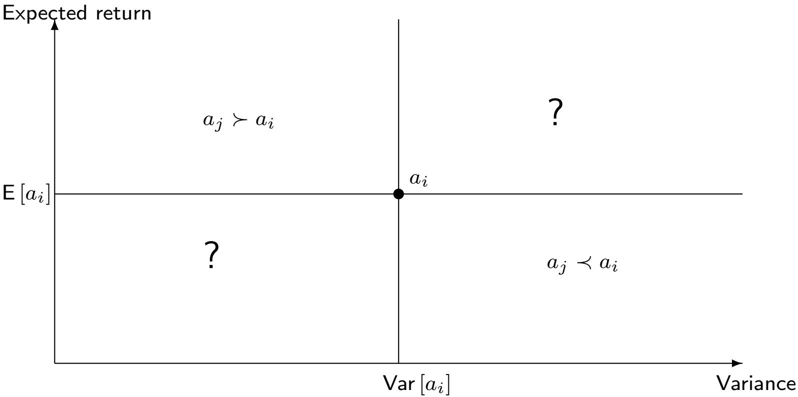
Andreas Krause

Mean-Variance criterion

Preferences for outcomes

- In finance it is common to express outcomes in terms of returns on the initial investment and associated risks as risks in the return
- Individuals will prefer higher expected returns to lower expected returns, *ceteris paribus*
- Individuals will prefer lower risks to higher risks, *ceteris paribus*
- Based on these two criteria we can compare choices and exclude many cases

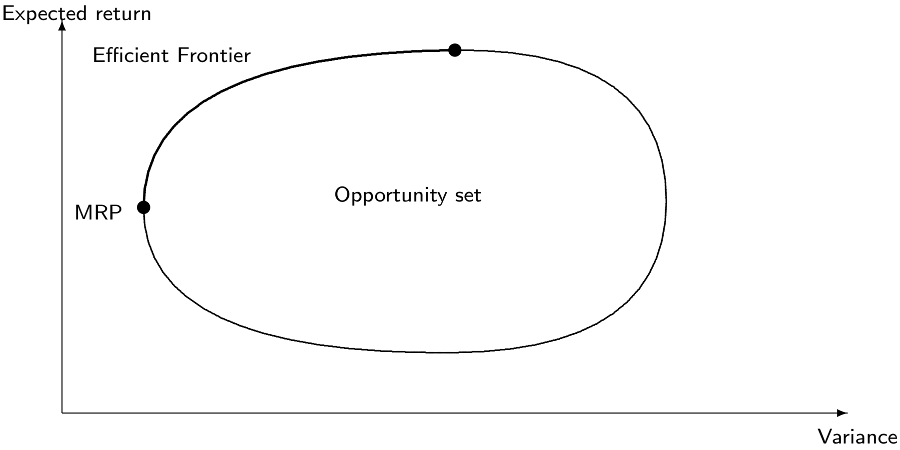
Choice between two alternatives



Determining possible choices

- By comparing any two alternatives, we can eliminate alternatives that have higher risk and lower return (lower right)
- We cannot make a choice if the alternative has higher risks and higher returns (upper right)
- We cannot make a choice if the alternative has lower risks and lower returns (lower left)
- The best choices have no alternatives with lower risks and higher returns (upper right)

The efficient frontier



Selecting the best choice

- The efficient frontier resembles all possible choices that do not have an alternative with lower risks and higher returns (upper right)
- So far we only assumed that individuals are risk averse
- The specific utility function or the level of risk aversion was not required
- The optimal choice will be on the efficient frontier, but the utility function is needed to select it

Indifference curves

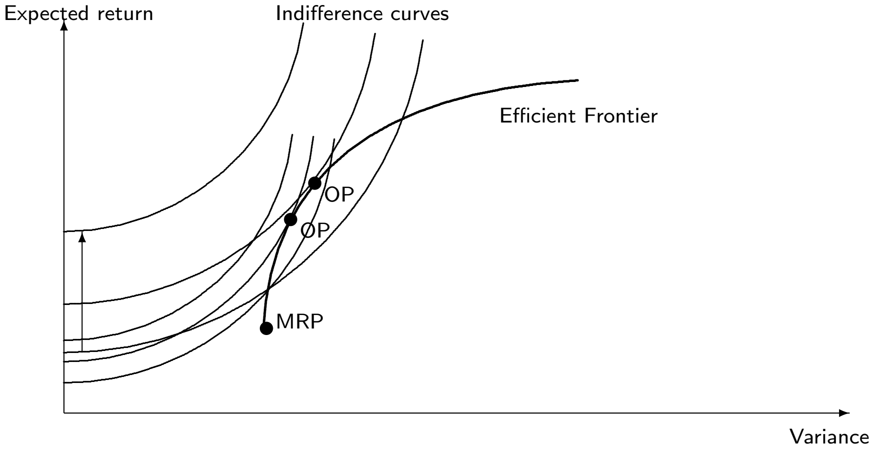
- To compensate for higher risks, individuals require a higher return

$\Rightarrow$ Indifference curves have a positive slope as risk with risk aversion

- A higher risk aversion implies that individuals require more compensation when taking on additional risk

$\Rightarrow$ Indifference curves have a higher slope the more risk averse an individual is

Determination of the optimal choice



Properties of the optimal portfolio

- The optimal choice (portfolio) is located where the indifference curve is tangential to the efficient frontier
- A higher risk aversion reduces the risk of the optimal portfolio
- The more risk averse an individual is, the closer the optimal portfolio moves to the minimum risk portfolio

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