

LOS 51.a Explain the capital market theory, including its underlying assumptions, and explain the effect on expected returns, the standard deviation of returns, and possible risk/return combinations when a risk-free asset is combined with a portfolio of risky assets.

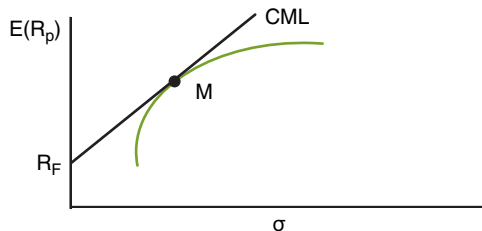
Key Terms: Standard deviation; Efficient frontier; Capital market line (CML); Market portfolio (M)

- Assumptions of capital market theory: (1) All investors want the most suitable portfolio on the **efficient frontier**; (2) Investors can borrow or lend unlimited amounts at the *risk-free rate*; (3) All investors have the *same expectations*; (4) All investors have the same *one-period time horizon*; (5) all investments are *infinitely divisible*; (5) no *taxes or transactions costs* exist; (6) there is *no inflation* or inflation is perfectly forecasted; and (7) capital markets are in equilibrium.
- Adding a risk-free asset to the efficient frontier results in a new risk/return trade-off: a straight-line tangent to the efficient frontier at the **market portfolio (point M)** and a vertical intercept at the risk-free rate of return (R_F). This line is called the **capital market line (CML)**.

LOS 51.b Identify the market portfolio and describe the role of the market portfolio in the formation of the capital market line (CML).

6 PORTFOLIO MANAGEMENT

- The market portfolio, M , consists of all risky assets. It is at the point of tangency of the capital market line (CML) and the old efficient frontier. The combination of the market portfolio of risky assets M and riskless assets offers investors a range of risk/return possibilities. Each investor would choose a point on the SML that corresponds to his or her risk preferences.



LOS 51.b**Equation 51.1**

$$E(R_p) = W_{RF} (R_{RF}) + (1 - W_{RF}) E(R_M)$$

where W_{RF} is the weight of risk-free assets in the portfolio;
 R_{RF} is the expected return on risk-free assets;
 R_M is the expected return on the market portfolio.

Use the above equation to find the expected return on a *2-asset class portfolio* consisting of risk-free and risky assets.

For example: An investor invests 40% of his assets in a risk-free portfolio at 3.8% and 60% of his assets in a risky portfolio with an expected return of 14.0%. What is the expected return on the portfolio?

$$E(R_p) = (0.40)(3.8\%) + (1 - 0.40)(14.0\%) = 9.92\%$$

LOS 51.b**Equation 51.2**

$$E(\sigma_{\text{port}}) = (1 - W_{\text{RF}}) \sigma_{\text{M}}$$

where W_{RF} is the weight of risk-free assets in the portfolio;
 σ_{M} = standard deviation of the market portfolio.

Use the above equation to determine the expected standard deviation of a portfolio that lies on the capital market line.

For example: An investor places 30% of her portfolio in risk-free assets and 70% in the market portfolio. If the standard deviation of the market portfolio's returns is 9.5%, what is the standard deviation of the portfolio?

$$E(\sigma_p) = (1 - 0.30) 9.5\% = 6.65\%$$

LOS 51.c Define systematic and unsystematic risk, and explain why an investor should not expect to receive additional return for assuming unsystematic risk.

Key Terms: Systematic risk; Unsystematic risk; Covariance

- **Systematic risk** is the variability of a security's total returns that is associated with overall movements in the general market or economy.
- **Unsystematic risk** is the variability in a security's returns that is firm-specific in origin (not related to moves in the overall market).
- Because investors can eliminate unsystematic risk through diversification, the relevant risk measure for assets is systematic risk (there is no reward for assuming unsystematic risk).
- **Covariance** is a relative (unscaled) measure of association between two variables (in this context between the return on two securities).

LOS 51.d Explain the capital asset pricing model (CAPM), including the security market line (SML) and beta, and describe the effects of relaxing its underlying assumptions.

Key Terms: Capital asset pricing model; Security market line; Beta; Zero-beta portfolio

- The **capital asset pricing model (CAPM)** is used to indicate the required rate of return on risky assets.
- The **security market line (SML)** graphically represents the relationship between systematic risk (**beta**) and required rate of return on an asset.
- The CAPM makes a series of assumptions that are generally violated. The general effect of violations is to render the SML a “band” rather than as a singular line (securities plot very close to the SML, but not exactly on it). For example, CAPM assumes that investors can borrow and lend any amount at the risk-free rate. This *violated assumption* is addressed by re-specifying the CAPM using the **zero-beta** approach. Other commonly violated assumptions are that there are no transactions costs, all investors have the same expectations, and all investors have a single-period investment horizon.

LOS 51.d**Equation 51.3**

$$E(R_i) = R_F + \beta[E(R_M) - R_F]$$

where $E(R_i)$ is the required rate of return on security;

R_F is the risk-free rate;

$E(R_M)$ is the expected return on the market;

β_i is a measure of systematic risk.

Use the above equation to estimate the required return on a stock to be added to an efficiently diversified portfolio.

For example: The risk-free rate is 4.5% and the expected return on the market is 14.0%. What return do you require on a stock with a beta of 1.2?

$$E(R_i) = 4.5\% + 1.2 (14.0\% - 4.5\%) = 15.9\%$$

LOS 51.e Calculate, using the SML, the expected return on a security, and evaluate whether the security is overvalued, undervalued, or properly valued.

A security that does not lie on the SML is presumably mispriced.

- (1) Calculate the required rate of return using the CAPM;
- (2) Determine the market-implied expected rate of return using an alternative methodology such as the dividend discount model;
- (3) Compare the two returns. If the market-implied expected return $>$ the CAPM required return, the security is undervalued. If the CAPM required return $>$ the market-implied expected return, the security is overvalued.