LEVEL I SCHWESER'S QuickSheet

CRITICAL CONCEPTS FOR THE 2017 CFA® EXAM

ETHICAL AND PROFESSIONAL STANDARDS

I Professionalism
I(A) Knowledge of the Law.
I(B) Independence and Objectivity.
I(C) Misrepresentation.
I(D) Misconduct.
II Integrity of Capital Markets
II(A) Material Nonpublic Information.
II(B) Market Manipulation.
III Duties to Clients
III(A) Loyalty, Prudence, and Care.
III(B) Fair Dealing.
III(C) Suitability.
III(D) Performance Presentation.
III(E) Preservation of Confidentiality.
IV Duties to Employers
IV(A) Loyalty.
IV(B) Additional Compensation Arrangements.
IV(C) Responsibilities of Supervisors.
V Investment Analysis, Recommendations, and Action
V(A) Diligence and Reasonable Basis.
V(B) Communication with Clients and Prospective Clients.
V(C) Record Retention.
VI Conflicts of Interest
VI(A) Disclosure of Conflicts.
VI(B) Priority of Transactions.
VI(C) Referral Fees.
VII Responsibilities as a CFA Institute Member or CFA Candidate
VII(A) Conduct as Participants in CFA Institute Programs.
VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program.

Global Investment Performance Standards (GIPS®)

- *Compliance statement:* "[Insert name of firm] has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS)." Compliance must be applied on a firm-wide basis.
- *Nine sections:* fundamentals of compliance, input data, calculation methodology, composite construction, disclosures, presentation and reporting, real estate, private equity, and wrap fee/separately managed account portfolios.

QUANTITATIVE METHODS

Time Value of Money Basics

- *Future value* (FV): amount to which investment grows after one or more compounding periods.
- *Future value:* $FV = PV(1 + I/Y)^N$.
- *Present value* (PV): current value of some future cash flow $PV = FV/(1 + I/Y)^N$.
- *Annuities:* series of equal cash flows that occur at evenly spaced intervals over time.
- *Ordinary annuity:* cash flow at *end*-of-time period.
- *Annuity due:* cash flow at *beginning*-of-time period.
- *Perpetuities:* annuities with infinite lives.
  $PV_{perpetuity} = PMT/(\text{discount rate})$.

Required Rate of Return

Components:
1. Real risk-free rate (RFR).
2. Expected inflation rate premium (IP).
3. Risk premium.

$$E(R) = (1+RFR_{real})(1+IP)(1+RP)-1$$

Approximation formula for nominal required rate:

$$E(R) \cong RFR + IP + RP$$

Means

Arithmetic mean: sum of all observation values in sample/population, divided by # of observations.
Geometric mean: used when calculating investment returns over multiple periods or to measure compound growth rates.
Geometric mean return:

$$\bar{R}_G = \left[(1+R_1)\times\ldots\times(1+R_N)\right]^{1/N} - 1$$

$$\textit{harmonic mean} = \frac{N}{\sum_{i=1}^{N}\left(\frac{1}{X_i}\right)}$$

Variance and Standard Deviation

Variance: average of squared deviations from mean.

$$\text{population variance} = \sigma^2 = \frac{\sum_{i=1}^{N}(x_i-\mu)^2}{N}$$

$$\text{sample variance} = s^2 = \frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}$$

Standard deviation: square root of variance.

Holding Period Return (HPR)

$$R_t = \frac{P_t - P_{t-1} + D_t}{P_{t-1}} \text{ or } \frac{P_t + D_t}{P_{t-1}} - 1$$

Coefficient of Variation

Coefficient of variation (CV): expresses how much dispersion exists relative to mean of a distribution; allows for direct comparison of dispersion across different data sets. CV is calculated by dividing standard deviation of a distribution by the mean or expected value of the distribution:

$$CV = \frac{s}{\bar{X}}$$

Sharpe Ratio

Sharpe ratio: measures *excess* return per unit of risk.

$$\text{Sharpe ratio} = \frac{\bar{r}_p - r_f}{\sigma_p}$$

$$\textit{Roy's safety-first ratio}: \frac{\bar{r}_p - r_{target}}{\sigma_p}$$

For both ratios, larger is better.

Expected Return/Standard Deviation

Expected return: $E(X) = \sum P(x_i)\,x_n$

$$E(X) = P(x_1)x_1 + P(x_2)x_2 + \ldots + P(x_n)x_n$$

Probabilistic variance:

$$\sigma^2(X) = \sum P(x_i)\left[x_i - E(X)\right]^2$$
$$= P(x_1)\left[x_1 - E(X)\right]^2 + P(x_2)\left[x_2 - E(X)\right]^2 + \ldots + P(x_n)\left[x_n - E(X)\right]^2$$

Standard deviation: take square root of variance.

Correlation and Covariance

Correlation: covariance divided by product of the two standard deviations.

$$\text{corr}(R_i, R_j) = \frac{COV(R_i, R_j)}{\sigma(R_i)\sigma(R_j)}$$

Expected return, variance of 2-stock portfolio:

$$E(R_p) = w_A E(R_A) + w_B E(R_B)$$

$$\text{var}(R_p) = w_A^2\sigma^2(R_A) + w_B^2\sigma^2(R_B) + 2w_A w_B \sigma(R_A)\sigma(R_B)\rho(R_A, R_B)$$

Normal Distributions

Normal distribution is completely described by its mean and variance.
68% of observations fall within ± 1σ.
90% fall within ± 1.65σ.
95% fall within ± 1.96σ.
99% fall within ± 2.58σ.

Computing Z-Scores

Z-score: "standardizes" observation from normal distribution; represents # of standard deviations a given observation is from population mean.

$$z = \frac{\text{observation} - \text{population mean}}{\text{standard deviation}} = \frac{x-\mu}{\sigma}$$

Binomial Models

Binomial distribution: assumes a variable can take one of two values (success/failure) or, in the case of a stock, movements (up/down). A binomial model can describe changes in the value of an asset or portfolio; it can be used to compute its expected value over several periods.

Sampling Distribution

Sampling distribution: probability distribution of all possible sample statistics computed from a set of equal-size samples randomly drawn from the same population. The *sampling distribution of the mean* is the distribution of estimates of the mean.

Central Limit Theorem

Central limit theorem: when selecting simple random samples of size *n* from *population* with mean μ and finite variance σ^2, the sampling distribution of sample mean approaches normal probability distribution with mean μ and variance equal to σ^2/n as the sample size becomes large.

Standard Error

Standard error of the sample mean is the standard deviation of distribution of the sample means.

$$\text{known population variance: } \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$\text{unknown population variance: } s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

Confidence Intervals

Confidence interval: gives range of values the mean value will be between, with a given probability (say 90% or 95%). With known variance, formula for a confidence interval is:

$$\bar{x} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

$z_{\alpha/2}$ = 1.645 for 90% confidence intervals (significance level 10%, 5% in each tail)
$z_{\alpha/2}$ = 1.960 for 95% confidence intervals (significance level 5%, 2.5% in each tail)
$z_{\alpha/2}$ = 2.575 for 99% confidence intervals (significance level 1%, 0.5% in each tail)