Dynamic Asset Allocation in a Conditional Value-at-risk Framework

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: .................................................................
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Abstract

The thesis first extends the original Black-Litterman model to dynamic asset allocation area by using the expected conditional equilibrium return and conditional covariances based on three volatility models (the DCC model, the EWMA model and the RW model) into the reverse optimisation of the utility function (the implied BL portfolio) and the maximised Sharpe ratio optimisation model (the SR-BL portfolio). The momentum portfolios are inputted as the view portfolios in the Black-Litterman model. The thesis compares performance of the dynamic implied BL portfolio and the dynamic SR-BL portfolio in the single period and multiple periods with in-sample analysis and out-of-sample analysis. The research finds that dynamic BL portfolios can beat benchmark in in-sample and out-of-sample analysis, the dynamic implied BL portfolio always show better performance than the dynamic SR-BL portfolio. The empirical VaR and CVaR of the dynamic SR-BL portfolios are much higher than that of the dynamic implied BL portfolio. The dynamic BL portfolios based on the DCC volatility model perform best in contrast to other two volatility models.

In the aim of improving performance of SR-BL portfolios, the thesis further constructs dynamic BL portfolios based on two new optimisation models including maximised reward to VaR ratio optimisation model (MVaR-BL portfolios) and maximised reward to CVaR ratio optimisation model (MCVaR-BL portfolios) with assumption of the normal distribution and the t-distribution at confidence levels of 99%, 95% and 90%. The thesis compares performance of the dynamic MVaR-BL portfolio and the dynamic MCVaR-BL portfolio in the single period and multiple periods with in-sample analysis and out-of-sample analysis. There are three main findings. Firstly, both the MVaR-BL portfolio and the MCVaR-BL portfolio could improve the dynamic SR-BL portfolio performance at moderate confidence levels. Secondly, the MVaR-BL portfolio and the MCVaR-BL portfolio show similar performance with normal distribution assumption, the MCVaR-BL portfolio performs better than the MVaR-BL with t-distribution assumption at certain confidence levels in single period and multiple periods. Thirdly, the performance of the DCC-BL portfolio with t-distribution assumption is superior to the performance of the DCC-BL portfolio with normal distribution assumption.
As the result of higher empirical VaR and CVaR of dynamic SR-BL portfolios, the thesis develops to constrain VaR and CVaR in construction of dynamic BL portfolios with assumption of the normal distribution and the t-distribution at confidence levels of 99%, 95% and 90%. The research studies the effect of assumptions of two distributions, three confidence levels and levels of the VaR constraint and the CVaR constraint on dynamic BL portfolios. Both in-sample performance and out-of-sample performance could be improved by imposing constraints, and they suggest adding moderate CVaR constraints to maximal Sharpe ratio optimisation model with t-distribution at certain confidence level could obtain the best dynamic DCC-BL portfolio performance in the single period and multiple periods. The performance evaluation criterion (higher Sharpe ratio, reward to VaR ratio, and reward to CVaR ratio) would affect the choice of optimisation models in dynamic asset allocation.
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<td>BL</td>
<td>Black-Litterman Portfolio</td>
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<tr>
<td>CSR</td>
<td>Conditional Sharpe Ratio</td>
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<td>Expected Conditional Sharpe Ratio</td>
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<td>Black-Litterman Portfolio with the VaR Constraint</td>
</tr>
<tr>
<td>Variance-adjusted BL</td>
<td>Black-Litterman Portfolio with Variance-Adjusted Equilibrium Return</td>
</tr>
<tr>
<td>&amp;/CVaR</td>
<td>Expected Excess Return to Conditional Value-at-Risk</td>
</tr>
<tr>
<td>&amp;/VaR</td>
<td>Expected Excess Return to Value-at-Risk Ratio</td>
</tr>
</tbody>
</table>