ULB

Solvay Brussels School of Economics and Management

# Advanced Corporate Finance (GEST S 410)

## 1. Introduction

**Professor Kim Oosterlinck**

E-mail: koosterl@ulb.ac.be

# Course Outline (1/4)

- Theory (24h) + Exercises (12h) + Textbooks and references
- Material available on
- http://homepages.ulb.ac.be/~koosterl/
- Prerequisites: Accounting, Microeconomics and Finance 101
- => Familiar with PV, Bonds and Stocks Valuation, NPV, IRR rules, portfolio theory, CAPM and option pricing (binomial model)

SolvayBrusselsSchool of Economics and Management

# Course Outline (2/4)

**Reference books:**

**David Hillier, Stephen Ross, Jeffrey Jaffe, Randolph Westerfield, (2013), *Corporate Finance European edition,* 2nd edition.**

Berk, J. and P. DeMarzo, (2013), *Corporate Finance, 3rd ed.* Pearson,

Bodie Zvi, Kane Alex, Marcus Alan J., (2011), *Investments and Portfolio Management, Global Edition*, McGraw Hill,

Brealey, R., Myers, S. and Allen, F. (2008), *Principle of Corporate Finance,* 9th ed., McGraw-Hill.

# Course Outline (3/4)

- Second course in finance. Objectives, understand:
  - ➢How to move from accounting to cash-flows
  - ➢The impact of capital structure on investment decisions
  - ➢The Value of the Firm (Modigliani-Miller)
  - ➢ Optimal capital structure
  - ➢Raising Capital and Going Public (IPO, SEO)
  - ➢Mergers and Acquisitions
  - ➢Risky Debt

ULB

Solvay Brussels School of Economics and Management

# Course Outline (4/4)

- Exam
  - Theory and Exercises
  - No help allowed…
  - The Course is in **ENGLISH =>** no dictionary, you should have a sufficiently good knowledge NOW
  - Exam is **HARD** be precise when answering
  - **Erasmus** no exam outside the normal sessions

# Roadmap

1. Introduction and Review of supposedly known concepts
2. From Accounting to Cash Flows
3. Capital Structure
4. Project valuation using the wacc
5. Financial Options
6. Real Options
7. Market efficiency
8. Raising capital and going public
9. Long Term Bonds
10. Alternative Investments

# Beware, Beware, Beware

- This session will provide a short wrap-up of what I believe should be known…
- If you never had a finance class before: WORK
- To help you here are the hillier et al.(2013) chapters I assume you have seen **BEFORE** this class:

- At least chapters: 1,2, 4, 5, 6, 7, 10 and 22

- If not it is up to **YOU** to make up for this

# A short review

- Financial valuation most of the time relies on the **discounting** concept
- Decisions to invest or not in a project are then made based on the **NPV rule** (invest if NPV > 0). Even though other methods exist (IRR, Payback etc) they do not always yield a proper result => stick to NPV!!!
- Choosing the proper interest rate to use is not easy (more on this later). Besides one must take into account **compounding intervals**

# A short review

- One may also wish to benefit from **shortcut formulas** to compute PV
- Discounting future cash flows is also at the basis of **bonds and equity valuation**
- The discount rate should take **risk** into account
- **Capital Asset Pricing Model (CAPM)**

# Discounting: Time value of Money

0 — 1

**Case 1**
Future value

C (€100) → ? $= 100 \times (1 + r)$

Capitalizing

**Case 2**
Present value

C (€100)

$\frac{100}{(1+r)} = 100 \times DF_1 =$ ? ← C (€100)

Discounting

# With Cash Flows

| | 0 | 1 | 2 | … | n-1 | n |
|---|---|---|---|---|---|---|

time

**Case 1**
**Future value**

C (€100) → ?

$$C_0 \times (1+r) \qquad C_0 \times (1+r) \times (1+r) \qquad C_0 \times (1+r) \times (1+r) \times \ldots \qquad C_0 \times (1+r)^n$$

**Case 2**
**Present value**

? ← CF (€100)

$$\frac{C_n}{(1+r)^n} \qquad C_n \times \prod_{n-1} \frac{1}{(1+r)} \quad C_n \times \prod_{n-2} \frac{1}{(1+r)} \qquad \frac{C_n}{(1+r)^1} \times \frac{1}{(1+r)} \times \ldots \qquad \frac{C_n}{(1+r)^1}$$

# The discount factor

- How much would an investor pay today to receive € $C_t$ in t years given market interest rate $r_t$?
  - We know that $1\ €_0 \rightarrow (1+r_t)^t\ €_t$
  - Hence $PV \times (1+r_t)^t = C_t \rightarrow PV = C_t/(1+r_t)^t = C_t \times DF_t$

- The process of calculating the present value of future cash flows is called discounting.
- The present value of a future cash flow is obtained by multiplying this cash flow by a discount factor (or present value factor) $DF_t$
- The general formula for the t-year discount factor is:

$$DF_t = \frac{1}{(1+r_t)^t}$$

# Net Present Value

- Decide whether it is worth investing in a project
- Rule => it should bring money. To compare the cash flows arriving at ≠ dates => discount the cash flows

- Cash flows: $C_0 \quad C_1 \quad C_2 \ldots \quad C_t \quad \ldots \quad C_T$

- *t*-year discount factor: $DF_t = 1/(1+r)^t$

- NPV = $C_0 + C_1 DF_1 + \ldots + C_t DF_t + \ldots + C_T DF_T$

- Usually $C_0 < 0$ since it often represents the investment made for the project

# Example…

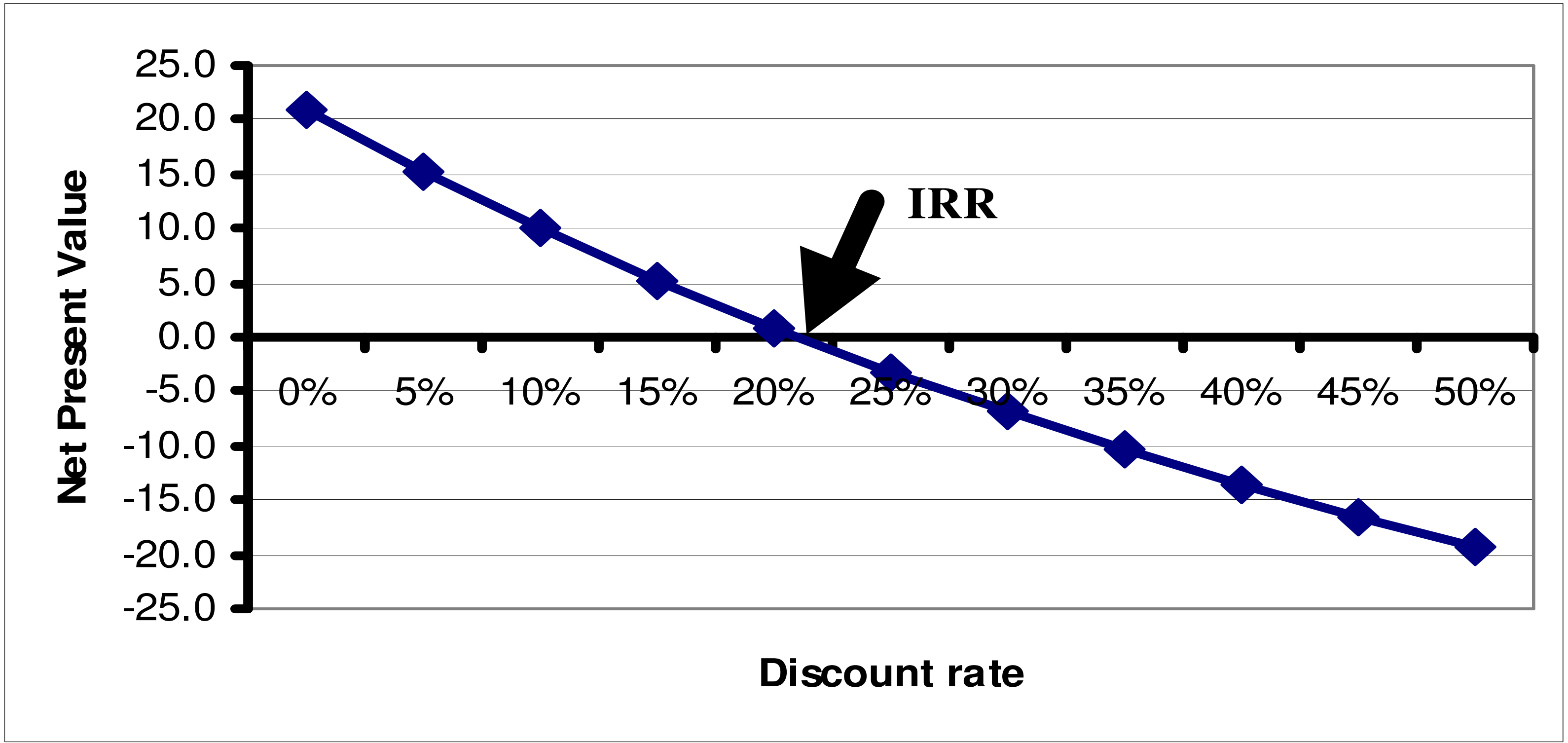
- Suppose $r$ = 10%

| t | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Cash flow | -100 | 30 | 60 | 40 |
| Discount Factor | 1 | 0.9091 | 0.8264 | 0.7513 |
| PresentValue | -100.0 | 27.3 | 49.6 | 30.1 |
| NPV | 6.9 | | | |

- In this case the investment is worth undertaking
- *NB: an alternative method could have been to compute the Net Future Value (NFV)*

# Internal Rate of Return

- The Internal Rate of Return is the discount rate such that the NPV is equal to zero.



# Internal Rate of Return

- In a multiple period setting
- Reinvestment assumption: the IRR calculation assumes that all future cash flows are reinvested at the IRR

- Disadvantages:
  - Does not distinguish between investing and financing
  - IRR may not exist or there may be multiple IRR
  - Problems with mutually exclusive investments

- Advantages:
  - Easy to understand and communicate

# Compounding Interval

- Up to now, interest paid annually
- If $n$ payments per year, compounded value after 1 year :
- Example: Monthly payment :
  - $r = 12\%$, $n = 12$
  - Compounded value after 1 year : $(1 + 0.12/12)^{12} = 1.1268$
  - ***Effective Annual Interest Rate*** : 12.68%
- Continuous compounding:
  - $[1+(r/n)]^n \rightarrow e^{rn}$ (e= 2.7183)
  - Example : $r = 12\%$ $e^{12} = 1.1275$
  - ***Effective Annual Interest Rate*** : 12.75%

# Shortcut Formulas…

- Constant perpetuity: $C_t = C$ for all $t$

$$PV = \frac{C}{r}$$

- Growing perpetuity: $C_t = C_{t-1}(1+g)$

  ⚠ $r>g$ $\quad t = 1$ to $\infty$

$$PV = \frac{C_1}{r-g}$$

- Constant annuity: $C_t=C \quad t=1$ to $T$

$$PV = \frac{C}{r}\left(1 - \frac{1}{(1+r)^T}\right)$$

- Growing annuity: $C_t = C_{t-1}(1+g)$

  $t = 1$ to $T$

$$PV = \frac{C_1}{r-g}\left(1 - \frac{(1+g)^T}{(1+r)^T}\right)$$

# Bond valuation

- Zero-Coupon ⇔ one bullet payment at maturity T

$$PV = \frac{1}{(1+r)^T}$$

- Level coupon bond, paying a yearly coupon C

$$P_0 = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^T} + \frac{100}{(1+r)^T} = C \times A_r^T + 100 \times d_T$$

- With A the annuity factor

- *NB: Inverse relationship between interest rate r and Bond Price!*

# Stock (Equity) valuation

- Dividend Discount Model (DDM): 1-year horizon

$$P_0 = \frac{div_1 + P_1}{1 + r}$$

← <u>Expected</u> price

← $r$ = expected return on shareholders' equity
 = Risk-free interest rate + risk premium

- Example. Assume $r$ = 10%, expected dividend = 2 and expected price = 50

$$P_0 = \frac{2 + 50}{1 + 0.10} = 47.27$$

Dividend yield = 2/47.27 = 4.23%

Rate of capital gain = (50 – 47.27)/47.27 = 5.77%

# DDM: where does the expected stock price come from?

- Expected price at forecasting horizon depends on expected dividends and expected prices beyond forecasting horizon

- To find $P_2$, use 1-year valuation formula again:

$$P_1 = \frac{div_2 + P_2}{1 + r}$$

- Current price can be expressed as:

$$P_0 = \frac{div_1}{1 + r} + \frac{div_2}{(1 + r)^2} + \frac{P_2}{(1 + r)^2}$$

- General formula:

$$P_0 = \frac{div_1}{1 + r} + \frac{div_2}{(1 + r)^2} + ... + \frac{div_T}{(1 + r)^T} + \frac{P_T}{(1 + r)^T}$$

# DDM - general formula

- With infinite forecasting horizon:

$$P_0 = \frac{div_1}{(1+r)} + \frac{div_2}{(1+r)^2} + \frac{div_3}{(1+r)^3} + \ldots + \frac{div_t}{(1+r)^t} + \ldots$$

- Forecasting dividends up to infinity is not an easy task. So, in practice, simplified versions of this general formula are used. One widely used formula is the Gordon Growth Model base on the assumption that dividends grow at a constant rate.

  - DDM with constant growth $g$

  - *Note:* $g < r$

$$P_0 = \frac{div_1}{r - g}$$

# Risk-Return and diversification

- Risk linked to return
- Benefits from diversification, let us consider a portfolio of two stocks (A,B)
- Characteristics:
  - Expected returns : $\overline{R}_A, \overline{R}_B$
  - Standard deviations : $\sigma_A, \sigma_B$
  - Covariance : $\sigma_{AB} = \rho_{AB}\sigma_A\sigma_B$
- Portfolio: defined by fractions invested in each stock $X_A$ , $X_B$

  $X_A + X_B = 1$

- Expected return on portfolio: $\boxed{\overline{R}_P = X_A\overline{R}_A + X_B\overline{R}_B}$

- Variance of the portfolio's return: $\boxed{\sigma_P^2 = X_A^2\sigma_A^2 + 2X_AX_B\sigma_{AB} + X_B^2\sigma_B^2}$

# Covariance and correlation

- Statistical measures of the degree to which random variables move together
- Covariance $$\sigma_{AB} = \text{cov}(R_A, R_B) = E[(R_A - \overline{R}_A)(R_B - \overline{R}_B)]$$
- Like variance figure, the covariance is in squared deviation units.
- Not too friendly ...
- Correlation $$\rho_{AB} = Corr(R_A, R_B) = \frac{Cov(R_A, R_B)}{\sigma_A \sigma_B}$$
- Covariance divided by product of standard deviations
- Covariance and correlation have the same sign
  - Positive : variables are positively correlated
  - Zero : variables are independent
  - Negative : variables are negatively correlated
- The correlation is always between –1 and + 1

# Portfolio with many assets

- Portfolio composition :
  - $(X_1, X_2, \ldots , X_i, \ldots , X_N)$
  - $X_1 + X_2 + \ldots + X_i + \ldots + X_N = 1$

- Expected return:

$$\overline{R}_P = X_1\overline{R}_1 + X_2\overline{R}_2 + \ldots + X_N\overline{R}_N$$

- Risk:

$$\sigma_P^2 = \sum_j X_j^2\sigma_j^2 + \sum_i \sum_{j \neq i} X_i X_j \sigma_{ij} = \sum_i \sum_j X_i X_j \sigma_{ij}$$

- Note:
  - N terms for variances
  - N(N-1) terms for covariances
  - Covariances dominate

# Covariance domination…

| | | | | |
|---|---|---|---|---|
| Var | Cov | Cov | Cov | Cov |
| Cov | Var | Cov | Cov | Cov |
| Cov | Cov | Var | Cov | Cov |
| Cov | Cov | Cov | Var | Cov |
| Cov | Cov | Cov | Cov | Var |

# Equally weighted portfolio

- Consider the risk of an equally weighted portfolio of $N$ "identical« stocks:

$$\overline{R}_j = \overline{R}, \sigma_j = \sigma, Cov(R_i, R_j) = \text{cov}$$

- Equally weighted: $$X_j = \frac{1}{N}$$

- Variance of portfolio: $$\sigma_P^2 = \frac{1}{N}\sigma^2 + (1 - \frac{1}{N})\text{cov}$$

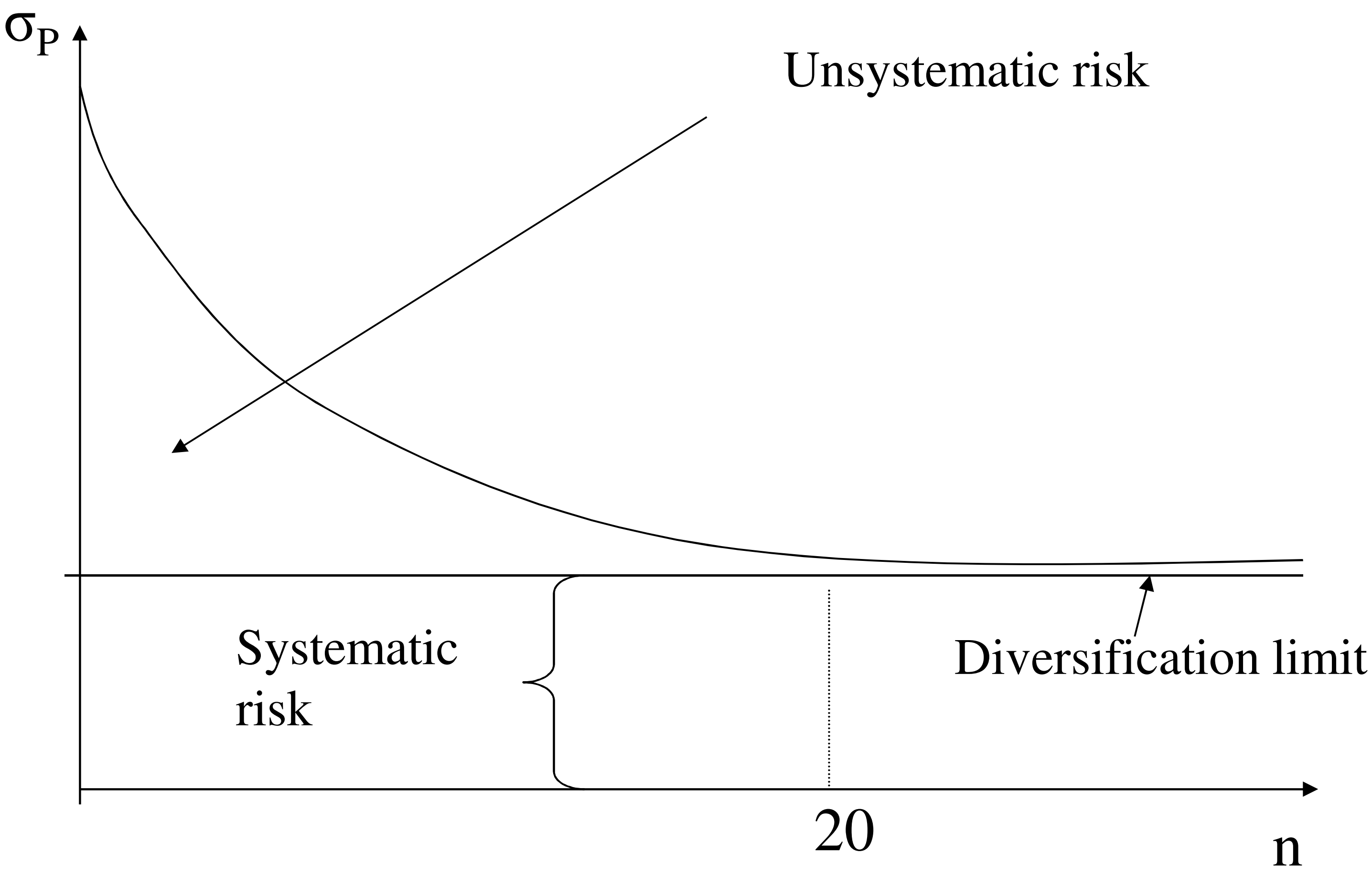
- If we increase the number of securities ?:

- Variance of portfolio:

$$\sigma_P^2 \rightarrow \text{cov}$$
$$N \rightarrow \infty$$

# In practice

Diversification gains already close to maximum with n = 20



# Risk and CAPM

- Discount rate should take risk into account
- Concept of opportunity cost
- Risk usually measured as the standard deviation of returns
- Part of the risk may be reduced thanks to diversification
- The market only rewards the risk which cannot be diversified

- Capital-Asset Pricing Model (CAPM)

$$\overline{R} = R_F + (\overline{R}_M - R_F) \times \beta$$

- with $\beta_i = \frac{Cov(R_i, R_M)}{\sigma^2(R_M)} = \frac{\sigma_{iM}}{\sigma^2_M}$

# This course…

- Many questions remain unanswered

=> How do we determine the Cash Flows to Discount?

⇒ CAPM provides some insights regarding the discount rate but how is it affected by the capital structure (% debts versus equity)?

⇒ Is there such a thing as an optimal capital structure?

⇒ How do we move from project valuation to company valuation?

⇒ How do companies raise funds? Or go Public?

⇒ How do we value options in a broader setting?

⇒ Are equity prices affected by behavioral elements?

⇒ How do we deal with risky debt?