Assignment #1: Statistically Equivalent Portfolios

Introduction

This analysis explores the concept of statistically equivalent portfolios, aiming to find insights from returns data for multiple assets (AMZN,MSFT,XOM,BOKF) over 5 years.

Data Collection

The returns data for the selected assets were collected over a period of five years or more manually from WRDS. The dataset includes observations for each asset, allowing for a comprehensive analysis.

Global Minimum Variance (GMV) Portfolio

Portfolio Weights

GMV Portfolio Weights:

[‘AMZN’,[-0.10002596]

‘BOKF’,[0.03996612]

‘XOM’,[0.87923166]

‘MSFT’,[0.18082818]]

Expected Return and Standard Deviation

GMV Portfolio Expected Return: 0.02002443

GMV Portfolio Standard Deviation: 0.05483456

Maximum Sharpe Ratio (MSR) Portfolio

Portfolio Weights

MSR Portfolio Weights:

['AMZN',[-0.34560028]

'BOKF',[-0.10356513]

 'XOM',[1.36597948]

 'MSFT',[0. 08318593]]

Expected Return and Standard Deviation

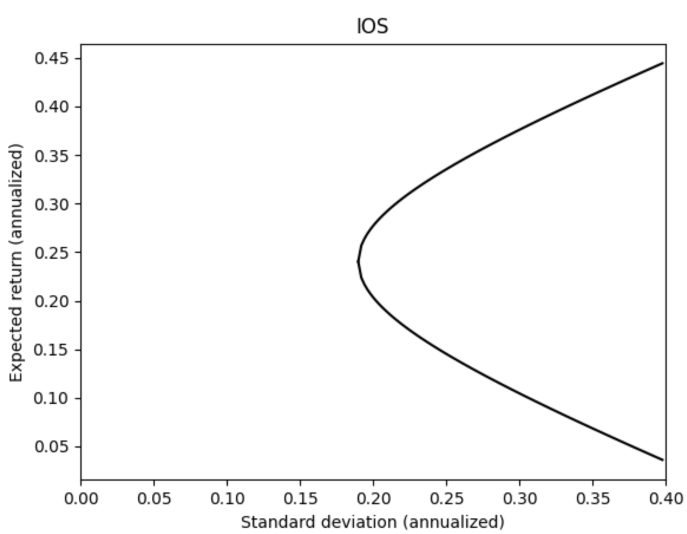
MSR Portfolio Expected Return: 0.02429235

MSR Portfolio Standard Deviation: 0.06039612

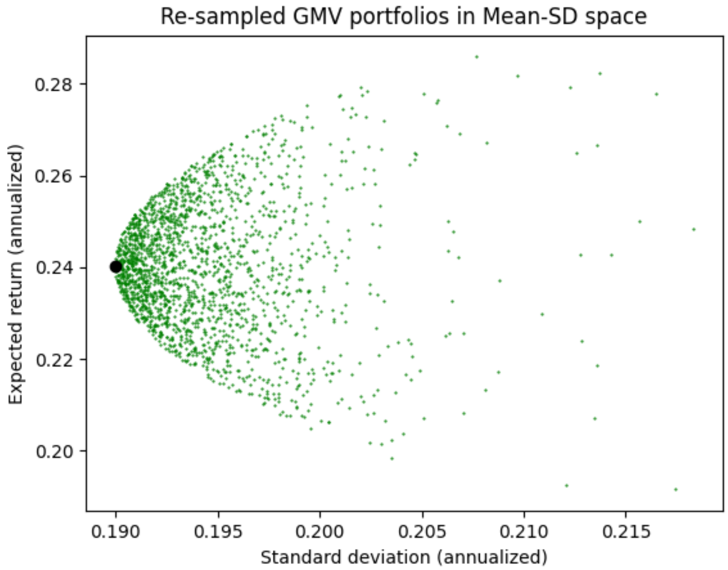
Multivariate Normal Distribution Assumption

The analysis assumes that asset returns conform to a multivariate normal distribution with mean and covariance matrix equal to the sample ones estimated earlier.

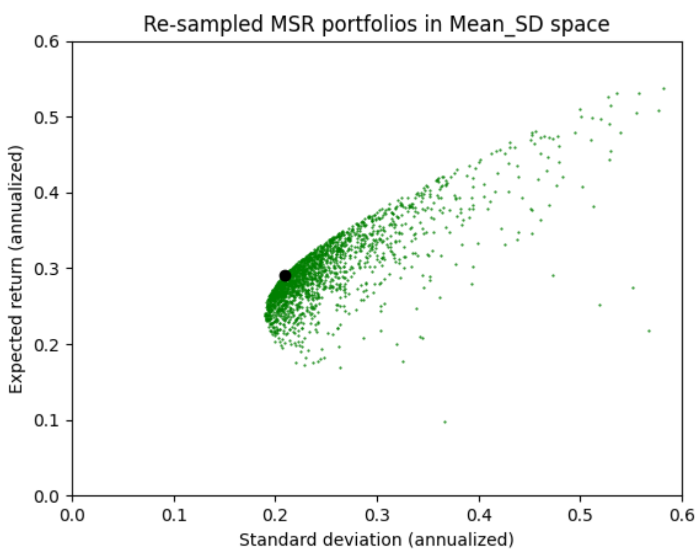
Simulations



GMV Portfolio Simulation



MSR Portfolio Simulation



Summary Statistics Table for GMV Portfolio

Metric	Count	Mean	Std	Min	25%	50%	75%	Max
Std	2001.0	0.056031	0.001	0.054835	0.0553	0.055775	0.05648	0.064097
Expect R	2001.0	0.020005	0.001109	0.01637	0.019312	0.020043	0.020749	0.023811
Stock_0	7.0	-0.042305	0.459613	-0.216022	-0.216022	-0.216022	-0.216022	1.0
Stock_1	7.0	0.200695	0.35246	0.067477	0.067477	0.067477	0.067477	1.0
Stock_2	7.0	0.952763	0.020829	0.944891	0.944891	0.944891	0.944891	1.0
Stock_3	7.0	0.317418	0.30099	0.203655	0.203655	0.203655	0.203655	1.0

Summary Statistics Table for MSR Portfolio

Metric	Count	Mean	Std	Min	25%	50%	75%	Max
Standard Deviat	2001	0.057512	0.002645	0.055212	0.055758	0.056967	0.05864	0.093045
Expected Retu	2001	0.019663	0.001581	0.011247	0.018672	0.019786	0.020932	0.024292
Stock_0	7	-0.042305	0.459613	-0.216022	-0.216022	-0.216022	-0.216022	1.0
Stock_1	7	0.200695	0.35246	0.067477	0.067477	0.067477	0.067477	1.0
Stock_2	7	0.952763	0.020829	0.944891	0.944891	0.944891	0.944891	1.0
Stock_3	7	0.317418	0.30099	0.203655	0.203655	0.203655	0.203655	1.0

Summary Statistics Table for Sharpe Ratios

Metric	Count	Mean	Std	Min	25%	50%	75%	Max
Sharpe Rat	2001.0	0.0751	0.044578	0.054856	0.060717	0.066225	0.077805	1.679092