Asset Pricing: ASSIGNMENT 1

(Nasruddin)

Create a table showing the mean return and standard deviation of return for the ten industry portfolios.

	mean_returns	std_dev
NoDur	0.902833	3.345657
Durbl	0.733333	8.361852
Manuf	1.012833	5.310270
Enrgy	1.231167	6.081524
HiTec	0.766250	5.381191
Telcm	0.881417	4.448284
Shops	0.916333	4.093786
Hlth	0.783833	3.787172
Utils	0.907167	3.701763
Other	0.489083	5.582452

Plot the minimum-variance frontier (without the riskless asset) generated by the ten industry portfolios:

- **This graph must have expected (monthly) return on the vertical axis vs standard deviation of (monthly) return on the horizontal axis.**

- **This graph must cover the range from 0% to 2% on the vertical axis, in increments of 0.1% (or less).**
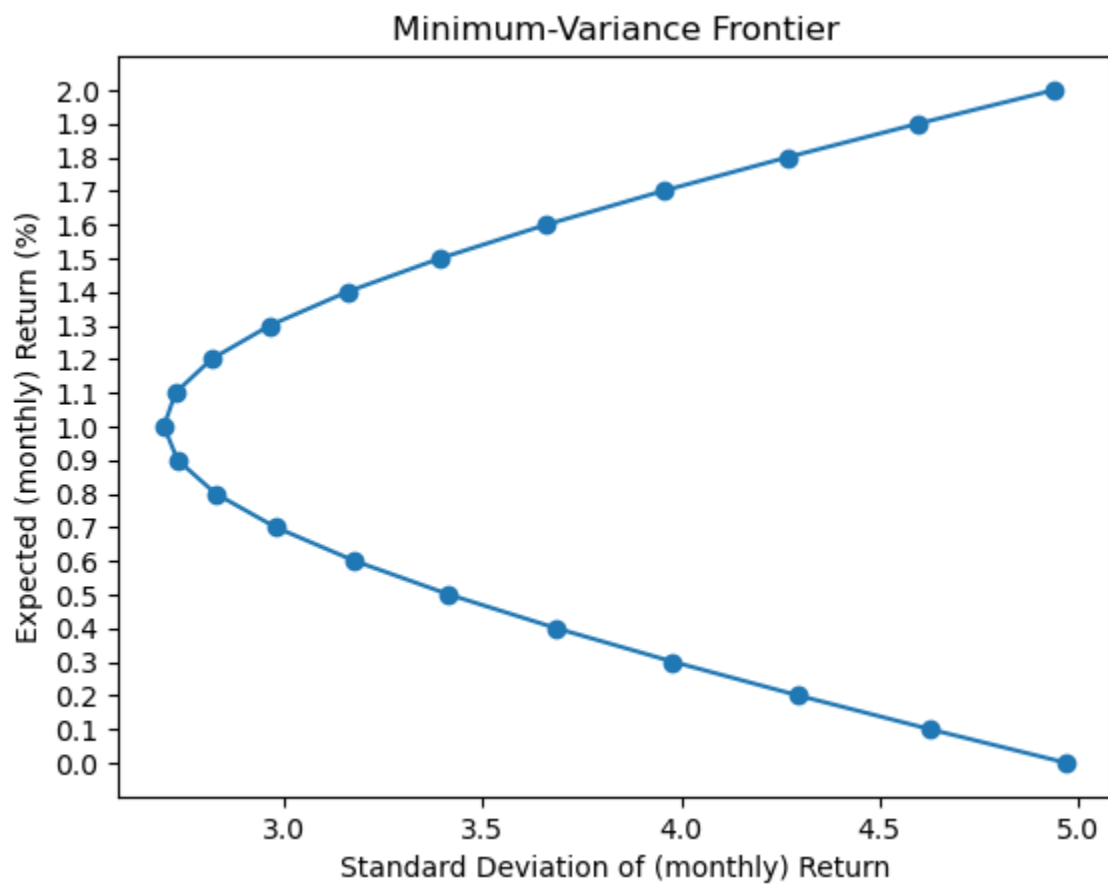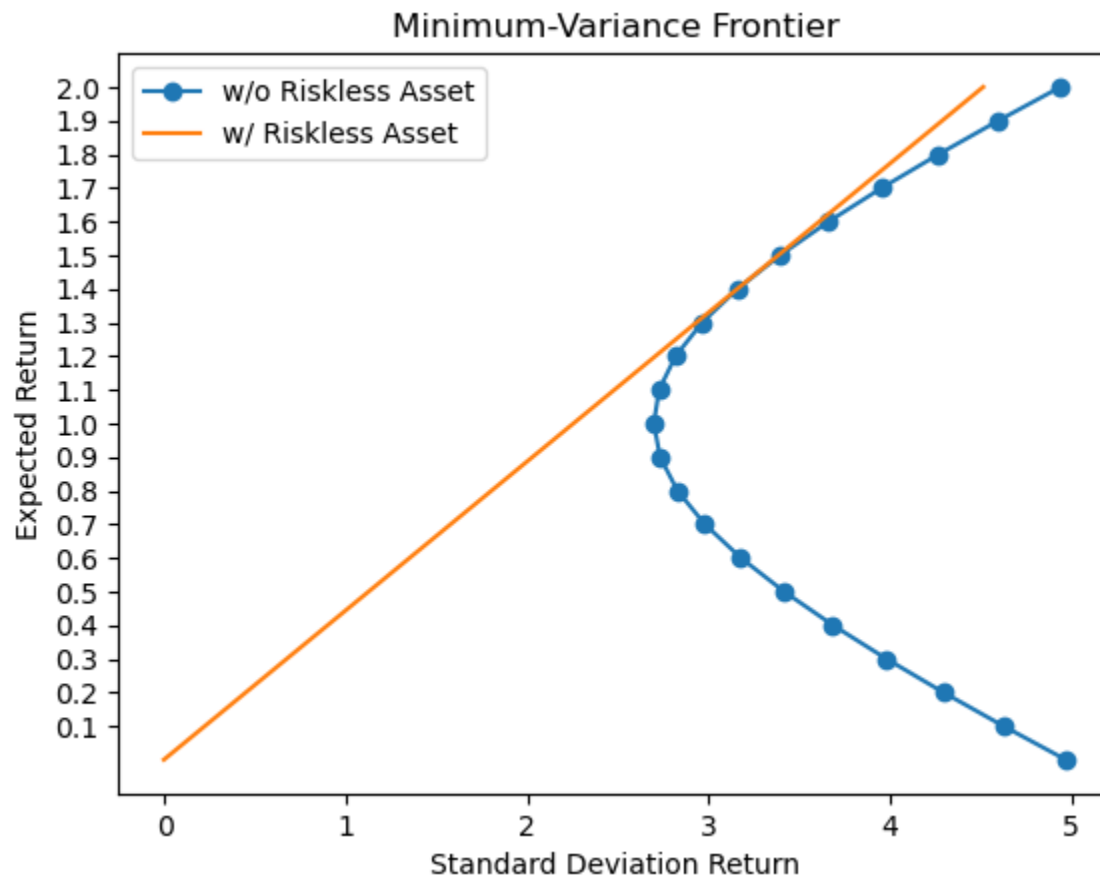
Briefly explain (in words, without mathematical equations or formulas) the economic significance and relevance of the minimum-variance frontier to an investor.

The minimum-variance frontier would define the limit of risk return combinations that are achievable. Portfolios should not lie at the left of the minimum-variance frontier, as this implies a lower level of risk for the same or higher expected returns, which is unlikely to be possible within the given set of investment options. While the minimum-variance frontier does not impact the economy, it does provide an important framework to understand the limits of investment opportunities that are available. The relevance of minimum-variance frontier lies in the ability of universal application to any set of investment options.

Now suppose that the (net) risk-free rate is 0.13% per month:

Plot the efficient frontier (with the riskless asset) on the same graph as the minimum-variance frontier generated by the ten industry portfolios.

Minimum-Variance Frontier

Briefly explain the economic significance and relevance of the efficient frontier to an investor.

Efficient Frontier would consist of portfolios that would allow the highest expected returns for a particular risk level. Combinations of all the optimal portfolio on the Efficient Frontier, and investors who are risk-averse would invest in it to maximize expected utility. Like the minimum-variance frontier, the efficient frontier does not impact the economy directly but provides a fundamental understanding of optimum resource allocation within the financial markets. Its universal application is also relevant to any set of investment options where investment decisions are shaped according to individuals and institutions.

The two frontiers will intersect at single point: the tangency portfolio:

Calculate the Sharpe ratio for the tangency portfolio, and also the tangency portfolio weights for the ten industry portfolios.

```
NoDur     0.564836
Durbl    -0.200658
Manuf     0.603062
Enrgy     0.099235
HiTec    -0.326252
Telcm    -0.102361
Shops     0.940003
Hlth      0.084214
Utils     0.156093
Other    -0.818173
Name: tangent weights, dtype: float64
```

Briefly explain the economic significance and relevance of the tangency portfolio to an investor.

Tangency portfolio is the point on the Efficient Frontier that would have the highest Sharpe ratio, it represents the portfolio with the highest risk-adjusted return, in which, investors maximize their risk-adjusted returns by investing in it. From an economic perspective, it plays a crucial role in CAPM model, and represents a market portfolio, which is a benchmark for every risky asset. The tangency portfolio can be combined with a risk-free asset to create a portfolio with the desired risk-return profile.