

Given Formulas

- $\text{Duration} = \sum_{t=1}^n \frac{PV(CF_t)}{\text{market price}} \times t$
- $\text{Modified Duration} = \frac{\text{Duration}}{1 + YTM}$
- $E(X) = \sum_{i=1}^n p_i X_i$
- $VAR(X) = \sum_{i=1}^n p_i (X_i - E(X))^2$
- $E(R_p) = aE(X) + (1 - a)E(Y)$
- $VAR(R_p) = a^2 VAR(X) + (1 - a)^2 VAR(Y) + 2a(1 - a)COV(X, Y)$
- $COV(X, Y) = E[(X - E(X))(Y - E(Y))] = \sigma_{xy} = r_{xy}\sigma_x\sigma_y$
- $VAR(X) = \sigma_x^2$
- $VAR(R_p) = a^2\sigma_x^2 + (1 - a)^2\sigma_y^2 + 2a(1 - a)r_{x,y}\sigma_x\sigma_y$
- $\sigma_p = \sqrt{VAR(R_p)}$