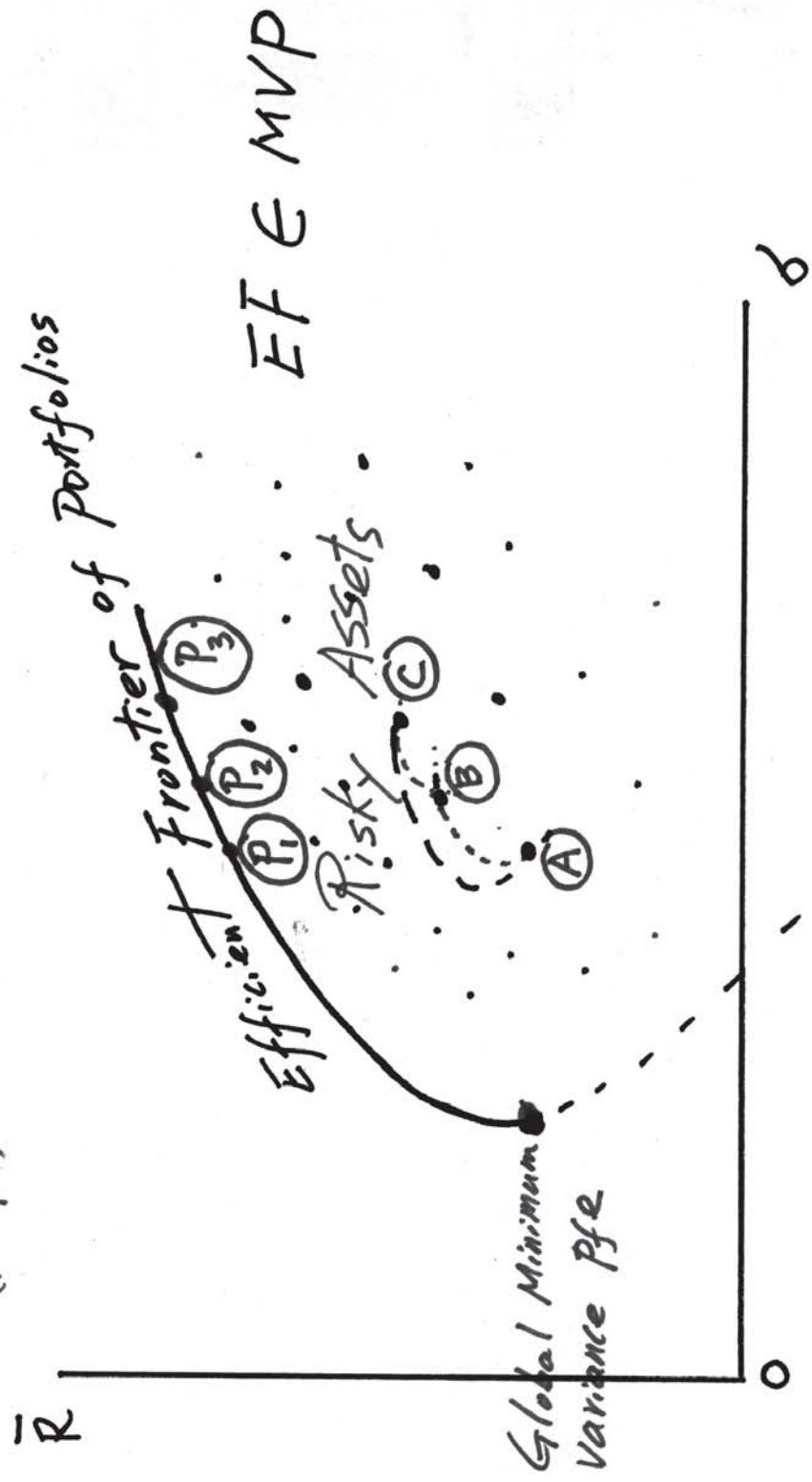


Line "

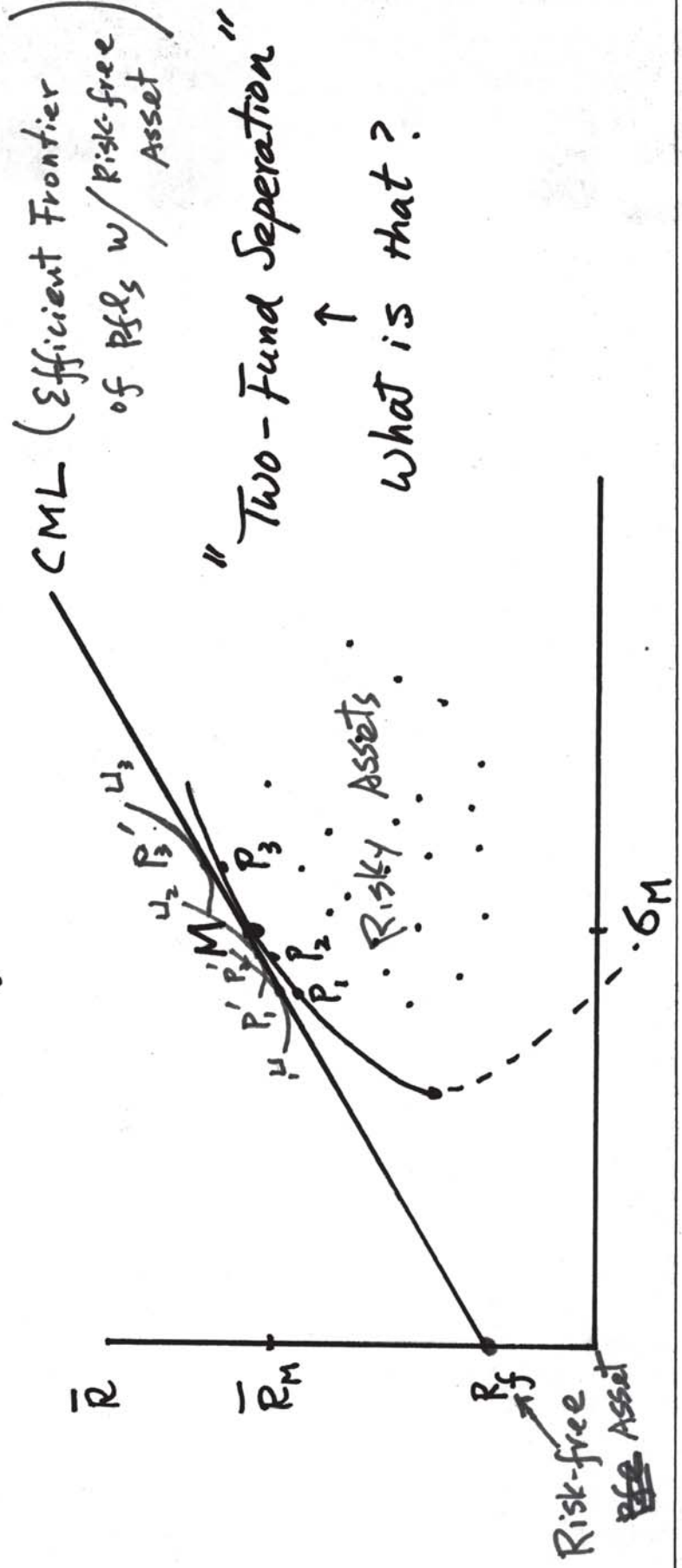
Minimum Variance portfolios and Efficient Frontier (EF)

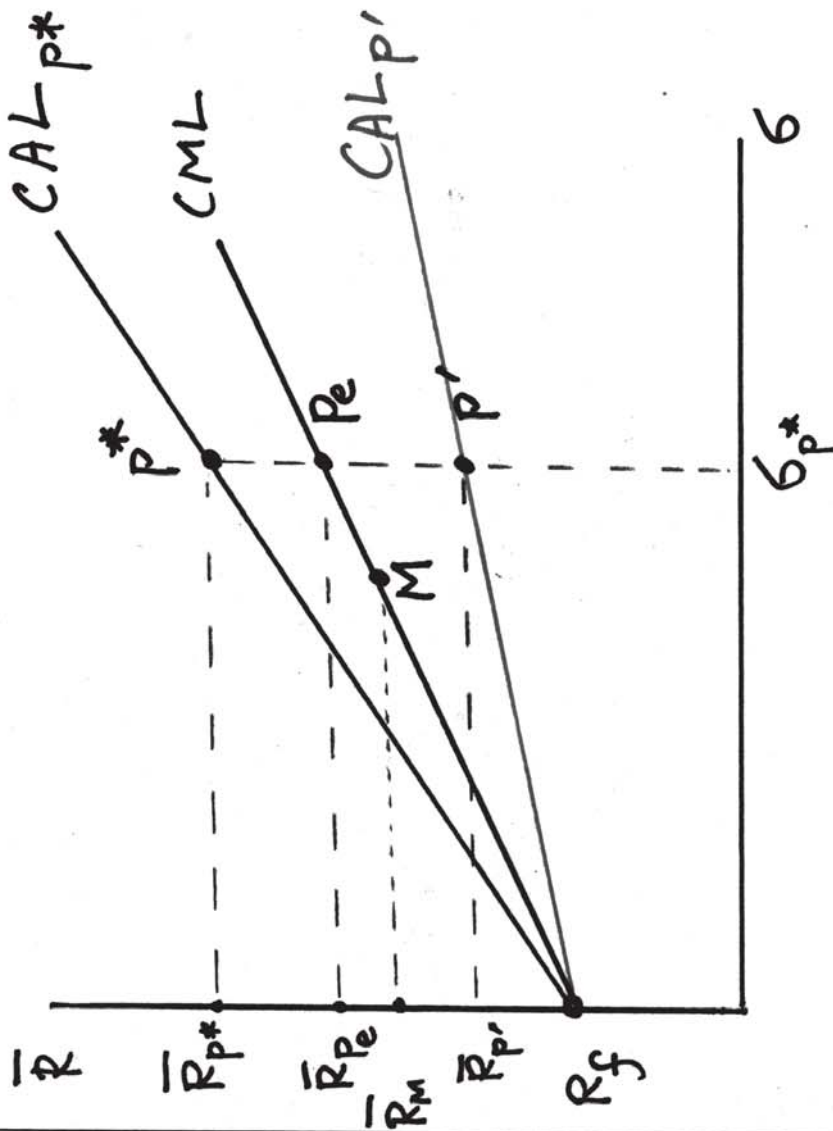


Capital Market Line & Asset Allocation Line

Capital Market Line (CML) = Efficient Frontier of PFLs with a risk-free Asset.

- Note that
- ① between risky Assets and risk-free Asset is "zero"
 - ② Efficient portfolios are risky an
 - ③ There is a linear relationship between an efficient PFL and a risk-free Asset.





$$\frac{\bar{R}_{p^*} - R_f}{\sigma_{p^*}} > \frac{\bar{R}_M - R_f}{\sigma_M}$$

$$\bar{R}_{p^*} > R_f + \frac{\sigma_{p^*}}{\sigma_M} (\bar{R}_M - R_f)$$

$$\bar{R}_{p'} < R_f + \frac{\sigma_{p'}}{\sigma_M} (\bar{R}_M - R_f)$$

$$S_{p^*} > [S_{p^e} = S_M] > S_{p'}$$

Capital Market Line & Capital Allocation Line

A general rule to evaluate if a new asset should be added to an existing portfolio (P)?

Add if $S_{new} > S_P * \rho_{new,P}$

Discuss Later about SML

why? ① On eq'n, $\bar{R}_{new} = R_f + \beta_{new,P} [\bar{R}_P - R_f]$;

so, add if ② $\bar{R}_{new} > R_f + \beta_{new,P} (\bar{R}_P - R_f)$: where

$$\beta_{New,P} = \frac{\sigma_{New} \cdot \rho_{New,P}}{\sigma_P^2} = \frac{\sigma_{New} \rho_{New,P}}{\sigma_P}$$

$$\bar{R}_{new} - R_f > \frac{\sigma_{New} \cdot \rho_{New,P}}{\sigma_P} (\bar{R}_P - R_f)$$

$$\frac{\bar{R}_{new} - R_f}{\sigma_{New}} > \frac{\bar{R}_P - R_f}{\sigma_P} \cdot \rho_{New,P}$$

Prefer High

Sharp Ratio ! $S_{new} > S_P \cdot \rho_{new,P}$
of New Asset.

Prefer Low Correlation !