1 Portfolio Theory with 2 Risky Assets

1a: Expected Return & Standard Deviation

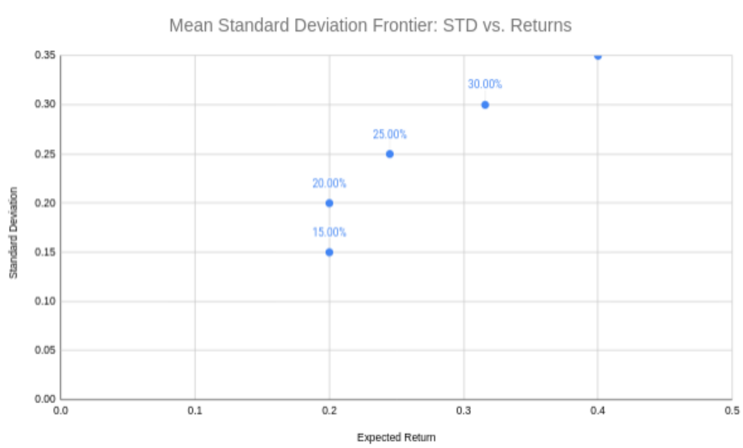
	Security Y	**Security X**
Expected Return	15%	35%
Expected Return	20%	40%
Correlation	0.25	

Calculating the $E(R)$ and σ from 1 to 5 with respective weights, w_1.

$$E(R) = w_1 E(R_1) + w_2 E(R_2)$$
$$Var = \sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho$$

	E(R)	σ
1.	.15%	.200%
2.	.20%	.200%
3.	.25%	.245%
4.	.30%	.316%
5.	.35%	.400%

1b: Efficient Frontier Plot



1c: Efficient Portfolio

Efficient portfolios which maximize the $E(R)$ (mean) and lowers the variation and standard deviation include 2-5. Since, 2 and 1 have the same standard deviation, we accept the portfolio with the higher $E(R)$, 2.

2 Portfolio Theory with a Riskless Asset

- $E(R) = 16\%$ and $\sigma = 10\%$
- $R_f = 8\%$

2a: Expected Return and Standard Deviation

Since the asset is risk free, the standard deviation of the portfolio is 0.

2b: 50% Weight in SnP

$$E(R) = w_1 E(R_1) + w_2 E(R_2) = .5(.16) + .5(.08) = .08 + .04 = .12$$
$$\sigma_p = w_M \sigma_M = (.5)(.10) = .05$$

2c: Borrowing

Portfolio with 125% in SnP, with 25% borrowed at risk-free asset rate.

$$\sigma = w_M \sigma_M = 1.25(.1) = 0.125$$

$$E(R) = w_m E(R_m) + w_{-m} E(R_f) = 1.25(.16) + -.25(.08) = .18$$

Note: total weight cannot exceed 1

2d: Backwards Solving for Weight

We substitute $2\sigma_p$ for σ_M and $w_M = -1$ so total weight $= 1$. Thus,

$$2\sigma_M = w_M \sigma_M \rightarrow w_M = 2$$

$$\sigma_p = w_m \sigma_m = 2(.10) = .2$$
$$E(R) = w_f R_f + w_M R_M = -1(.08) + 2(.16) = .24$$

3: Preference w/ T-Bill

	$E(R)$	σ
Russel Fund	.16	.12
Windsor Fund	.14	.10
SnP Fund	.12	.08

- Russel Fund
- Windsor Fund
- SnP Fund
- $0.6 = w_R$ and $0.4 = w_{snp}$

To find the best fund, we calculate the sharpe ratio with $R_t = 0.6\%$:

$$\text{Russel} = \frac{E(R_r) - R_t}{\sigma_r} = \frac{.16 - .06}{0.12} = 0.8333$$

$$\text{Windsor} = \frac{E(R_w) - R_t}{\sigma_w} = \frac{.14 - .06}{0.10} = 0.8$$

$$\text{SnP} = \frac{E(R_{snp}) - R_t}{\sigma_{snp}} = \frac{.12 - .06}{0.08} = 0.75$$

Finding $E(R_M)$, σ_M and the sharpe ratio. Note: w_2 = weight of SnP

$$E(60/40) = .6E(R_r) + .4E(R_{snp}) = .6(.16) + .4(.12) = .144$$

$$\sigma_m^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho$$
$$= (.36)(.0144) + (.16)(.0064) + 2(.6)(.4)(.7)(.12)(.08) = 0.0094336$$

$$\sqrt{\sigma_m^2} = \sqrt{0.0094336} = 0.0971267213$$

$$\text{sharpe-ratio} = \frac{E(R_M) - R_t}{\sigma_m} = \frac{0.144 - 0.6}{0.0971267213} = 0.8648495375$$

Thus, we would choose the 60/40 Portfolio since it has the highest sharpe ratio.

	$E(R)$	σ	Sharpe Ratio
Russel Fund	.16	.12	0.8333
Windsor Fund	.14	.10	0.800
SnP Fund	.12	.08	0.750
60/40	.144	.097	0.8648

3 The Capital Asset Pricing Model (CAPM)

- $R_f = 0.04$
- $E(R_M) = .12$
- $\sigma_m = .15$

4a: Equilibrium Risk Premium

$$\text{ERP} = E(R_M) - R_f = 0.12 - 0.4 = .8$$

4b: Realized Return & Beta

We cannot compute the beta of this stock, because we are given realized return, not $E(R)$.

4c: Expected Return & Beta

$$\beta = \frac{E(R) - R_f}{E(R_M) - R_f} = \frac{.15 - .04}{.12 - .04} = 1.25$$