Prob1.

Based on the given data, I can get following results:

closed\_form\_greeks

Delta of the call option is: 0.083

Delta of the put option is: -0.917

Gamma of the call option is: 0.017

Gamma of the put option is: 0.017

Vega of the call option is: 6.939

Vega of the put option is: 6.939

Theta of the call option is: -8.127

Theta of the put option is: -1.941

Rho of the call option is: -0.03

Rho of the put option is: -1.243

Carry Rho of the call option is: 1.133

Carry Rho of the put option is: -12.515

finite\_diff\_greeks

Delta of the call option is: 0.083

Delta of the put option is: -0.917

Gamma of the call option is: 0.017

Gamma of the put option is: 0.017

Vega of the call option is: 6.904

Vega of the put option is: 6.904

Theta of the call option is: -8.098

Theta of the put option is: -1.913

Rho of the call option is: -0.03

Rho of the put option is: -1.243

Carry Rho of the call option is: 1.131

Carry Rho of the put option is: -12.516

The american call option value without dividend is: 0.336

The american put option value without dividend is: 14.037

Delta of the call option is: 0.083

Delta of the put option is: -0.917

Gamma of the call option is: 0.017

Gamma of the put option is: 0.017

Vega of the call option is: 6.939

Vega of the put option is: 6.939

Theta of the call option is: -8.127

Theta of the put option is: -1.941

Rho of the call option is: -0.03

Rho of the put option is: -1.243

Carry Rho of the call option is: 1.133

Carry Rho of the put option is: -12.515

The american call option value with dividend is: 0.298

The american put option value with dividend is: 14.559

Delta of the call option is: 0.069

Delta of the put option is: -0.938

Gamma of the call option is: 0.017

Gamma of the put option is: 0.017

Vega of the call option is: 5.97

Vega of the put option is: 5.478

Theta of the call option is: -7.058

Theta of the put option is: -0.239

Rho of the call option is: 0.941

Rho of the put option is: -12.409

Sensitivity of dividend of the call option is: -0.025

Sensitivity of dividend of the put option is: 0.941

Prob2.

For normal assumption:

A screenshot of a computer

Description automatically generated

For delta assumption:

A table of numbers and letters

Description automatically generated

For last week’s result:

A screenshot of a computer

Description automatically generated

After observation, last week's result does not have similar results with normal or delta assumption. Every method has different pros and cons. Therefore, we need to pick which method to simulate data based on the requirements.

Prob3.

Based on the given data, I have following result:

Annual return:

A table of numbers and symbols

Description automatically generated

The covariance matrix:

A number of numbers on a white background

Description automatically generated

The super-efficiency portfolio is shown in weights:

A close up of a number

Description automatically generated