu, C., Huo, YL, Osaka, K.: PERIOD VALUE AT RISK AND ITS ESTIMATION BY SIMU- LATION, Proceedings of the Asian Conference of Management Science and Applications 2012(CD-
[6] ROM), pp.48-50, Jiuzhaigou-Chengdu, Sichuan, China, September 7-10, 2012
[7] Huo, Y. , Xu, C., Osaka, K., Huang M. : Period Value at Risk and its Estimation by Simulation. Information , pp.2605-2617, Vol.17 , N0.6(B), June 2014.
[8] Xu, C., Huo, YL.: Measuring market risk of financial investments with flexible terminating time. Presentation at The Asian Conference of Management Science and Applications 2015(CD-ROM), Dalian, China, September 11-14, 2015.

★★★