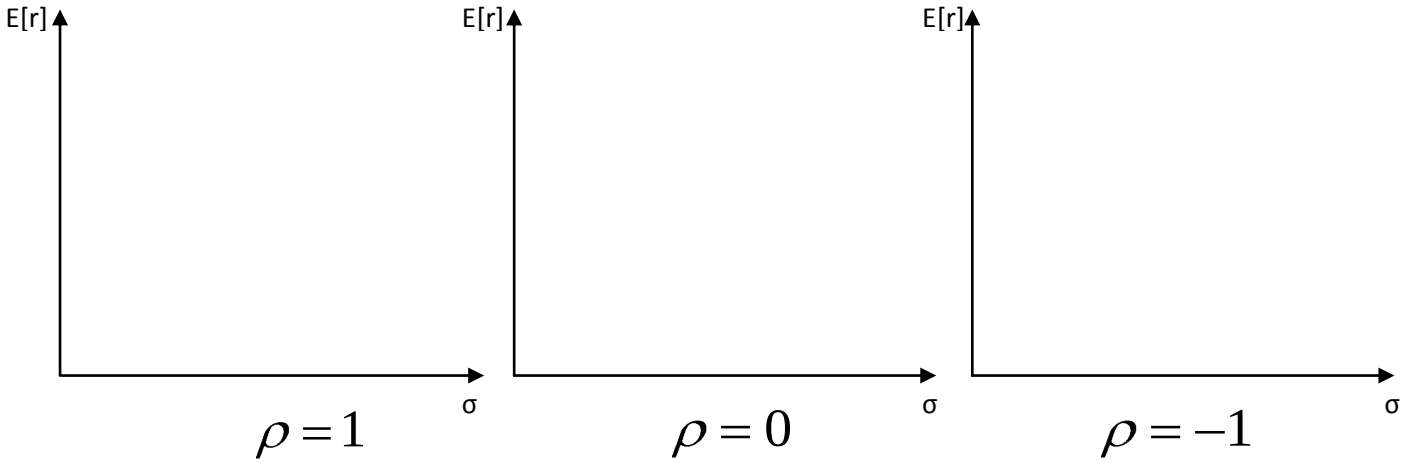
Topic 7. Asset Pricing Models
Markowitz Portfolio Theory (1950s) –
- Mean-Variance Analysis

Assumption: Investors care ONLY about expected returns and the variance of returns of their portfolios (mean-variance preferences)

⇨ Combining stocks into portfolios can reduce standard deviation, below the level obtained from a simple weighted average calculation

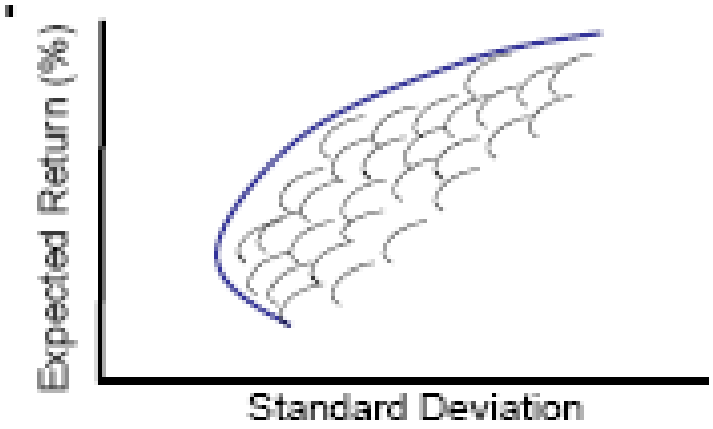
⇨ Non-unit correlation between the stocks makes this possible

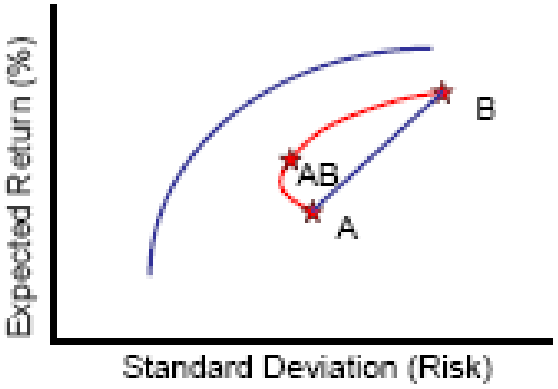


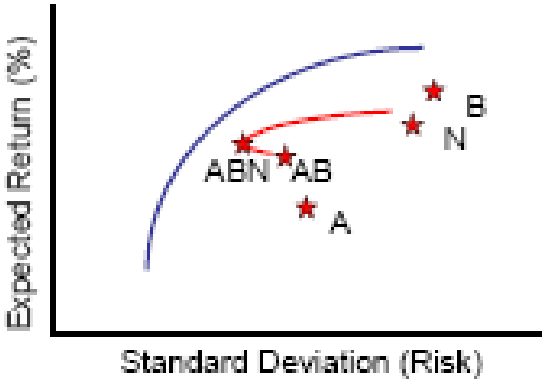
⇨ Mean Variance Efficient portfolio is the combination of stocks that has the lowest risk for a given return expectation. You cannot diversify the risk any further. It's the best possible portfolio!

Mean-Variance Frontier

- Each small half egg shell represents the combinations for two stocks
- The optimal combination for all stocks constitutes the large half egg shell: the mean-variance frontier:







Where is the minimum variance portfolio?

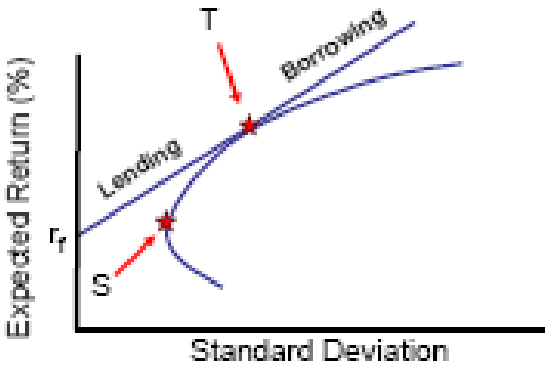
Where is the efficient frontier?

Which portfolio would you choose?

Introducing risk-free rate

$$\rho_{r_f, r_p} = 0$$

⇨ Lending or borrowing at the risk free rate (r_f) allows us to achieve the returns beyond the efficient frontier, i.e. higher returns for a given risk or lower risk for a given return



Which portfolio would you choose now?

What is the composition of your portfolio?

⇨ **Two-fund separation theorem!**

Capital Asset Pricing Model (CAPM)
(Sharp, Lintner, 1964-65)

- a model of asset pricing equilibrium:

The tangency portfolio (T) =
= The market portfolio (M)

$$E(r_i) = r_f + \beta_i [E(r_M) - r_f]$$

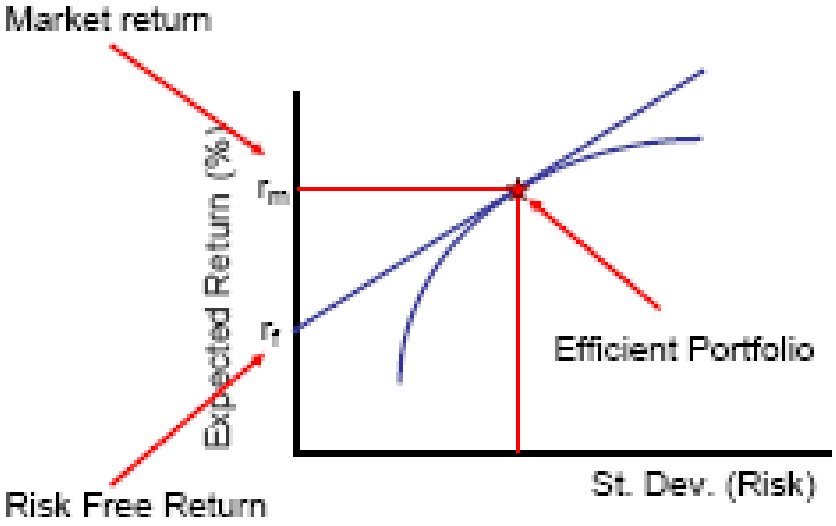
where $$\beta_i \equiv \frac{Cov(r_i, r_M)}{Var(r_M)}$$

Assumptions of CAPM:

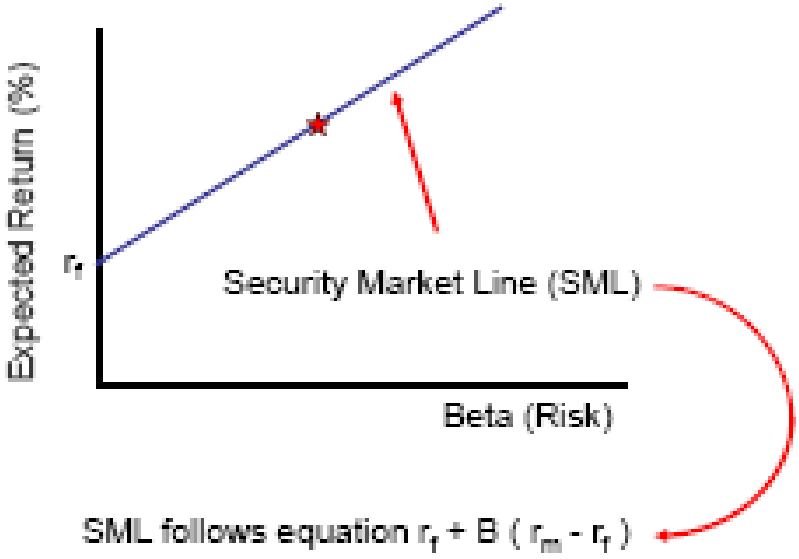
- Investors maximize utility over expected return and return variance
- Investors have homogeneous expectations regarding future asset returns
- Unlimited amounts may be borrowed and loaned at the risk-free rate
- Asset markets are perfect and frictionless (e.g. no taxes, no transaction costs, no short sale constraints)

Beta VS Standard Deviation

Capital Market Line (CML):



Security Market Line (SML):



Implications of CAPM:

- An asset's expected (fair) return is proportional to its market beta, and only beta;
- For a diversifying investor, it is beta what matters for asset pricing, not standard deviation

Criticism of CAPM assumptions

- ⇨ U.S. Treasury bills are risk free? But do they guarantee a positive real return?
- ⇨ Can investors borrow and lend the same rate?
- ⇨ What is the benchmark market portfolio?
- ⇨ Any other relevant factors?

Empirical tests of CAPM:

Size and B/M are also relevant factors in explaining the cross-section of returns (e.g. Fama, French, 1992, 1993)