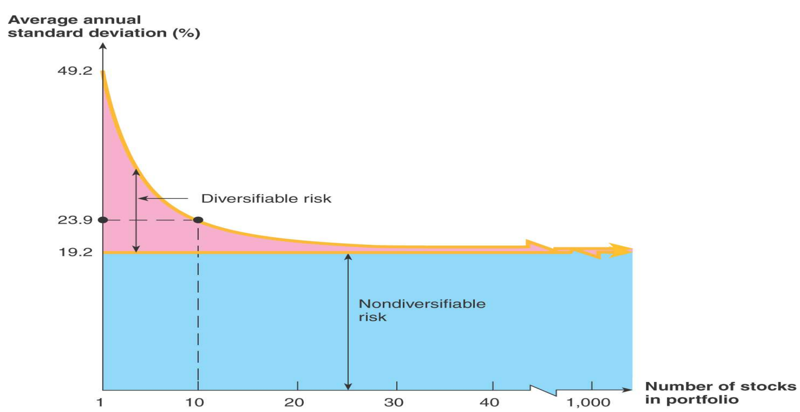
The Principle of Diversification

- Diversification can substantially reduce the variability of returns without an equivalent reduction in expected returns
- This reduction in risk arises because worse-than-expected returns from one asset are offset by better-than-expected returns from another asset
- However, there is a minimum level of risk that cannot be diversified away - that is the systematic portion

Figure 11.1



Diversifiable Risk

- The risk that can be eliminated by combining assets into a portfolio
- Often considered the same as unsystematic, unique, or asset-specific risk
- If we hold only one asset, or assets in the same industry, then we are exposing ourselves to risk that we could diversify away

Total Risk

- Total risk = systematic risk + unsystematic risk
- The standard deviation of returns is a measure of total risk
- For well-diversified portfolios, unsystematic risk is very small
- Consequently, the total risk for a diversified portfolio is essentially equivalent to the systematic risk

Systematic Risk Principle

- There is a reward for bearing risk
- There is not a reward for bearing risk unnecessarily
- The expected return on a risky asset depends only on that asset's systematic risk since unsystematic risk can be diversified away

Measuring Systematic Risk

- How do we measure systematic risk?
- We use the beta coefficient to measure systematic risk
- What does beta tell us?
  - A beta of 1 implies the asset has the same systematic risk as the overall market
  - A beta < 1 implies the asset has less systematic risk than the overall market
  - A beta > 1 implies the asset has more systematic risk than the overall market

Table 11.8

Company	Beta Coefficient (β_j)
Coca-Cola	.60
Kellogg	.65
Papa John's	.80
3M	.85
Home Depot	1.00
Bed, Bath, and Beyond	1.05
McDonald's	1.10
American Eagle Outfitters	1.35
Tiffany & Co.	1.55
Continental Airlines	2.40

Source: From Value Line *Investment Survey,* various issues, 2007.

TABLE 11.8

Beta coefficients for selected companies

Total versus Systematic Risk

- Consider the following information:

	Standard Deviation	Beta
– Security C	20%	1.25
– Security K	30%	0.95

- Which security has more total risk?
- Which security has more systematic risk?
- Which security should have the higher expected return?

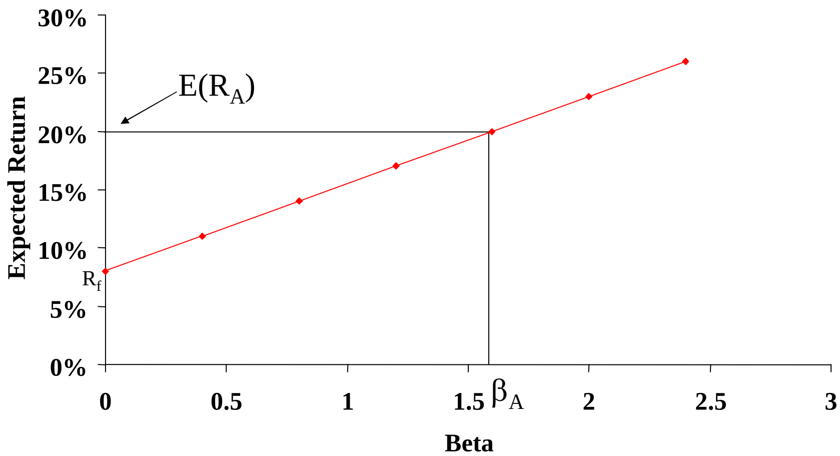
Example: Portfolio Betas

- Consider the previous example with the following four securities
  - Security Weight Beta
  - DCLK .133 4.03
  - KO .2 0.84
  - INTC .267 1.05
  - KEI .4 0.59
- What is the portfolio beta?
- .133(4.03) + .2(.84) + .267(1.05) + .4(.59) = 1.22

Beta and the Risk Premium

- Remember that the risk premium = expected return – risk-free rate
- The higher the beta, the greater the risk premium should be
- Can we define the relationship between the risk premium and beta so that we can estimate the expected return?
  - YES!

Example: Portfolio Expected Returns and Betas



Market Equilibrium

- In equilibrium, all assets and portfolios must have the same reward-to-risk ratio, and each must equal the reward-to-risk ratio for the market

$$\frac{E(R_A) - R_f}{\beta_A} = \frac{E(R_M - R_f)}{\beta_M}$$

Security Market Line

- The security market line (SML) is the representation of market equilibrium
- The slope of the SML is the reward-to-risk ratio: $(E(R_M) – R_f) / \beta_M$
- But since the beta for the market is ALWAYS equal to one, the slope can be rewritten
- Slope = $E(R_M) – R_f$ = market risk premium

Capital Asset Pricing Model

- The capital asset pricing model (CAPM) defines the relationship between risk and return
- $E(R_A) = R_f + \beta_A(E(R_M) – R_f)$
- If we know an asset’s systematic risk, we can use the CAPM to determine its expected return
- This is true whether we are talking about financial assets or physical assets

Factors Affecting Expected Return

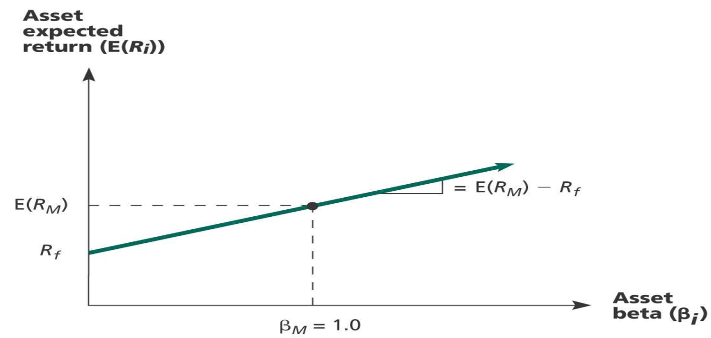
- Pure time value of money – measured by the risk-free rate
- Reward for bearing systematic risk – measured by the market risk premium
- Amount of systematic risk – measured by beta

Example: CAPM

- Consider the betas for each of the assets given earlier. If the risk-free rate is 3.15% and the market risk premium is 9.5%, what is the expected return for each?

Security	Beta	Expected Return
DCLK	4.03	3.15 + 4.03(9.5) = 41.435%
KO	0.84	3.15 + .84(9.5) = 11.13%
INTC	1.05	3.15 + 1.05(9.5) = 13.125%
KEI	0.59	3.15 + .59(9.5) = 8.755%

SML and Equilibrium



The slope of the security market line is equal to the market risk premium; i.e., the reward for bearing an average amount of systematic risk. The equation describing the SML can be written:

$$E(R_i) = R_f + \beta_i \times [E(R_M) - R_f]$$

which is the capital asset pricing model (CAPM).