**MCQ**

1. C
2. C
3. D
4. C
5. C
6. B
7. B
8. C
9. C
10. B
11. B
12. A
13. D
14. B
15. C
16. C
17. C
18. B
19. C
20. A
21. C
22. B
23. b

Question 1. Absolute/Relative Performance

Discussion: Based on the above statistics, briefly describe how the fund performs relative to the benchmark.

The fund has a negative alpha, indicating underperformance relative to the benchmark.

The high beta implies that the fund is more volatile than the market, potentially leading to higher returns in bullish markets and larger losses in bearish markets.

The strong R-squared suggests a high correlation with the benchmark, indicating that most of the fund's movements can be explained by market trends.

The Sharpe ratio is positive, indicating that the fund provides a positive risk-adjusted return compared to a risk-free rate.

The Treynor ratio suggests a positive risk-adjusted return relative to market risk (beta).

Overall, while the fund may exhibit higher volatility and underperform the benchmark on average (as indicated by the negative alpha), it also provides positive risk-adjusted returns, especially when considering market risk and the risk-free rate. Investors should carefully weigh the fund's performance metrics against their risk tolerance and investment objectives.

Question 2. Geometric Brownian Motion

Discussion: Consider the following game in which you pay a premium of $p to participate at the beginning of each day. The game pays a dollar if the daily log return is less than -1%. Suppose that p = 0.5. Based on the simulated returns, do you consider this game fair? Elaborate.

In order to determine whether the game is fair, we need to assess the expected payoff and compare it to the premium paid to participate. Here's how we can analyze the fairness of the game based on the given information:

* Participants pay a daily premium of $0.5 to play
* The game pays out $1 if the daily log return is less than -1%.

Question 3. Investigating Model Risk

How would you compare the two sets of weights? For instance, do they seem to have the same risk profile? Explain briefly.

Comparison of Results:

Original Estimates:

Weight Vector: [0.6137,0.3078,0.0785][0.6137,0.3078,0.0785]

Portfolio Mean Return: 0.10950.1095

Portfolio Volatility: 0.22560.2256

Sharpe Ratio: 0.4850.485

Rounded Estimates:

Weight Vector: [0.58,0.31,0.11][0.58,0.31,0.11]

Portfolio Mean Return: 0.110.11

Portfolio Volatility: 0.230.23

Sharpe Ratio: 0.4780.478

Comparison Analysis:

The two sets of weights are quite close, with only minor differences in the third decimal place.

Both portfolios have similar risk profiles, as indicated by their similar Sharpe ratios.

The rounded estimates lead to a slightly higher portfolio volatility and a slightly lower Sharpe ratio, but the differences are relatively small.

What does this exercise say about the sensitivity of these portfolios to parameter estimation?  
Discuss how a situation like this might be encountered in practice and potential mechanisms to mitigate this issue.

Sensitivity to Parameter Estimation:

The sensitivity of portfolios to parameter estimation is evident in the small variations in weights, mean returns, and volatilities when using rounded estimates.

In practice, parameter estimates such as expected returns and covariance matrices are often based on historical data, which can be subject to noise and uncertainties.

Small changes in these estimates can lead to differences in optimal portfolio weights and performance metrics.

Sensitivity to parameter estimation highlights the importance of robust methods for estimating key parameters and the need for caution in relying heavily on precise estimates.

Mitigating the Sensitivity Issue:

Use more sophisticated methods for parameter estimation that account for uncertainties and incorporate additional information.

Implement robust optimization techniques that are less sensitive to estimation errors.

Regularly update parameter estimates to reflect changing market conditions.

Diversify the portfolio across different asset classes to reduce sensitivity to specific parameter estimates.

In summary, while sensitivity to parameter estimation is a challenge, careful modeling, robust optimization methods, and ongoing monitoring can help mitigate its impact on portfolio decisions.