QF600-G1-2-Asset Pricing

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Course Schedule 2

Session 2

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Efficient Frontier

`Industry_Portfolios.xlsx` contains monthly nominal (net) returns (expressed as percentages) for ten industry portfolios, over the ten-year period from Jan 2004 through Dec 2013.

Use these returns to estimate the vector of mean returns and the covariance matrix of returns for the ten industry portfolios:

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

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.

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

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.

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

Please submit your results (including relevant tables and graphs) as an Adobe PDF file to Homework 1.

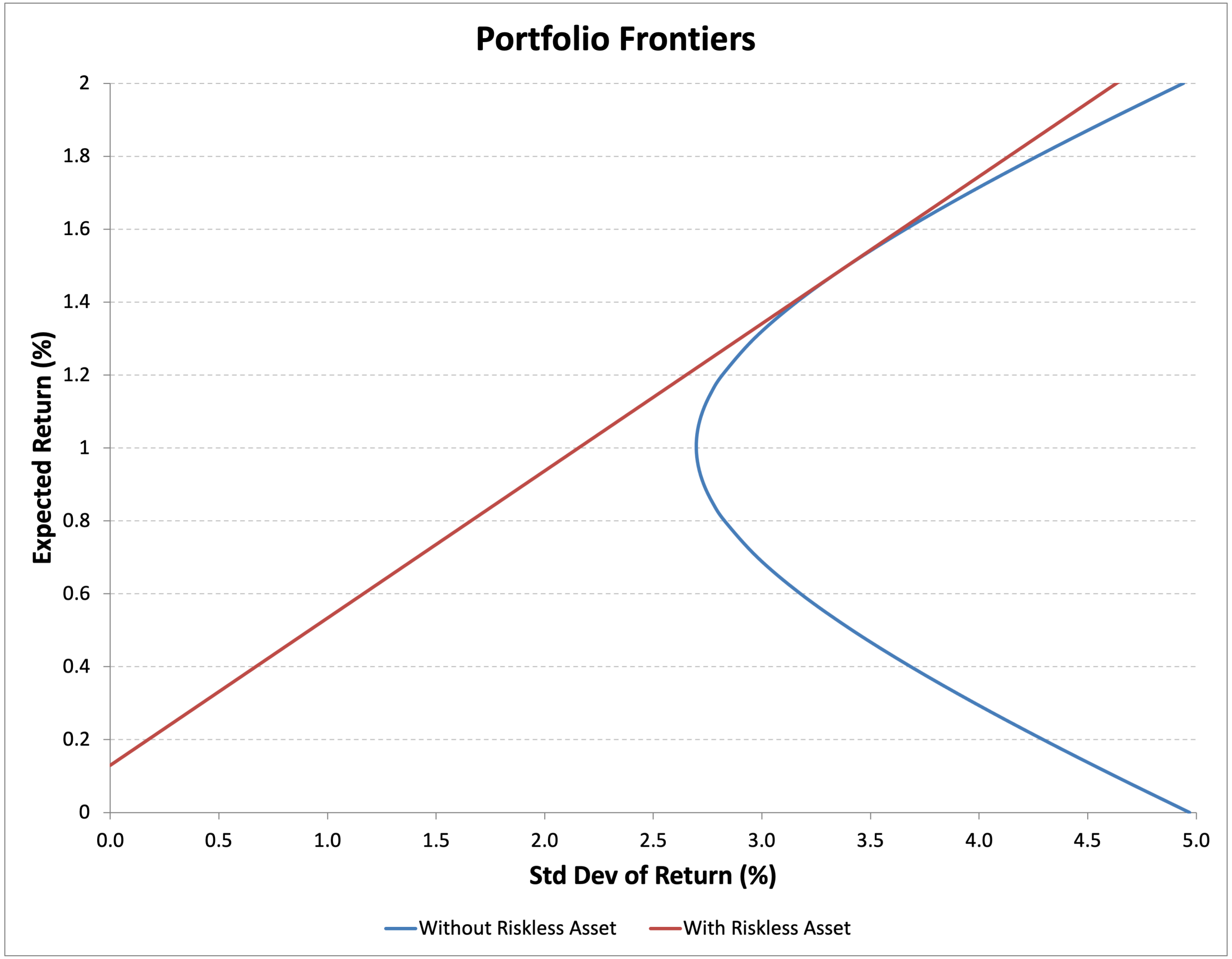
Miscellaneous

Economic significance:

- Minimum-variance frontier represents outermost envelope of attainable portfolios ⇒ no attainable portfolio exists to the left of the minimum-variance frontier.

- Efficient frontier consists of portfolios with highest mean return for specified standard deviation of return ⇒ risk-averse investor will invest in (optimal) portfolio on efficient frontier that maximises expected utility (of wealth).

- Tangency portfolio has the highest possible Sharpe ratio.



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Wikipedia: Modern Portfolio Theory

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Wikipedia: Sharpe Ratio

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Wikipedia: Lagrange Multiplier

Link

Lecture 2: Efficient Frontier

PDF document

Industry Portfolios

Excel Spreadsheet