Chapter 11 – Return and Risk

Unequal Probabilities

Economy	Probability	Return	$P \times R$	$R - E(R)$	$[R - E(R)]^2$	$P[R - E(R)]^2$
Boom	0.3	0.34				
Normal	0.5	0.14				
Recession	0.2	–0.05				

$\sigma^2 = \Sigma\ P[R - E(R)]^2$

Portfolios

Stock	Shares	Price	E(R)	σ	*Value*	*w*
A	100	$70	11%	47%		
B	150	$32	9%	39%		
C	220	$41	13%	61%		

Portfolio value

Portfolio weights

$E(R_P) = \sum w_i E(R_i)$

Can you find the portfolio standard deviation using a weighted average of the asset's standard deviations?

Portfolio Risk

Economy	Probability	X	Y
Bad	0.5	–20%	30%
Good	0.5	70%	10%
E(R)		25%	20%
σ		45%	10%
weight		2/11	9/11

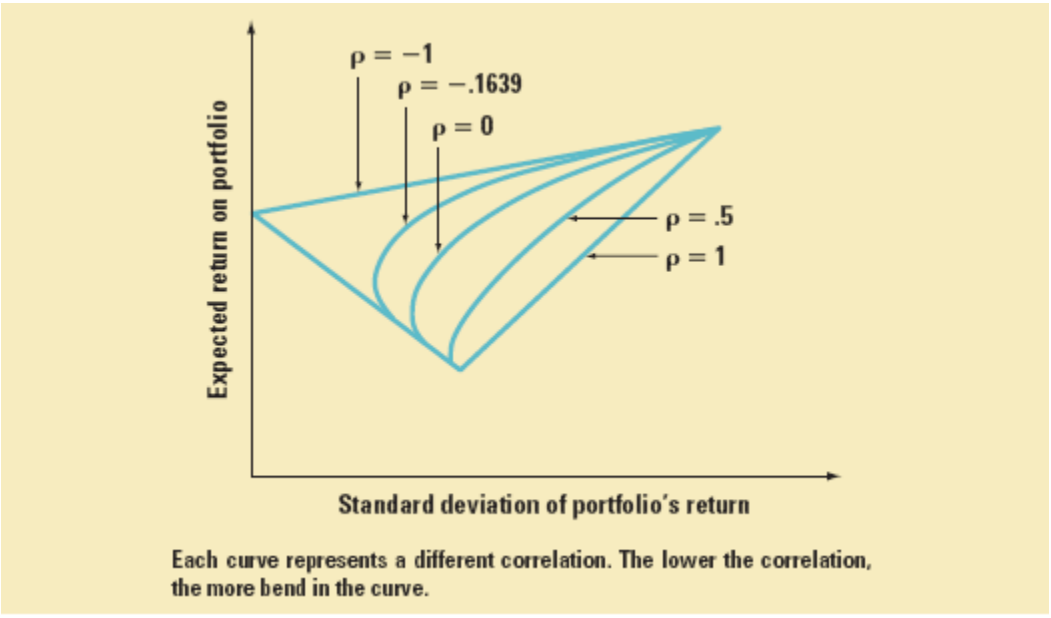
What is the portfolio standard deviation?

Covariance and Correlation

Portfolio variance for 2 asset portfolio (total risk) = $w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B Cov(A,B)$

Portfolio variance for 2 asset portfolio (total risk) = $w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B \sigma_A \sigma_B \rho_{A,B}$

What does this mean in a portfolio?



Each curve represents a different correlation. The lower the correlation, the more bend in the curve.

Why does diversification work?

Actual return = Expected return + Unexpected return

Types of risk

Systematic		Unsystematic
Market	VS.	Firm specific
Nondiversifiable		Diversifiable

Systematic Risk Principle

Capital Asset Pricing Model (CAPM)

$E(R) = R_f + \beta[E(R_M) - R_f]$

Expected return depends on three things:
1. *The pure time value of money.* As measured by the risk-free rate. This is the reward for waiting for your money, without taking any risk.
2. *The reward for bearing systematic risk.* As measured by the market risk premium, $[E(R_M) - R_f]$, this component is the reward the market offers for bearing an average amount of systematic risk in addition to waiting.
3. *The amount of systematic risk.* As measured by β, this is the amount of systematic risk present in a particular asset, relative to an average asset.

Beta of a portfolio

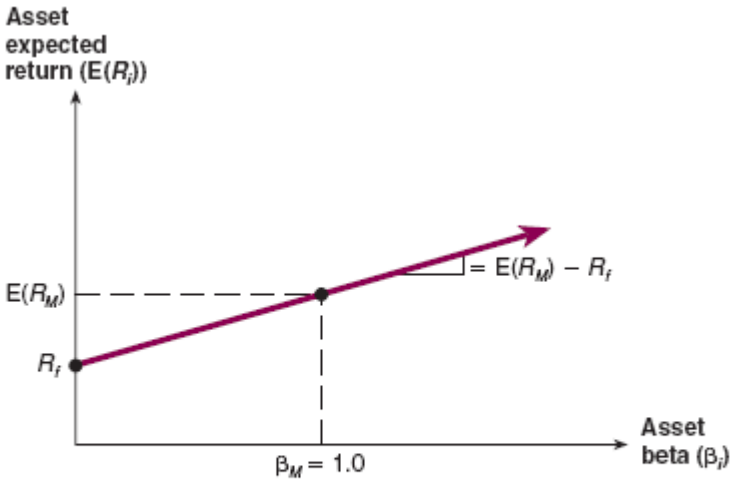
$\beta_P = \sum w_i \beta_i$

Stock	β	w
A	1.3	.25
B	.95	.45
C	1.27	

Reward-to-Risk Ratio

$$\frac{E(R) - R_f}{\beta}$$

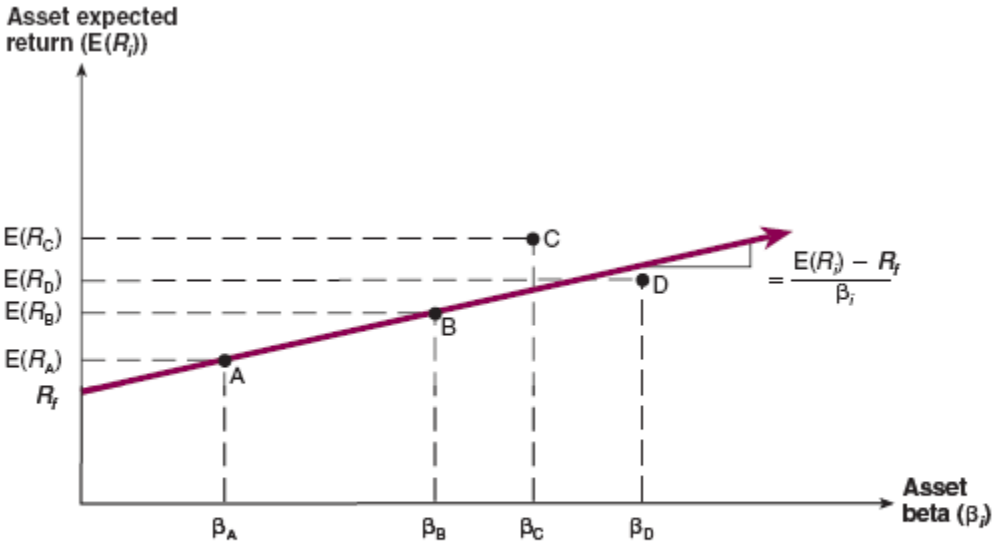
Security Market Line (SML)



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:

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

which is the capital asset pricing model, or CAPM.



The fundamental relationship between beta and expected return is that all assets must have the same reward-to-risk ratio, $[E(R_i) - R_f]/\beta_i$. This means that they would all plot on the same straight line. Assets A and B are examples of this behavior. Asset C's expected return is too high; Asset D's is too low.

What is the slope of the SML? Why?