

Week 5 Capital Market Line

- Capital Market Line is an equation which describes the relationship between risk and return for a portfolio of risky assets with access to risk free assets
- Components
 - o Weights (W), row of weights
 - o Matrix returns (W*E(r))
 - o Variance covariance matrix
 - o Portfolio variance (W*var/cov*W^T)
- Feasible set
 - o Is a set of feasible weights in which we can construct our portfolio of the assets available
 - o **Efficient set:** is the maximum returns available for every level of risk undertaken, these are the sets to undertake to maximize returns
 - *Global minimum variance portfolio:* is the combination of assets that provide the lowest risk
 - To find the efficient set:
 - Let R be a vector of E(r) of each asset c be a vector of constants, S = variance covariance matrix
 - $R - c = Sz$, where z is a vector
 - $z = S^{-1}\{R - c\}$, divided by sum of z to create x
 - o Z is a vector of the inverse variance covariance – (R-c)
 - o Divide each value in z by the sum of the entire column
 - x is an 'envelope portfolio', consisting of weights
 - Pick another constant and find another envelope portfolio
 - Find the expected return of each these portfolios
 - o Then using the mean as the return for x and y respectively, we take the product of x and y and their mean return
 - o What the result is an efficient portfolio
 - Calculate of a two-way data table of how *expected return* and *standard deviation* changes with varying weight in z_1
 - Plot the table for efficient set
- Investor utility/indifference curve
 - o An investors' optimal efficient portfolio is the tangency point between the indifference curve and the efficient set
- Capital market line/market portfolio
 - o With access to risk free assets, the efficient set becomes a straight line
 - o The security market line is the efficient set of portfolio with access to risk free assets
 - o **Market portfolio:** optimal combination of risky assets portfolio with access to risk free assets
 - o **CML:**
$$E[r_p] = \frac{\sigma_p}{\sigma_M} (E[r_M] - r_f) + r_f$$
 - o **Optimal portfolio:** tangency between CML and indifference curve