# LEVEL 1 SCHWESER'S QuickSheet™

## CRITICAL CONCEPTS FOR THE 2011 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 Members and Candidates in the CFA Program.
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:*

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

*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 $\sigma^2$, the sampling distribution of sample mean approaches normal probability distribution with mean μ 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)

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