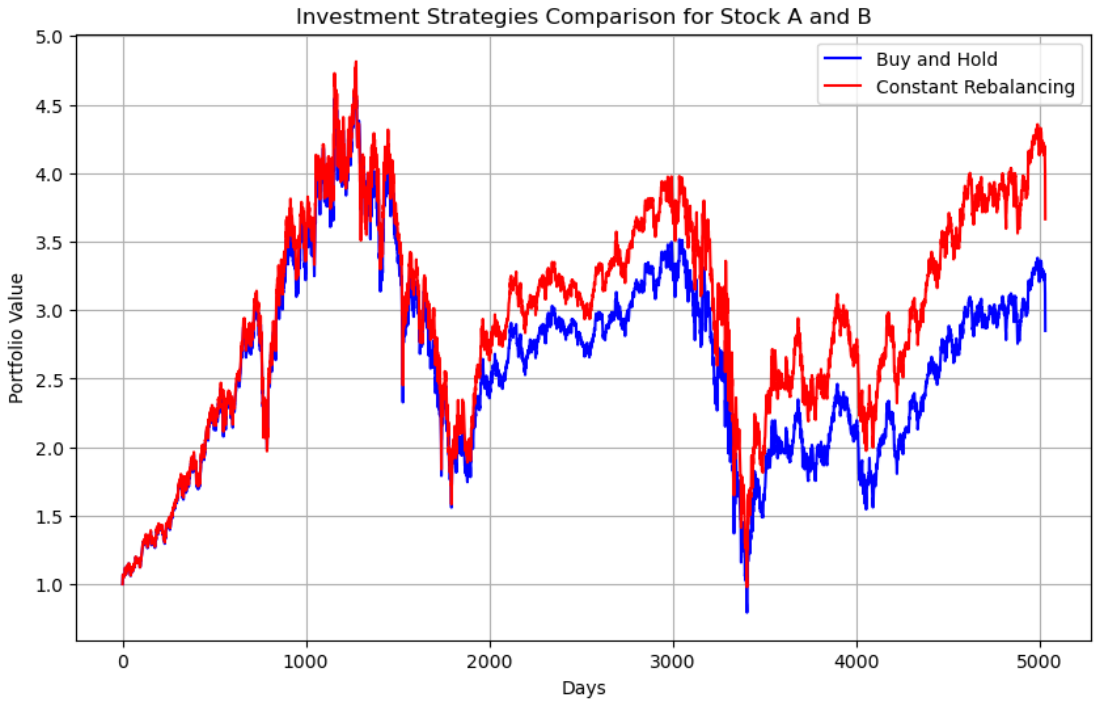
Part (a)

For the buy-and-hold strategy, I calculated the value of Stock A and Stock B separately and added them together by the end of each day. For the Constant Rebalancing Strategy, I calculated the total value of the portfolio and divided it at the end of each day.

Result:




Part (b)

For part (b), to compute the average value of the portfolio at the end of the investment window, I first generated all possible patterns for investment D using binary numbers, then implemented both strategies for investments C and D. For the final step, I calculated the total values at the end of 20 days for all possible patterns and then take the average of the total values.

Result:

Computed Averaged Value for Buy & Hold: 4.328100317281023

Computed Averaged Value for Rebalancing: 4.007585849351221

Part (c)

For part (c), the steps to compute the doubling rate for the two strategies across all the patterns include:

1. Use a backtracking approach to generate all sequences of 20 binary digits where exactly 10 digits are '1' (up days) and 10 digits are '0' (down days)
2. Calculate the final wealth for each strategy after 20 days for each pattern
3. Use the formula ( $r_n \triangleq 1/n * \log_2(w_n)$ ) to calculate the doubling rate
4. Compare the doubling rates of the two strategies for each pattern.
5. Count the number of patterns where the buy and hold strategy performs better.

6. Calculate the fraction of patterns where the buy and hold strategy performs better.

Result:

Fraction of patterns where Buy and Hold perform better: 0.0

**Part (d)**

For part (d), the steps to compute the doubling rate for the two strategies across all the patterns include:

1. Repeat the first 3 steps I did in part (c)
2. Average the doubling rates across all patterns.

Result:

Computed Doubling Rate for Buy & Hold: 0.07038932789139796

Computed Doubling Rate for Rebalancing: 0.08526299958842398