The Effect of Correlation.

- If $\rho = 1$, then the feasible set is a straight line between the two assets.
- The higher the correlation, the smaller the curvature of the feasible set.
- If $\boxed{\rho = -1}$, then ...

Claim: There is a weight w of asset #1 such that the resulting portfolio is risk-free, i.e., its volatility is zero.

$\longrightarrow$:

$$Var[w \cdot R_1 + (1-w) \cdot R_2] \stackrel{!}{=} 0$$

$$w^2 \cdot Var[R_1] + (1-w)^2 \cdot Var[R_2] + 2w(1-w)\,Cov[R_1, R_2] = 0$$

$$w^2 \cdot \sigma_1^2 + (1-w)^2 \cdot \sigma_2^2 + 2w(1-w) \cdot \sigma_1 \cdot \sigma_2 \cdot \rho = 0$$

$$w^2 \cdot \sigma_1^2 - 2w(1-w)\sigma_1 \cdot \sigma_2 + (1-w)^2 \cdot \sigma_2^2 = 0$$

$$(w \cdot \sigma_1)^2 - 2(w\sigma_1)((1-w)\sigma_2) + ((1-w)\sigma_2)^2 = 0$$

$$(w \cdot \sigma_1 - (1-w) \cdot \sigma_2)^2 = 0$$

$$w \cdot \sigma_1 - (1-w) \cdot \sigma_2 = 0$$

$$w(\sigma_1 + \sigma_2) = \sigma_2$$

$$\boxed{w = \frac{\sigma_2}{\sigma_1 + \sigma_2}}$$