Homework 5 report

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Problem 1

Part (a)

Buy-and-hold strategy:

Rebalancing strategy: Parameters:

- S_0: initial stock price.
- S_t: stock price at time t.
- x_t: number of stock shares at time t.
- C_t: cash held at time t in dollar.

Use the Monte Carlo to simulate the stock price to get all S_t, and then update all all C_i and x_i:

$$C_{t+1} = \frac{x_t S_{t+1}}{2}$$
$$x_{t+1} = \frac{C_1}{S_1}$$

Monte Carlo simulations:

- $u = 2$
- $d = 0.5$
- $p_u = p_d = 0.5$

Running the attached code, we can get,

$$E(U) = \quad var(U) =$$
$$E(V) = \quad var(V) =$$

To get 95% confidence interval, we should $\delta = 0.05$, $z_{1-\delta/2} = 1.96$, then the confidence interval

$$\left[E(U) - 1.96\frac{\sigma_u}{\sqrt{n}}, E(U) + 1.96\frac{\sigma_u}{\sqrt{n}}\right] : [,]$$
$$\left[E(V) - 1.96\frac{\sigma_v}{\sqrt{n}}, E(V) + 1.96\frac{\sigma_v}{\sqrt{n}}\right] : [,]$$

Part (b)

Now we have new random variable $T = V - U$. Since V and U are independent, then we can have

$$E(T) = E(V) - E(U) =$$
$$var(T) = var(T) + var(E) =$$

then the confidence interval

$$\left[E(T) - 1.96\frac{\sigma_u}{\sqrt{n}}, E(T) + 1.96\frac{\sigma_u}{\sqrt{n}}\right] : [,]$$

Part(c)

If we use the same stream of random numbers then the confidence interval is

$$E(V-U) =$$
$$var(V-U) =$$
$$Confidenceinterval : [,]$$

This confidence is wider than that of Part(b).

Part(d)

If we use the same stream of random numbers then the confidence interval is

$$E(log_{10}V - log_{10}U) =$$
$$var(log_{10}V - log_{10}U) =$$
$$Confidenceinterval : [,]$$

Compare with Part(c) using utility functions gives a better comparison of investment alternatives.

Problem 2

Problem 3

Problem 4