Problem 1

Maximum Sharpe Ratio Portfolio

```
Optimal Weights: [ 0.15202905 -0.13302031  0.98099126]
Portfolio Return: 0.1820589576129143
Portfolio Standard Deviation: 0.3910053146991314
Maximum Sharpe Ratio: 0.34413587885999447
```

Risk-Adjusted Return Portfolio

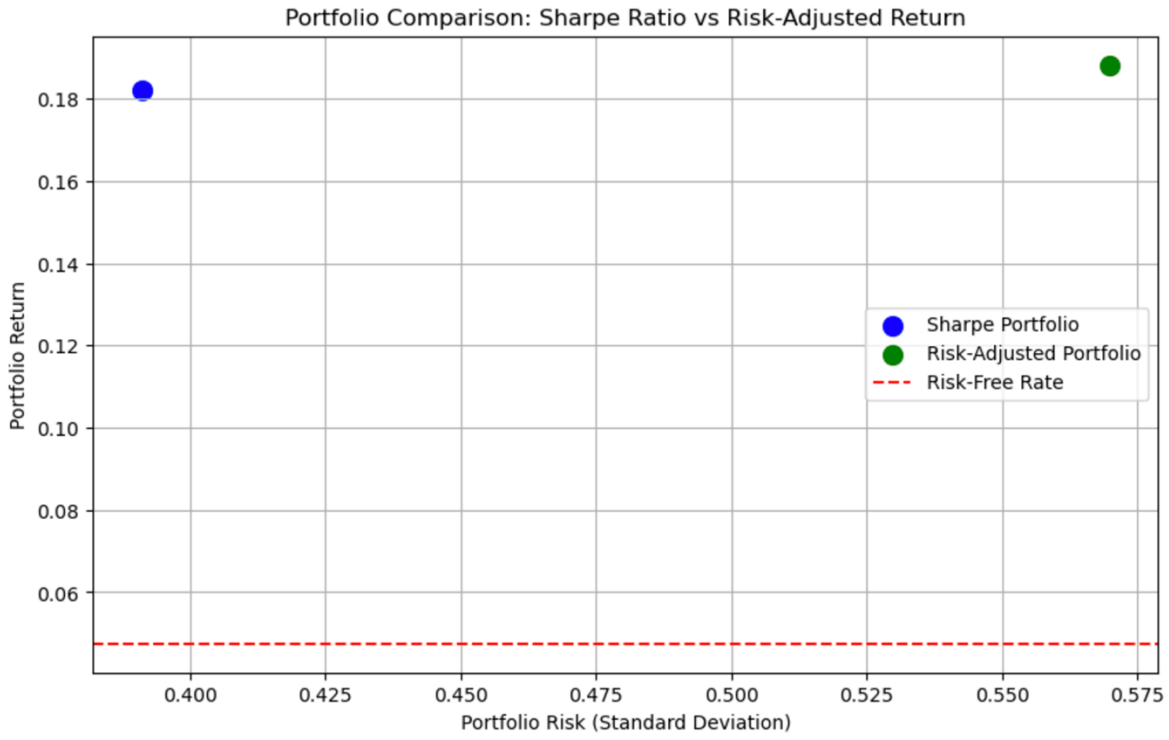
```
Optimal Weights (RR_p): [0.46206864 0.03502933 0.50290203]
Portfolio Return (RR_p): 0.18815914635831188
Portfolio Standard Deviation (RR_p): 0.5698179503518336
Expected Shortfall (RR_p): 0.5311796878771226
Maximum Risk-Adjusted Return (RR_p): 0.26480520541073566
```

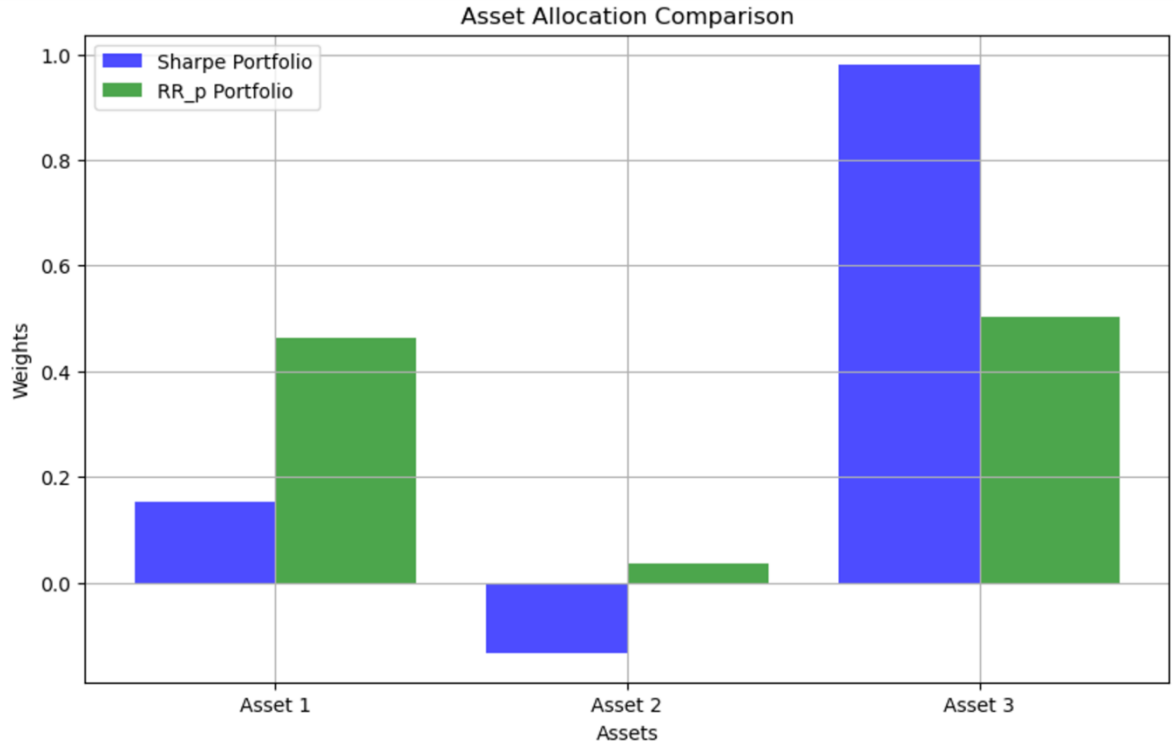
```
Portfolio Comparison Table:
                      Portfolio  \
0          Maximum Sharpe Ratio
1  Maximum Risk-Adjusted Return

                                              Weights    Return  \
0  [0.1520290521472676, -0.13302030736988432, 0.9...  0.182059
1  [0.4620686430452974, 0.03502933044279534, 0.50...  0.188159

   Standard Deviation  Sharpe Ratio  Risk-Adjusted Return  \
0            0.391005      0.344136                   NaN
1            0.569818           NaN              0.264805

   Expected Shortfall (RR_p)
0                        NaN
1                    0.53118
```


Portfolio Comparison: Sharpe Ratio vs Risk-Adjusted Return
Portfolio Return
Portfolio Risk (Standard Deviation)
Sharpe Portfolio
Risk-Adjusted Portfolio
Risk-Free Rate
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.400
0.425
0.450
0.475
0.500
0.525
0.550
0.575


Asset Allocation Comparison
Sharpe Portfolio
RR_p Portfolio
Weights
Assets
Asset 1
Asset 2
Asset 3
1.0
0.8
0.6
0.4
0.2
0.0

Summary

Metrics	Maximum Sharpe Ratio Portfolio	Maximum Risk-Adjusted Return Portfolio
Risk (Standard Deviation)	Lower (more efficient use of risk)	Higher (accepts more risk for minimizing downside)
Return	Moderate	Slightly higher
Sharpe Ratio	Highest (optimized)	N/A
Expected Shortfall	N/A	Minimized (tail risk-focused)
Allocation Strategy	Concentrated (high weight on Asset 3, short Asset 2)	Diversified (higher weight on Asset 1, balanced allocation)