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Sample Formula Sheet for CIMA® Certification[1]

Beta: $\beta_A = \frac{cov_{A,M}}{\sigma_M^2} = \frac{\rho_{A,M}\sigma_A}{\sigma_M} = \frac{cov(s)_{A,M}}{s_M^2} = \frac{\rho_{A,M}s_A}{s_M}$

Beta of portfolio: $\beta_P = \sum_{i=1}^{n} w_i\,\beta_i$

Bond Value: $P = \sum_{t=1}^{n} \frac{\text{Coupon}}{(1+y)^t} + \frac{\text{Par Value}}{(1+y)^n}$

CAPM, Security market line: $E(R_A) = R_f + \beta_A\big(E(R_M) - R_f\big)$

Capital allocation line: $E(R_C) = R_f + \left(\frac{\sigma_C}{\sigma_P}\right)(E(R_P) - R_f)$

Capital market line: $E(R_P) = R_f + \left(\frac{\sigma_P}{\sigma_M}\right)(E(R_M) - R_f)$

Capture ratio, downside:

$$DCR = \frac{\left[(1+R_{p,down1})(1+R_{p,down2})\ldots(1+R_{p,downn})\right]^{(1/t_{down})} - 1}{\left[(1+R_{b,down1})(1+R_{b,down2})\ldots(1+R_{b,downn})\right]^{(1/t_{down})} - 1}$$

Capture ratio, upside:

$$UCR = \frac{\left[(1+R_{p,up1})(1+R_{p,up2})\ldots(1+R_{p,upn})\right]^{(1/t_{up})} - 1}{\left[(1+R_{b,up1})(1+R_{b,up2})\ldots(1+R_{b,upn})\right]^{(1/t_{up})} - 1}$$

Convexity: $C = \frac{1}{P}\sum_{t=1}^{n} \frac{t(t+1)CF_t}{(1+y)^{t+2}}$

Correlation coefficient: $\rho_{A,B} = \frac{cov_{A,B}}{\sigma_A\sigma_B} = \frac{cov(s)_{A,B}}{s_A s_B}$

Covariance of a population: $cov_{A,B} = \rho_{A,B}\sigma_A\sigma_B = \frac{\sum_{t=1}^{n}[(R_{At} - \bar{R}_A)(R_{Bt} - \bar{R}_B)]}{n}$

Covariance of a sample: $cov(s)_{A,B} = \frac{\sum_{t=1}^{n}(R_{At} - \bar{R}_A)(R_{Bt} - \bar{R}_B)}{n-1}$

Downside deviation: $DD = \sqrt{\frac{\sum_{t=1}^{n}(min(R_i - MAR, 0))^2}{n-1}}$

Effective annual rate: $EAR = \left(1 + \frac{R_{nom.}}{freq.}\right)^{freq.} - 1$

Expected return: $E(R) = \sum_{i=1}^{n} P_i\,R_i$

Expected return, risky asset with risk-free asset: $E(R_P) = w_A(E(R_A)) + w_f R_f$

Forward exchange rate: $F_0 = E_0\left(\frac{1+R_A}{1+R_B}\right)^T$

Forward price: $FP = S_0(1 + R_f - d)^T$

Forward one-period rate at time t: $R_{t,t+1} = \left(\frac{(1+R_{t+1})^{t+1}}{(1+R_t)^t}\right) - 1$

Future value: $FV = \sum_{t=0}^{n} CF_t\,(1+R)^{n-t}$

Geometric mean return: $R_G = [(1+R_1)(1+R_2)(1+R_3)\ldots(1+R_n)]^{1/n} - 1$

Holding period return: $HPR_t = \frac{P_t - P_{t-1} + D_t}{P_{t-1}}$

Information ratio: $IR_P = \frac{\bar{R}_P - \bar{R}_B}{\sqrt{\frac{\sum_{t=1}^{n}(R_{Pt} - R_{Bt})^2}{n-1}}} = \frac{\bar{R}_P - \bar{R}_B}{Tracking\ error}$

Internal rate of return: $NPV = 0 = \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} - CF_0$

Jensen's alpha: $\alpha_P = R_P - [R_f + \beta_P(R_M - R_f)]$

Macaulay duration: $D = \frac{\sum_{t=1}^{n} \frac{tCF_t}{(1+y)^t}}{\sum_{t=1}^{n} \frac{CF_t}{(1+y)^t}}$

Macaulay duration of portfolio: $D_P = \sum_{i=1}^{n} w_i D_i$

Modified duration: $D^* = \frac{D}{(1+y)}$; $\frac{\Delta P}{P} \cong -D^* \Delta y$

Modigliani squared: $M^2 = \left[\left[1 - \frac{\sigma_M}{\sigma_P}\right] R_f + \left[\frac{\sigma_M}{\sigma_P}\right] R_P\right] - R_M$

Performance attribution:

Active asset allocation, active asset selection:

$$R_{AAAS} = \sum_{i=1}^{n} (\text{actual weight for class i})(\text{actual return for class i})$$

Passive (target) asset allocation, passive asset selection:

$$R_{PAPS} = \sum_{i=1}^{n} (\text{target weight for class i})(\text{benchmark return for class i})$$

Passive (target) asset allocation, active asset selection:

$$R_{PAAS} = \sum_{i=1}^{n} (\text{target weight for class i})(\text{actual return for class i})$$

Active asset allocation, passive asset selection:

$$R_{AAPS} = \sum_{i=1}^{n} (\text{actual weight for class i})(\text{benchmark return for class i})$$

Value added for active management:

Value added for active asset allocation = R_{AAPS}-R_{PAPS}

Value added for active asset selection = R_{PAAS}-R_{PAPS}

Total value added for active management = R_{AAAS}-R_{PAPS}

Present value: $PV = \sum_{t=0}^{n} \frac{CF_t}{(1+R)^t}$

Put-call parity: *Price of underlying equity* + *Price of put* = *Price of call* + *Present value of exercise price*

Real rate of return: $R_{real} = \left[\frac{(1+R_{nominal})}{(1+R_{inflation})}\right] - 1$

Sharpe ratio: $S_P = \frac{\bar{R}_P - \bar{R}_f}{\sigma_P}$

Sortino ratio: $SR_P = \frac{\bar{R}_P - \bar{R}_f}{\sqrt{\frac{\sum_{i=1}^{n}(min(R_i - MAR, 0))^2}{n-1}}} = \frac{\bar{R}_P - \bar{R}_f}{downside\ deviation}$

Spot – futures parity: $F_0 = S_0 (1 + R_f - y_s)^T$

Standard deviation annualized: $\sigma_{ann.} = \sigma\sqrt{t}$

Standard deviation, ex ante: $\sigma = \sqrt{\sum_{i=1}^{n} P_i (R_i - E(R))^2}$

Standard deviation of a multiple asset portfolio: $\sigma_P = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j cov_{ij}}$

Standard deviation of a population: $\sigma = \sqrt{\frac{\sum_{t=1}^{n}(R_t - \bar{R})^2}{n}}$

Standard deviation of a sample: $s = \sqrt{\frac{\sum_{t=1}^{n}(R_t - \bar{R})^2}{n-1}}$

Standard deviation, risky asset A with risk-free asset: $\sigma_P = w_A \sigma_A$

Standard deviation of two risky assets: $\sigma_P = \sqrt{w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2 w_A w_B \rho_{A,B} \sigma_A \sigma_B}$

Tracking error = $\sqrt{\frac{\sum_{t=1}^{n}(R_{Pt} - R_{Bt})^2}{n-1}}$

Treynor ratio: $T_P = \frac{\bar{R}_P - \bar{R}_f}{\beta_P}$

Value at risk: $VaR = V_p \sigma_p \sqrt{\frac{V_d}{D_y}} (-\alpha)$

Variance of a population: $\sigma^2 = \frac{\sum_{t=1}^{n}(R_t - \bar{R})^2}{n}$

Variance of a sample: $s^2 = \frac{\sum_{t=1}^{n}(R_t - \bar{R})^2}{n-1}$

[1] This formula sheet, which is provided during CIMA® certification exams, is intended only as a resource and not as a substitute for understanding the formulae and studying the topics in the Candidate Handbook's detailed content outline. The formula list, which may be updated periodically, is not inclusive of all formulae that may be needed for an exam form. Conversely, all formulae on the list are not necessary for any one exam form. These formulae may be expressed differently in some textbooks. Likewise, the format or nomenclature used by academic publishers and providers of study/review materials may vary. Candidates are encouraged to learn to read formulae and recognize them in different formats, selecting the ones they find most useful to perform the necessary calculations.