**2020 May Day MCM**

Problem B. The asset allocation strategies of funds from the perspective of systemic risk

With the development of China’s reform and opening up in recent years, various risks in economy are intensively exposed in the financial market. Therefore, the report at 19th CPC National Congress puts forward the requirement of “holding the bottom line of no systemic financial risks”. The prevention and mitigation of significant risks is also regarded as the first fight of three critical battles to build a moderately prosperous society.

As an important part of the financial market, the risk of asset management business is also a problem worthy of attention in the process of financial reform. Therefore, the People's Bank of China issued the “guidance on regulating the asset management business of financial institutions” in 2018. This policy document aims at regulating the asset management business of financial institutions in order to effectively prevent financial risks and direct investments from society to the real economy. As a result, the structure change and economic development are better supported.

Public offering of fund is the most representative form of asset management business. The competitive pressure formed by the performance appraisal system makes the asset allocation strategies of funds more complex, which increases the concentration of shareholdings. As a result, it provides a potential incentive for the systemic risk. Therefore, the tradeoff between investment return and systemic risk is an interesting question to be explored.

1. Appendix 1 provides some asset allocation information of 10 funds in the stock market in 2019. According the sample, please establish a reasonable mathematical model to measure the similarity of asset allocation strategies among different funds.
2. Appendix 2 provides the stock price of the sample in 2019. It is assumed that the total value of shares held by all funds is taken as the initial wealth, and we want to maximize the expected investment utility. Please establish a reasonable mathematical model to determine the optimal asset allocation strategy (Regardless of the correlation between stocks and short selling is not allowed).
3. It is assumed that asset allocation strategies in 2019 are continued in 2020 for all funds. According to Appendix 1 and Appendix 2, please establish a reasonable mathematical model to measure the value at risk of each fund with 95% confidence level in 2020, and then rank the funds.
4. For the market which is composed of the sample, we want to maximize the expected investment utility as well as minimize the systemic value at risk in 2020. Please establish a reasonable mathematical model to determine the optimal asset allocation strategy. Meanwhile, please show the expected investment utility and systemic value at risk.