

# CAPM and Market Risk

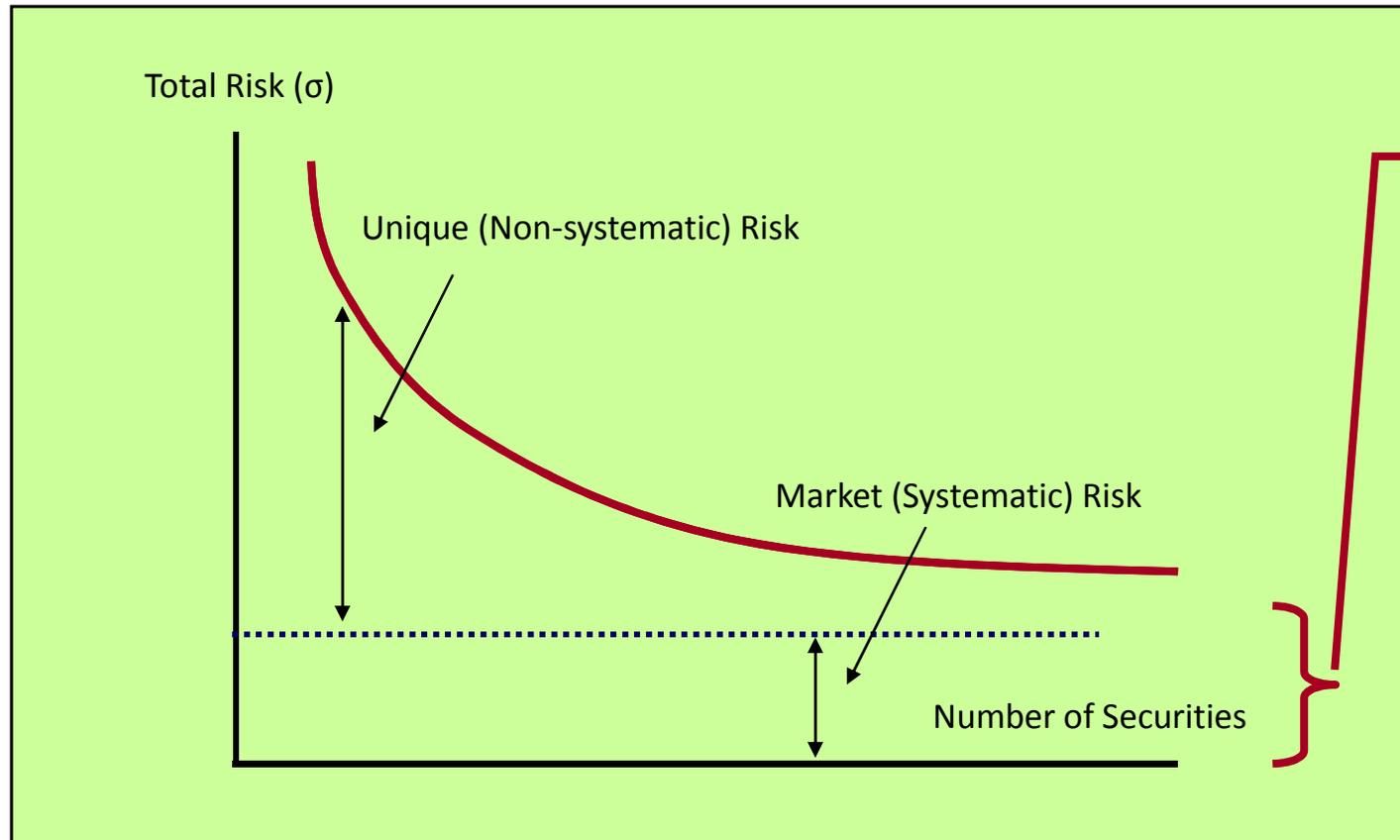
## The Capital Asset Pricing Model

# Diversifiable and Non-Diversifiable Risk

- CML applies to efficient portfolios
- Volatility (risk) of *individual security returns* are caused by two different factors:
  - Non-diversifiable risk (system wide changes in the economy and markets that affect all securities in varying degrees)
  - Diversifiable risk (company-specific factors that affect the returns of only one security)
- Figure in next slide illustrates what happens to portfolio risk as the portfolio is first invested in only one investment, and then slowly invested, naively, in more and more securities.

# The CAPM and Market Risk

## Portfolio Risk and Diversification



Market or systematic risk is risk that cannot be eliminated from the portfolio by investing the portfolio into more and different securities.

# Relevant Risk

## Drawing a Conclusion from Figure

- Figure demonstrates that an individual securities' volatility of return comes from two factors:
  - Systematic factors
  - Company-specific factors
- When combined into portfolios, company-specific risk is diversified away.
- Since all investors are 'diversified' then in an efficient market, no-one would be willing to pay a 'premium' for company-specific risk.
- Relevant risk to diversified investors then is systematic risk.
- Systematic risk is measured using the Beta Coefficient.

# Measuring Systematic Risk The Beta Coefficient

The Capital Asset Pricing Model  
(CAPM)

# The Beta Coefficient

## What is the Beta Coefficient?

- A measure of systematic (non-diversifiable) risk
- As a 'coefficient' the beta is a pure number and has no units of measure.

# The Beta Coefficient

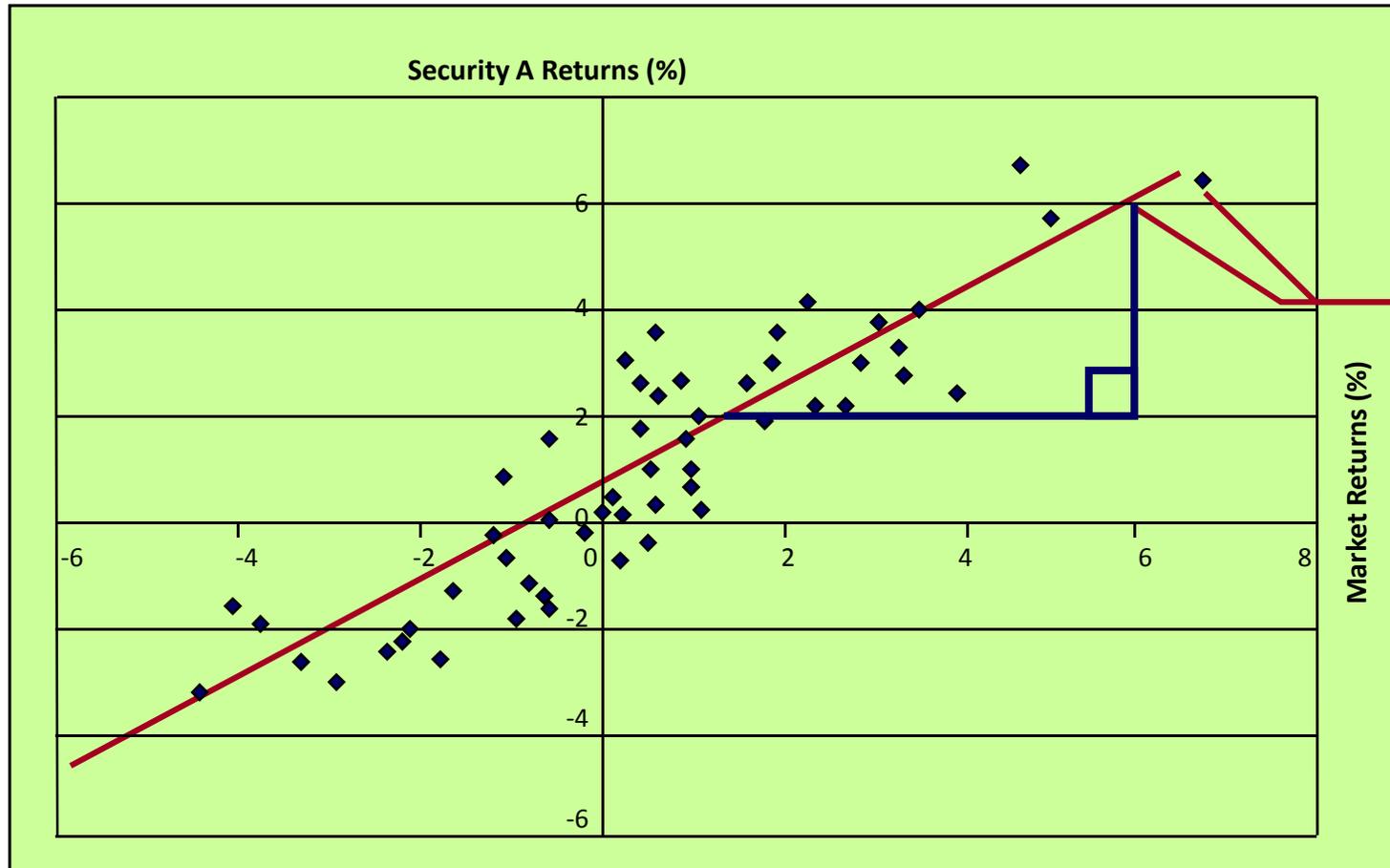
How Can We Estimate the Value of the Beta Coefficient?

- There are two basic approaches to estimating the beta coefficient:
  1. Using a formula (and subjective forecasts)
  2. Use of regression (using past holding period returns)

*(Figure on the following slide illustrates the characteristic line used to estimate the beta coefficient)*

# The CAPM and Market Risk

## The Characteristic Line for Security A



The plotted points are the coincident rates of return earned on the investment and the market portfolio over past periods.

# The Formula for the Beta Coefficient

Beta is equal to the covariance of the returns of the stock with the returns of the market, divided by the variance of the returns of the market:

$$S_i = \frac{COV_{i,M}}{\frac{2}{M}} = \frac{\dots_{i,M} \uparrow_i}{\uparrow_M}$$

# The Beta Coefficient

## How is the Beta Coefficient Interpreted?

- The beta of the market portfolio is ALWAYS = 1.0
- The beta of a security compares the volatility of its returns to the volatility of the market returns:
  - $\beta_s = 1.0$  - the security has the same volatility as the market as a whole
  - $\beta_s > 1.0$  - aggressive investment with volatility of returns greater than the market
  - $\beta_s < 1.0$  - defensive investment with volatility of returns less than the market
  - $\beta_s < 0.0$  - an investment with returns that are negatively correlated with the returns of the market

# The Beta of a Portfolio

The beta of a portfolio is simply the weighted average of the betas of the individual asset betas that make up the portfolio.

$$S_P = w_A S_A + w_B S_B + \dots + w_n S_n$$

Weights of individual assets are found by dividing the value of the investment by the value of the total portfolio.