

# LEVEL I SCHWESER'S QuickSheet

## CRITICAL CONCEPTS FOR THE 2021 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 Actions**  
 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.  
 $PV_{\text{perpetuity}} = PMT/(\text{discount rate})$ .

#### Required Rate of Return

Components:

1. Real risk-free rate (RFR).
  2. Expected inflation rate premium (IP).
  3. Risk premium.
- $$E(R) = (1 + RFR_{\text{real}})(1 + IP)(1 + RP) - 1$$

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:**

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

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

#### 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:

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

#### Roy's Safety-First Ratio

$$\frac{\bar{r}_p - r_{\text{target}}}{\sigma_p}$$

#### Expected Return/Standard Deviation

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

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

**Probabilistic variance:**

$$\begin{aligned} \sigma^2(X) &= \sum P(x_i)[x_i - E(X)]^2 \\ &= P(x_1)[x_1 - E(X)]^2 + P(x_2)[x_2 - E(X)]^2 \\ &\quad + \dots + P(x_n)[x_n - E(X)]^2 \end{aligned}$$

**Standard deviation:** take square root of variance.

#### Correlation and Covariance

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

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

**Expected return, variance of 2-stock portfolio:**

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

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

#### Normal Distributions

**Normal distribution** is completely described by its mean and variance.

68% of observations fall within  $\pm 1\sigma$ .

90% fall within  $\pm 1.65\sigma$ .

95% fall within  $\pm 1.96\sigma$ .

99% fall within  $\pm 2.58\sigma$ .

#### 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  $\mu$  and finite variance  $\sigma^2$ , the sampling distribution of sample mean approaches normal probability distribution with mean  $\mu$  and variance equal to  $\sigma^2/n$  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)

#### Null and Alternative Hypotheses

**Null hypothesis ( $H_0$ ):** hypothesis that contains the equal sign ( $=, \leq, \geq$ ); the hypothesis that is actually tested; the basis for selection of the test statistics.

**Alternative hypothesis ( $H_A$ ):** concluded if there is sufficient evidence to reject the null hypothesis.

#### Difference Between One- and Two-Tailed Tests

**One-tailed test:** tests whether value is greater than or less than a given number.