Reading 6: Overview of the Global Investment Professional Standards

1. Total return (when no external cash flows)
   Total return \( r_t = \frac{V_t - V_0 - CF}{V_0 + (CF \times w_i)} \)

2. Time weighted return = \( r_{t,w} = (1 + r_{t,1}) \times (1 + r_{t,2}) \times \ldots \times (1 + r_{t,n}) - 1 \)

3. Original Dietz Method = \( R_{Dietz} = \frac{V_t - V_0 - CF}{V_0 + (CF \times w_i)} \)

4. Modified Dietz Method = \( R_{ModDietz} = \frac{V_t - V_0 - CF}{V_0 + (CF \times w_i)} \)

5. Time weighted return using Modified Dietz = \( r_{ModDietz} = \frac{V_t - V_0 - CF}{V_0 + (CF \times w_i)} \)

where,
\( w_i = \frac{CD - D_i}{CD} \)
\( CD = \) total calendar days,
\( D_i = \) no. of calendar days from beginning of period to tie cash flow \( CF_i \) occurs.
\( V_t = \sum_{i=1}^{n} [CF_i \times (1 + r)] + v_o(1 + r) \)

6. Sum of beginning assets and weighted external cash flows = \( V_0 + \sum_{i=1}^{n}(CF \times w_i) \)

7. Composite return under the beginning of period value method = \( r_c = \sum_{i=1}^{n} \left[ \frac{V_{p,i} \times V_{0,p,i}}{\sum_{p=1}^{n} V_{0,p,i}} \right] \)

8. Return for a portfolio under the beginning of period value and weighted cash flows (\( r_c \)) is \( R_c = \)

9. \( n \sum_{i=1}^{n} \left( r_{p,i} \times \frac{V_{p,i}}{\sum_{p=i}^{n} V_{p,i}} \right) \)

10. Standard Deviation of Composite (in which constituents are equally weighted) = \( S_c = \sqrt{\frac{\sum_{i=1}^{n} (r_i - \bar{r})^2}{n - 1}} \)

11. Asset weighted Standard Deviation of individual portfolio returns within a composite = \( S_{c_{\text{w}}} = \sqrt{\sum_{i=1}^{n} \left[ (r_i - \bar{r}_{\text{proxy}})^2 \times w_i \right]} \)

where, \( \bar{r}_{\text{proxy}} = \sum_{i=1}^{n} (w_i - r_i) \)

12. Position of a percentile \( y \) in an array with \( n \) entries sorted in descending order = \( L_y = (n + 1) \frac{y}{100} \)

13. Annualized Internal Rate of Return from Value of \( r = \frac{CF_1}{(1 + r)^1} + \frac{CF_2}{(1 + r)^2} + \ldots + \frac{V_N}{(1 + r)^N} \)

Reading 7: The Behavioral Finance Perspective

1. Expected utility (\( U \)) = \( \sum \) (\( U \) values of outcomes \( \times \) Respective Prob)

2. Subjective expected \( U \) of an individual = \( \sum \left[ u (x_i) \times \text{Prob} (x_i) \right] \)

3. Bayes’ formula = \( P (A|B) = \frac{P (B|A) \times P (A)}{P (B)} \)

4. Risk premium = Diff. b/w Certainty Equivalent and Expected Value

5. Perceived value of each outcome = \( U = w (p_1) v (x_1) + w (p_2) v (x_2) + \ldots + w (p_n) v (x_n) \)

6. Abnormal return (\( R \)) = Actual \( R \) – Expected \( R \)

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1. After-tax (AT) Real required return (RR) % = \( \frac{\text{Client’s required expenditures in Year } n}{\text{Projected needs in Year } n} \times \frac{\text{Net Investable Assets}}{\text{Net Investable Assets}} + \text{Current Annual (Ann) Inflation (Inf)} % = \text{AT real RR%} + \text{Current Ann Inf%} \) 
   \text{ATNominal RR%} = (1 + \text{AT real RR%}) \times (1 + \text{Current Ann Inf%}) – 1
2. Total Investable assets = Current Portfolio -Current year cash outflows + Current year cash inflows
3. Pre-tax income needed = AT income needed / (1-tax rate)
4. Pre-tax Nominal RR = (Pre-tax income needed / Total investable assets) + Inf%

Reading 8: The Behavioral Biases of Individuals

Reading 9: Behavioral Finance & Investment Processes

1. Expected rate of return on equity
   \( E (R_e) \approx \frac{D}{P} + \left( \% S - \% E \right) + \Delta P/E \)
   Where,
   \( o E (R_e) = \text{Expected rate of return on equity} \)
2. Under Basic CAPM model:
   - $RP_i = \beta_{i,M} R_P$ risk premium on i\textsuperscript{th} asset
   - $RP_M = [ER_M - R_F]$ risk premium on market portfolio

\[
\beta_{i,M} = \text{i}th\text{ asset sensitivity to market portfolio} = \frac{\text{Cov}(R_i, R_M)}{\sigma_M^2} = \rho_{LM} \sigma_i \left( \frac{\sigma_1}{\sigma_M} \right)
\]

Where,
\[
RP_i = [ER_i - R_F]\text{ risk premium on i\textsuperscript{th} asset}
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\]

\[\sigma \text{ is standard deviation and } \rho \text{ is correlation} \]

3. $RP_i^C = \beta_{i,GM} R_{PGM} = \rho_{i,GM} \sigma_i \left( \frac{RP_{GM}}{\sigma_M} \right)$

Model’s 1\textsuperscript{st} component (full integration assumption):

4. $RP_i^S = 1 \times RP_{GM} = 1 \times \sigma_i \left( \frac{RP_{GM}}{\sigma_M} \right)$

Model’s 2\textsuperscript{nd} component (completely segmented market assumption):

5. $RP_i = \varphi RP_i^C + (1 - \varphi)RP_i^S$

6. Cap rate = Current year’s NOI Property value, where NOI = net operating income

7. $E(R_{re}) = \text{Expected return on real estate}$
   - long run (assuming constant growth rate for NOI)
     - $E(R_{re}) = \text{Cap rate + NOI growth rate}$
     - for a finite horizon (to reflect expected rate of change in the cap rate)
       - $E(R_{re}) = \text{Cap rate + NOI growth rate - } \% \Delta\text{ Cap rate}$

8. Implication of capital mobility:
   - $E(\Delta S_{d,t}) = (r^d - r^f) + \text{Term}^d - \text{Term}^f + \text{Credit} - \text{Credit}^t + \text{Equity}^d - \text{Equity}^t + \text{Liquid}^d - \text{Liquid}^t$

9. $\eta_i = \alpha_i + \sum_{k=1}^{K} \beta_{i,k} F_k + \varepsilon_i$
   - $\alpha_i = \text{constant intercept}$
   - $\beta_{i,k} = \text{asset’s sensitivity to k\textsuperscript{th} factor}$
   - $F_k = \text{k\textsuperscript{th} common factor return}$
   - $\varepsilon_i = \text{error term}$

10. $\text{Variance on i\textsuperscript{th} asset} = \sigma_{i,j}^2 = \sum_{m=1}^{K} \sum_{n=1}^{K} \beta_{i,m} \beta_{j,n} \rho_{mn} + \nu_i^2$
    where,
    - $\rho_{mn} = \text{covariance between the m\textsuperscript{th} and n\textsuperscript{th} factor}$
    - $\nu_i^2 = \text{variance of i\textsuperscript{th} asset return}$

11. Covariance between i\textsuperscript{th} and j\textsuperscript{th} asset = $\sigma_{ij} = \sum_{m=1}^{K} \sum_{n=1}^{K} \beta_{im} \beta_{jn} \rho_{mn}$

12. Current return = $R_t = (1 - \lambda) r_t + \lambda R_{t-1}$
    where $\lambda$ may range from 0 to 1

13. $var \left( R \right) = \frac{\left( \frac{1 + \lambda}{1 - \lambda} \right)}{var(R)}$

14. ARCH Methodology
   - $\sigma_i^2 = \gamma + \alpha \sigma_{i-1}^2 + \beta \eta_i^2$
   - Rearranging the above equation:
     - $\sigma_i^2 = \gamma + (\alpha + \beta) \sigma_{i-1}^2 + \beta (\eta_i^2 - \sigma_{i-1}^2)$

Reading 12: Overview of Asset Allocation

1. Risky Asset Allocation = $w^* = \frac{1}{\lambda} \left[ \frac{\mu - rf}{\sigma^2} \right]$

Reading 13: Principles of Asset Allocation

1. $U_m = E(R_m) - 0.005 \lambda \sigma_m^2$

2. $w_i \times \text{Cov}(\tilde{r}_i, r_p) = \frac{1}{n} \sigma_p^2$

3. Marginal contribution to risk (MCTR\textsubscript{i}) = (Beta of Asset Class i relative to Portfolio) x (Portfolio Std. Dev.)