Integrated Risk Measurement for Portfolio of Various Assets at Continuous Time Horizons*

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Abstract

Different financial products usually have very different risk profiles. In the financial Industry, risk measures based on VaR for financial products are either dominant market VaR or credit VaR or Add VaR, which is obtained by evaluating market VaR and credit VaR separately and then add them together. The regulatory capital required by regulators is then computed according to the VaR, which will either underestimate or overestimate the products risks. In order to reasonably measure market risk and credit risk together, in this study we present a new framework, with which we can measure integrated market risk and credit risk for portfolios consisting of various assets through continuous time horizons. Using Monte Carlo simulation, we employ this framework to portfolios consisting of bonds, stocks and bonds plus stocks with normal distributed asset return assumptions. We find that term structures of market VaR, credit VaR, integrated VaR and Add VaR are different for bond portfolio, stock portfolio and mixed portfolio, with the largest integrated VaR values for stock portfolio, the smallest ones for bond portfolio and those for mixed portfolio between them. Besides the type of assets, initial rating of the objective portfolio is also an important factor to determine the integrated VaRs. In this study, we also compare the integrated VaRs for portfolios with Student t and Skew t distributed asset returns to those with Normal distributed asset returns. We find that the integrated VaR magnitudes followed the pattern with Skewt > Student > Normal for VaR at confidence level of 99% and 99.9%, and a contrary pattern for VaR95. This is caused by the different shapes of these distributions, among them Skew t distributions have the fattest left tails while Normal distribution has thinnest left tail, and the tail attributes are inherited by the portfolio value distribution. This simulation study shows that asset type, initial rating, time horizon and asset return distribution assumptions are all significant factors to influence the portfolio value distributions and hence the integrated VaRs.