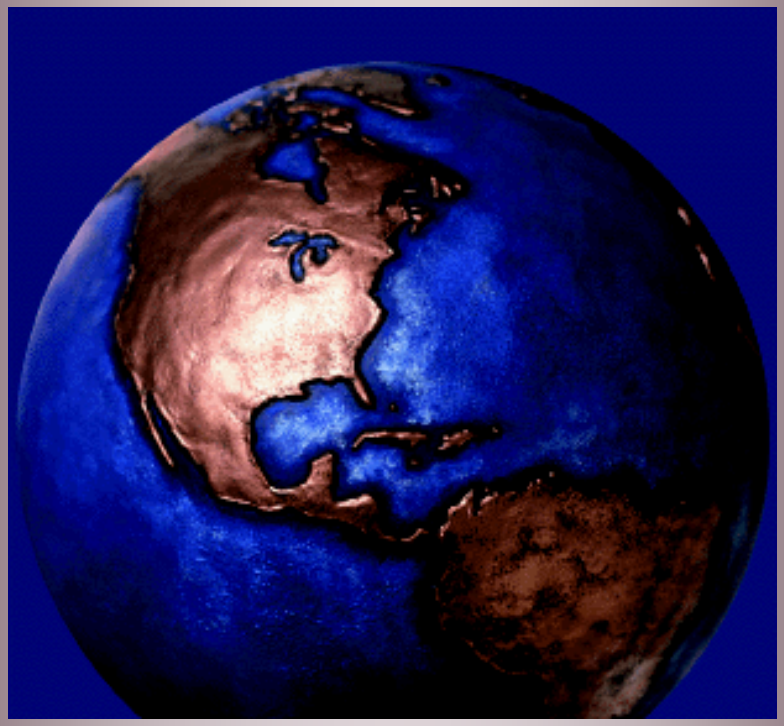
Part 1

Capital Budgeting without debt financing



MSc course in finance

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Topics Covered

1) **Discounting:**

- Adjusting for time value of money
- Adjusting for inflation
- Adjusting for risk:
  - ➔ Measures of risk
  - ➔ CAPM
  - ➔ Estimating cost of capital

Topics Covered

2) **What to discount?**

- Points to watch for (sunk costs, overheads…)
- Working capital
- Depreciation
- Free Cash Flows

Discounting

- Discount rate takes into account:
  - ➔ Time value of money
  - ➔ Business risk
  - ➔ Financial risk
- Discount at the correct opportunity cost of capital

Inflation

Inflation - Rate at which prices as a whole are increasing.

Nominal Interest Rate - Rate at which money invested grows.

Real Interest Rate - Rate at which the purchasing power of an investment increases.

Note: market interest rates are nominal rates

Inflation

$$1 + \text{real interest rate} = \frac{1+\text{nominal interest rate}}{1+\text{inflation rate}}$$

approximation formula

Real int. rate » nominal int. rate-inflation rate

Inflation

Example

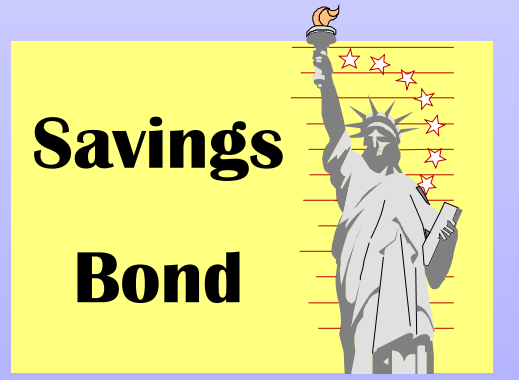
If the interest rate on one year govt. bonds is 5.9% and the inflation rate is 3.3%, what is the real interest rate?

$$1 + \text{real interest rate} = \frac{1+.059}{1+.033}$$

$$1 + \text{real interest rate} = 1.025$$

real interest rate = .025 or 2.5%

Approximation =.059-.033 =.026 or 2.6%



Inflation

INFLATION RULE

- Be consistent in how you handle inflation!!
- Use nominal interest rates to discount nominal cash flows.
- Use real interest rates to discount real cash flows.
- You will get the same results, whether you use nominal or real figures

Inflation

Example

You own a lease that will cost you $8,000 next year, increasing at 3% a year (the forecasted inflation rate) for 3 additional years (4 years total). If discount rates are 10% what is the present value cost of the lease?

$$1+\text{real interest rate}=\frac{1+\text{nominal interest rate}}{1+\text{inflation rate}}$$

Inflation

Example - nominal figures

Year	Cash Flow	PV @ 10%
1	8000	$\frac{8000}{1.10} = 7272.73$
2	$8000 \times 1.03 = 8240$	$\frac{8240}{1.10^2} = 6809.92$
3	$8000 \times 1.03^2 = 8487.2$	$\frac{8487.20}{1.10^3} = 6376.56$
4	$8000 \times 1.03^3 = 8741.82$	$\frac{8741.82}{1.10^4} = 5970.78$
		$26,429.99

Inflation

Example - real figures

Year	Cash Flow	PV@6.7961
1	$\frac{8000}{1.03} = 7766.99$	$\frac{7766.99}{1.068} = 7272.73$
2	$\frac{8240}{1.03^2} = 7766.99$	$\frac{7766.99}{1.068^2} = 6809.92$
3	$\frac{8487.20}{1.03^3} = 7766.99$	$\frac{7766.99}{1.068^3} = 6376.56$
4	$\frac{8741.82}{1.03^4} = 7766.99$	$\frac{7766.99}{1.068^4} = 5970.78$
		$= \$26,429.99$

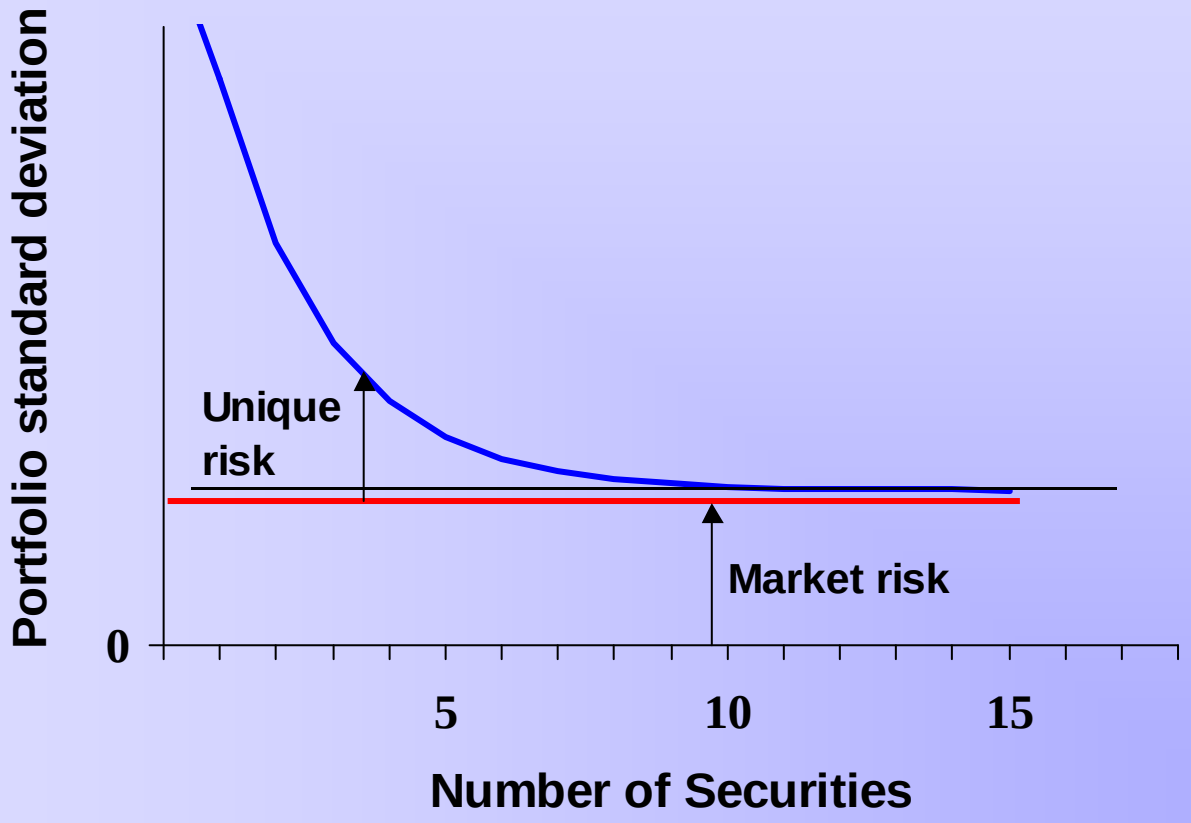
Adjusting for risk

- The standard deviation of the project's returns is a measure of the project's **total** risk
- Total risk can be decomposed into:
  - ➔ Market (=systematic, undiversifiable) risk
  - ➔ Idiosynchratic (=unsystematic, diversifiable) risk
- Beta is a measure of market risk

Individual stock volatility

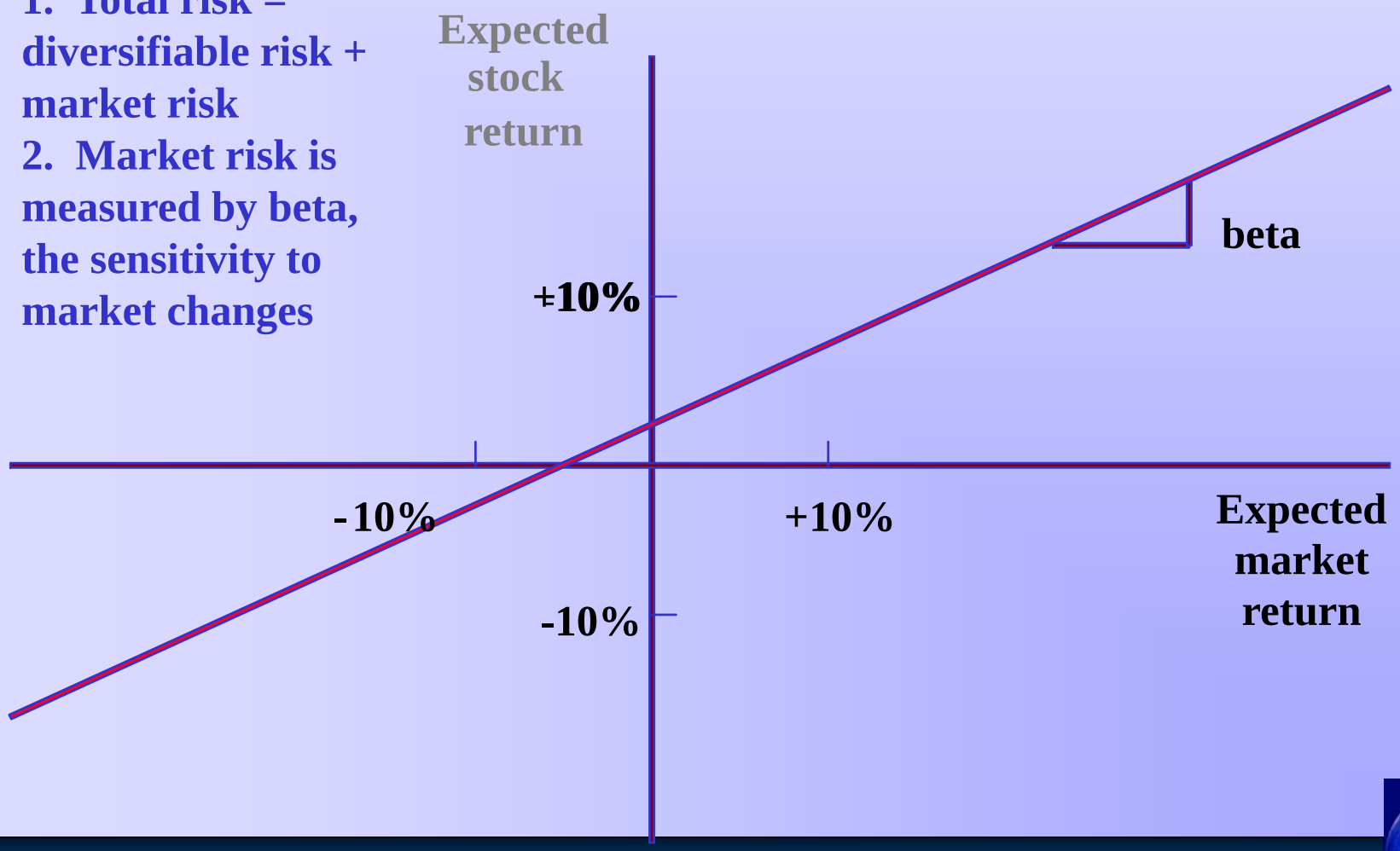
Stock	Std Dev	Stock	Std Dev.
Amazon	110.6	Gen. Electric	26.8
Boeing	30.9	Gen. Motors	33.4
Coca-Cola	31.5	McDonald's	27.4
Dell	62.7	Pfizer	29.3
Exxon Mobil	17.4	Reebok	58.5

Measuring Risk



Beta and Unique Risk

1. Total risk = diversifiable risk + market risk
2. Market risk is measured by beta, the sensitivity to market changes



Beta and Unique Risk

Market Portfolio - Portfolio of all assets in the economy. In practice a broad stock market index, such as the S&P Composite, is used to represent the market.

Beta - Sensitivity of a stock's return to the return on the market portfolio.

Estimating beta

- Beta can be estimated by regressing the project's returns on the returns on the market portfolio

$$R_i = \alpha + \beta R_m + \varepsilon_i$$

- Beta estimated from stock price returns captures both business and financial risk

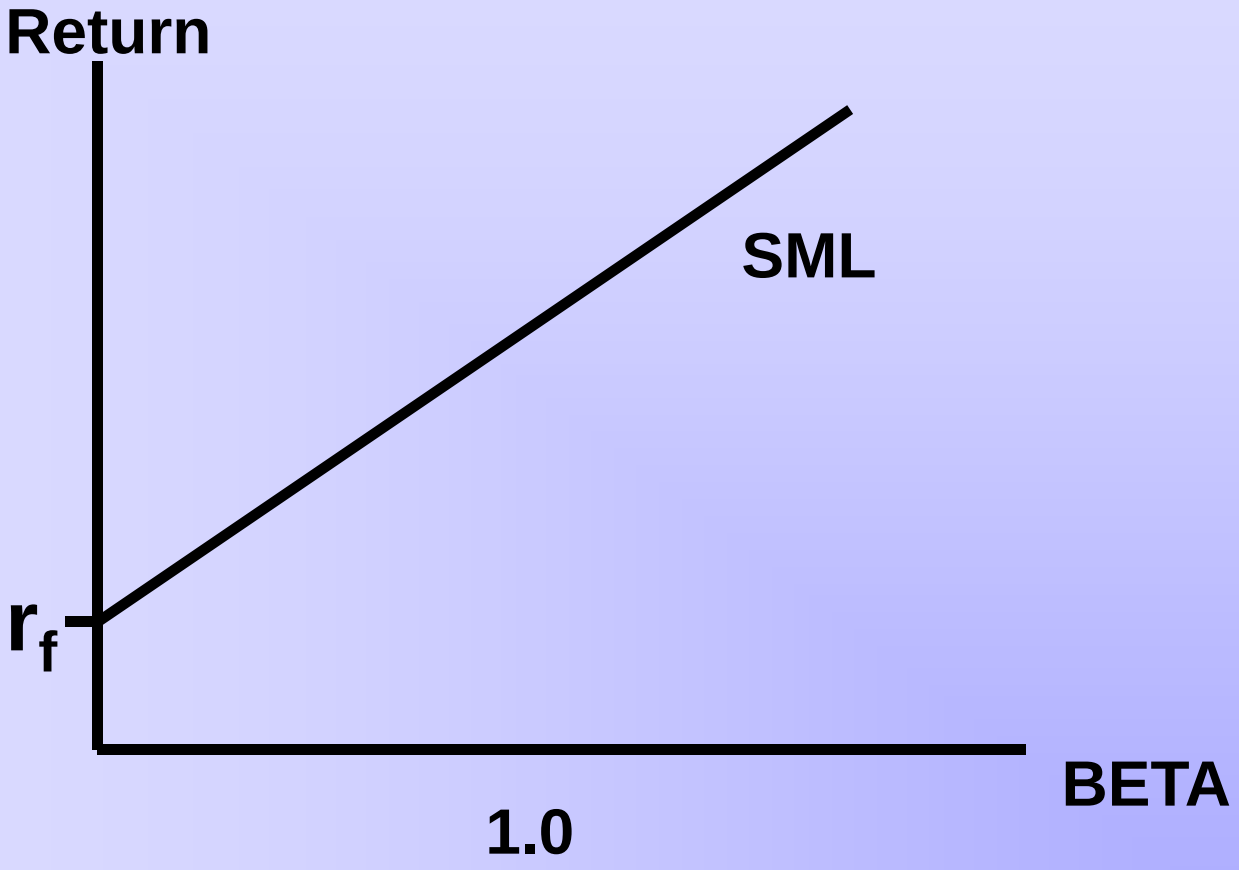
Beta and Unique Risk

$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2}$$

Covariance with the market

Variance of the market

Security Market Line



SML Equation: $R = r_f + B (r_m - r_f)$

Capital Asset Pricing Model

$$R - r_f = B (r_m - r_f)$$

CAPM

Estimating the cost of capital

- CAPM gives the cost of equity (if we have estimate for beta)
- The cost of equity can also be estimated using a dividend growth model:

$$\text{share price} = P_0 = \frac{Div_1}{r \quad g}$$

$$\text{cost of equity} = r = \frac{Div_1}{P_0} + g$$

Estimating the cost of capital

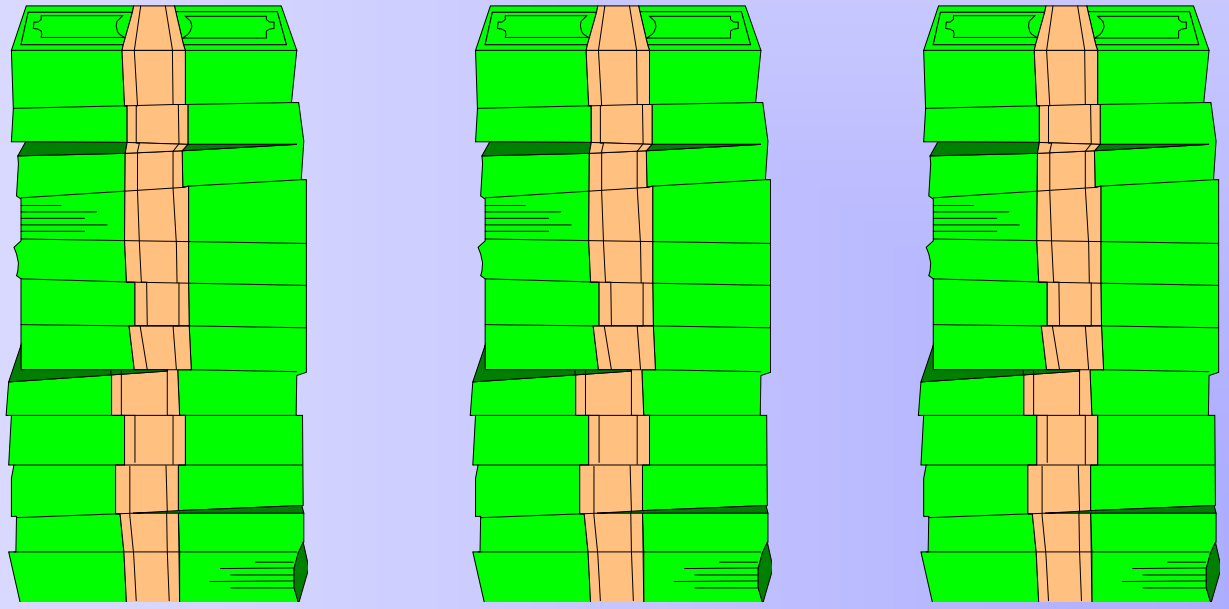
- In other words:

return on equity =dividends + capital growth

- Dividend yield and growth rates are empirically observable
- We consider the effect of leverage later

What To Discount

Only Cash Flow is Relevant



What To Discount

Points to "Watch Out For"

- Do not confuse average with incremental payoffs (past payoffs are irrelevant)
- Include all incidental effects
- Forget sunk costs
- Include opportunity costs
- Beware of allocated overhead costs
- Do not forget working capital requirements

Working capital

- Working capital is:
  - ➔ Inventories
  - ➔ Work-in-progress
  - ➔ Accounts receivable less payables
- Working capital can often be sold or liquidated at the end of a project

Depreciation

- Reduction in the book (or market value) of an asset
- Portion of historical investment cost that can be deducted from taxable income
- Straight-line depreciation: an equal dollar amount of depreciation in each period
- Declining-balance depreciation: a fixed proportion of the remaining book value is depreciated each period

Depreciation: An example

Example: A machine is purchased for 100m. It is depreciated over 5 years in straight line. What is the annual depreciation? What is the annual depreciation tax shield if the tax rate is 40%?

$$\text{Annual depreciation} = \frac{100}{5} = 20$$

$$\text{Net CF after taxes} = CF - (CF - Dep) * \tau = CF(1 - \tau) + \tau * Dep$$

$$\text{Annual depr. tax shield} = \tau * Dep = 0.4 * 20 = 8$$

Free Cash Flow (FCF)

- Free Cash Flow

= Dividends – Financing required

= Div – {Inv Expenditure – Retained CF}

= Div- Inv + [(CF-Dep)*(1-taxrate) +Dep -Div]

= (CF-Dep)(1-taxrate) + Dep - Inv

= CF – (CF-Dep)*taxrate – Inv

=CF- taxes - Inv

- Div + Inv = (CF-taxes)+ Financing Required

FCF and PV

- Free Cash Flows (FCF) should be the theoretical basis for all PV calculations.
- FCF is a more accurate measurement of PV than either Div or EPS.
- When valuing a business for purchase, always use FCF.

FCF and PV

Valuing a Business

The value of a business is usually computed as the discounted value of FCF out to a ***valuation horizon (H)*** plus the forecasted value of the business at the horizon **(*the terminal value*),** also discounted back to the present**.**

$$PV = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \ldots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H}$$