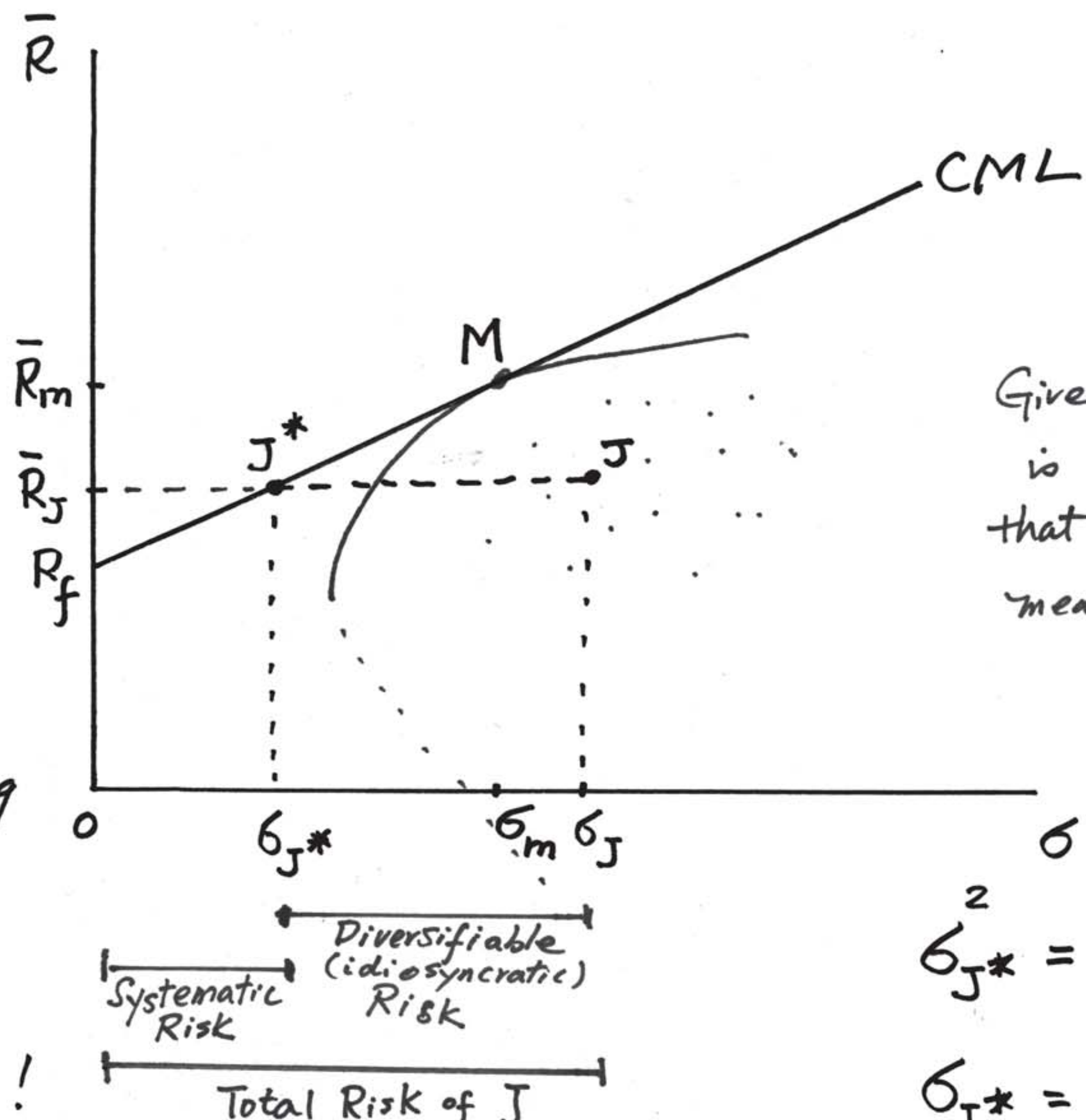
Risk and Return : Part 2 From CML to SML : The CAPM

Assume

1. Homogenous Expectation
2. Symetric Return Distributions
3. Borrowing & Lending at the Same rate



Given $\bar{R}_J$, J^* portfolio is the best choice in that σ_{J^*} is the minimum measure.

All investors are able to reduce the risk of J by holding J^* portfolio!

⇒ Thus, β_J instead of σ_J becomes the Focus!

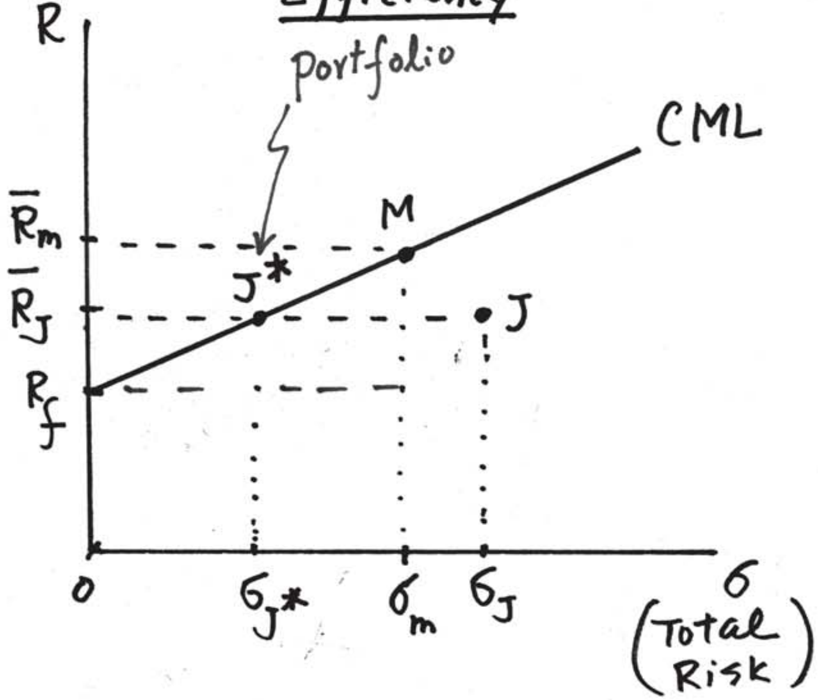
$$\sigma_{J^*}^2 = \beta_J^2 \sigma_m^2$$

$$\sigma_{J^*} = \beta_J \sigma_m$$

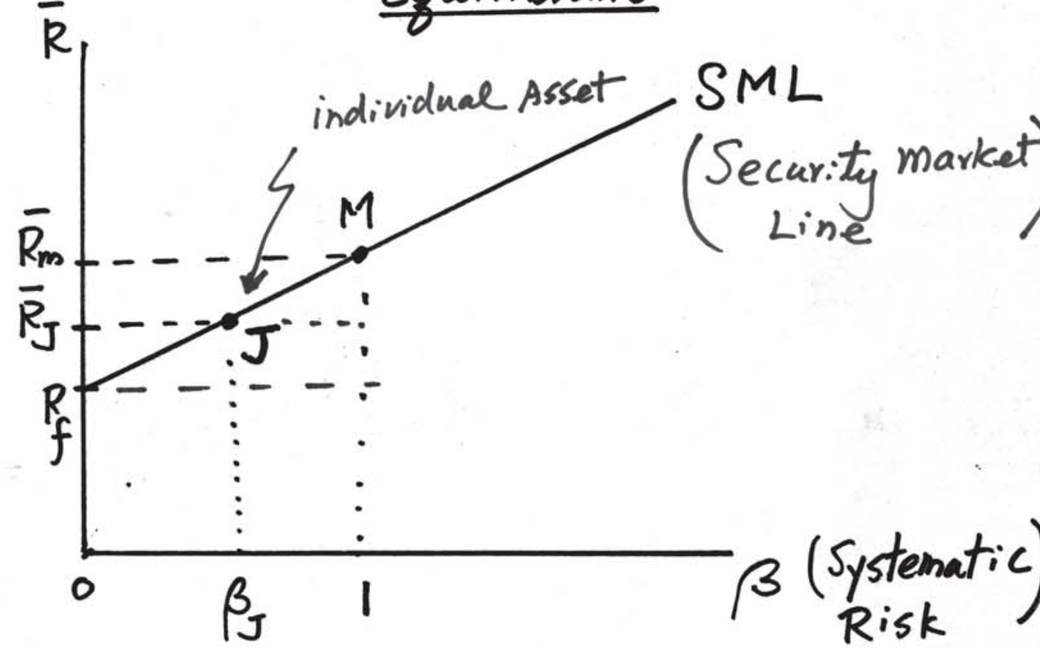
$$\beta_J = \frac{\sigma_{J^*}}{\sigma_m}$$

From CML to SML : The CAPM

"**Efficiency**"



"**Equilibrum**"



Slope of J^* = slope of M

$$\frac{\bar{R}_{J^*} - R_f}{\sigma_J^*} = \frac{\bar{R}_m - R_f}{\sigma_m}$$

$$\therefore \bar{R}_{J^*} = \bar{R}_J = R_f + \frac{\sigma_J^*}{\sigma_m}(\bar{R}_m - R_f)$$

Slope of J = slope of M

$$\frac{\bar{R}_J - R_f}{\beta_J} = \frac{\bar{R}_m - R_f}{1}$$

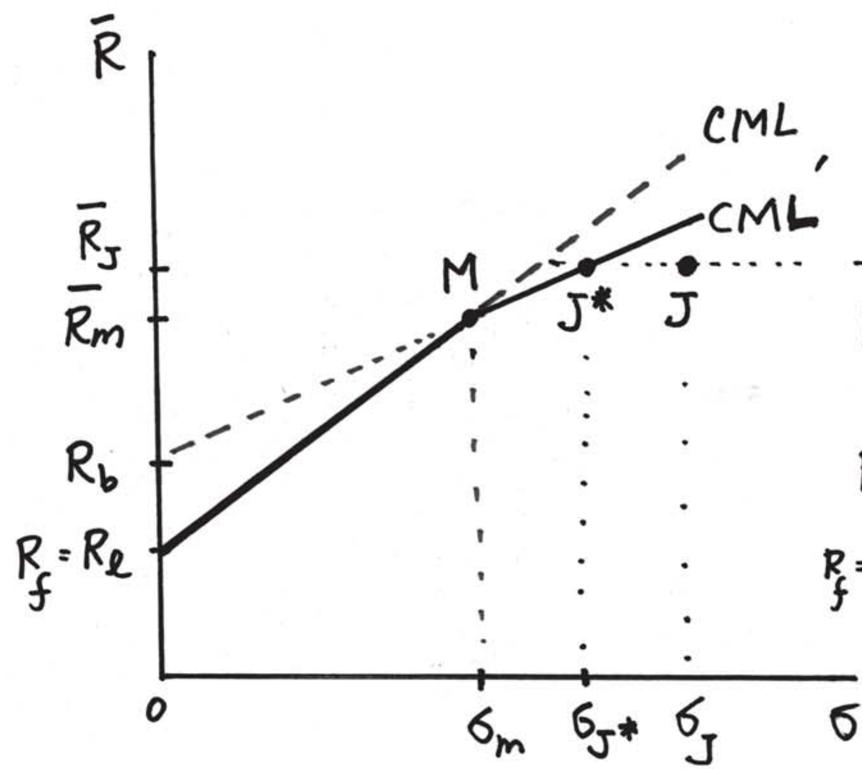
$$\therefore \bar{R}_J = R_f + \beta_J(\bar{R}_m - R_f)$$

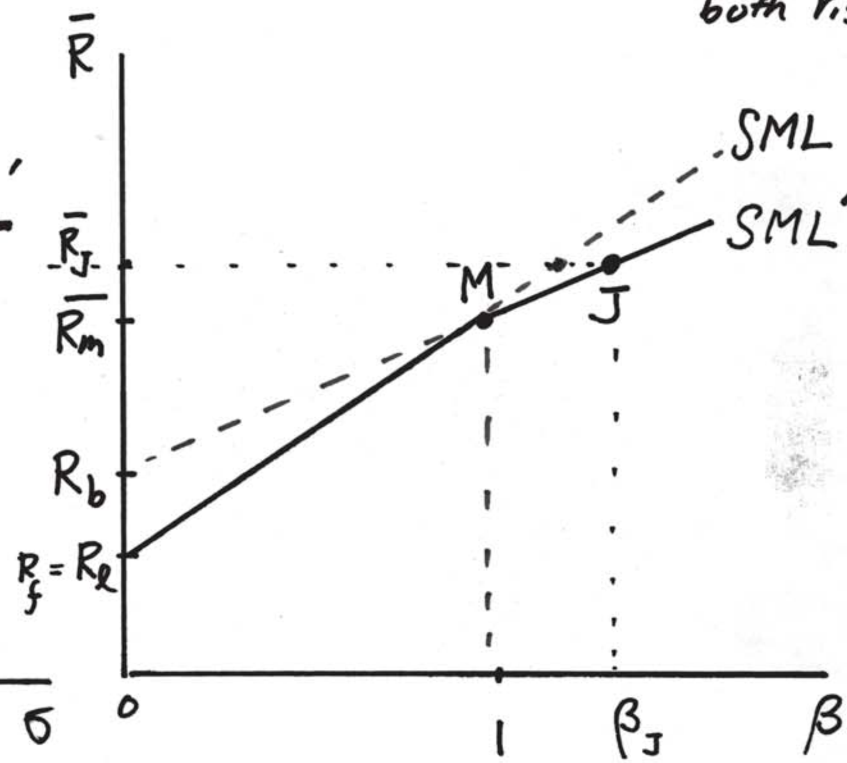
$$\boxed{\text{CAPM}}$$

$$\beta_J = \frac{\sigma_J^*}{\sigma_m}$$

From CML to SML : The CAPM

Borrowing & Lending at different rates : $R_b > R_\ell$ (although they are both risk-free)





$$\bar{R}_J = \bar{R}_{J^*} = R_b + \frac{\sigma_{J^*}}{\sigma_m}(\bar{R}_m - R_b)$$

$$\bar{R}_J = R_b + \beta_J(\bar{R}_m - R_b)$$

$$< R_f + \beta_J(\bar{R}_m - R_f)$$