Calculating Portfolio Risk

$\sigma^2 = W_a^2\sigma_a^2 + W_b^2\sigma_b^2 + 2(W_aW_b\ Cor\ \sigma_a\sigma_b)$

σ_x = standard deviation	σ^2 = variance of portfolio
W_x = weight of stock in portfolio	Covariance of stocks = correlation $*\sigma_a*\sigma_b$
σ = risk of an individual stock	
ß = Market risk	

If you need to find out the standard deviation, take the square root of the answer. Variance, leave it squared.

Book Rate of Return

Book Rate of Return=	Book income/book assets

Payback & Discounted Payback Period

Payback = # of years to payback investment (no NPV adjustment)

Discounted = # of years to payback investment NPV adjustment)

$NPV= C_0 + (C_1/(1+r_1)) + (C_2/(1+r_2)).............(C_t/(1+r_t))$

Non-constant growth valuation stock

G1= 20% for 2 years; G2=5% for rest of time
D0=1.25
$D1=1.25(1.20) = 1.50$
$D2=1.25(1.20)^2=1.80$
$D3=1.25(1.20)^2(1.05) =1.89$
$D4=1.25(1.20)^2(1.05)^2=1.98$

Internal rate of return | IRR

NPV must =0 to calculate

$NPV=C_0+C_1/(1+IRR)^1+C_2/(1+IRR)^2=0$

Must use Excel to calculate

Pitfall 1 = Lending or borrowing?

Pitfall 2 = Multiple rates of return (when cash goes from + to -)

Internal rate of return | IRR (cont)

Pitfall 3 = Mutually exclusive projects- IRR sometimes ignores magnitude of a project

Pitfall 4 – What Happens When There is More than One Opportunity Cost of Capital

Term Structure Assumption
We assume that discount rates are stable during the term of the project.
This assumption implies that all funds are reinvested at the IRR.
This is a false assumption.

Efficient Frontier
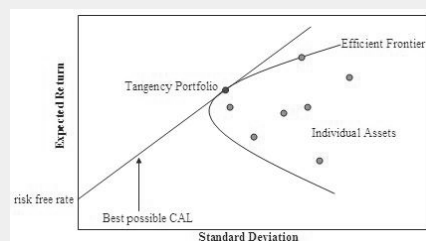
Covariance of multiple stocks

With 100 securities, the box is 100 by 100.The variance terms are the diagonal terms, and thus there are 100 variance terms. The rest are the covariance terms. Because the box has(100 × 100) terms altogether, the number of covariance terms is:Number of covariance terms = 1002– 100 = 9,900Half of these terms (i.e., 4,950) are different.
bWith 50 stocks, all with the same standard deviation (.30), the same weight in the portfolio (.02), and all pairs having the same correlation coefficient (.40), the portfolio variance is :σ2= 50(.02)2(.30)2+ [(50)2– 50](.02)2(.40)(.30)2= .03708σ = .193, or 19.3%
c.For a fully diversified portfolio, portfolio variance equals the average covariance:σ2= (.30)(.30)(.40) = .036σ = .190, or 19.0%

Present Value of a Growing Perpetuity

$PV = CF_1 / r - g$ $r > g$

Bond Valuation

$PV=C_1/(1+r)^1+C_2/(1+r)^2...+(Par+C_n)/(1+r)^n$

Duration = [1xPV (c1)]/PV+[2xPV (c2)]/PV...+(TxPV(CT)]/PV

Modified Duration = volatitliy (%)=duration/(1+yield)

DPS Calculation

D0=1.50
$D1=1.50(1.07)$
$D2=1.50(1.07)^2$
$D3=1.50(1.07)^3$
$D4=1.50(1.07)^3(1.05)$
$D5=1.50(1.07)^3(1.05)^2$

Sharpe Ratio = $(r-rf)/(\sigma)$
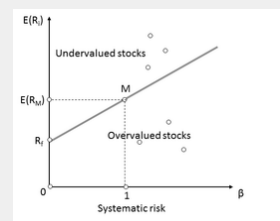
Risk premium	r-rf
Standard Deviation	σ

Ratio of risk premium to standard deviation. Measures risk-adjusted performance of investment managers

SML

The Y-intercept of the SML is equal to the risk-free interest rate. The slope of the SML is equal to the market risk premium and reflects the risk return trade off at a given time.
where:

E(Ri) is an expected return on security
E(RM) is an expected return on market portfolio M
β is a nondiversifiable or systematic risk
RM is a market rate of return
Rf is a risk-free rate

Efficient Frontier

The efficient frontier is the set of optimal portfolios that offers the highest expected return for a defined level of risk or the lowest risk for a given level of expected return. Portfolios that lie below the efficient frontier are sub-optimal, because they do not provide enough return for the level of risk.

Stock Returns

$R=(P_{t+1}-P_t+D)/(P_t)$

R=	Return
$P_t=$	Stock Price @ time
D =	Dividend

CAPM = Capital Asset Pricing Model

$r_i=r_f+\beta(r_m-r_f)$	ß=Beta
$r_f=$ risk free rate	r_m = market rate
i = investment	E(r) = expected return
Expected risk premium on stock=	beta x expected risk premium on market
$r-r_f=\beta(r_m-r_f)$	

Beta is the extent to which a stock moves with the market. CAPM says that the higher the Beta, the higher the risk

Market Efficiency

1.) Weak = Market reflects past info

2.) Semi-Strong = Past & Current public info is reflected

3.) All information is reflected in the stock price (public & private)

Efficient Market - Market in which information is reflected in stock prices quickly + correctly

Profitability Index

PI = NPV/Investment

Another Example - continued
Proj NPV Investment PI
A 230,000 200,000 1.15
B 141,250 125,000 1.13
C 194,250 175,000 1.11
D 162,000 150,000 1.08

Select projects with highest Weighted Avg PI
WAPI (BD) = 1.13(125) + 1.08(150) + 0.0 (25)
(300) (300) (300)
= 1.01

Captal Rationing

Capital Rationing - Limit set on the amount of funds available for investment.
Soft Rationing - Limits on available funds imposed by management.
Hard Rationing - Limits on available funds imposed by the unavailability of funds in the capital market.

Market Risk premium

$=r_m-r_f$

For any investment, we can find the opportunity cost of capital using the security market line. With = 0.8, the opportunity cost of capital is:
r = rf + B(rm − rf)
r = 0.04 + [0.8 B (0.12 − 0.04)] = 0.104 = 10.4%

The opportunity cost of capital is 10.4% and the investment is expected to earn 9.8%. Therefore, the investment has a negative NPV.

If return is 11.2% What is Beta?
r = rf + (rm − rf)
0.112 = 0.04 + (0.12 − 0.04) = 0.9