THEME 1
CAPITAL STRUCTURE

Dr Laurent GERMAIN
Professor of FINANCE

CAPITAL STRUCTURE

Hundreds of ≠ securities

Focus on the 2 most common

Bonds Stocks

Terminology : Financial leverage or Gearing is when a firm has debt in its capital structure

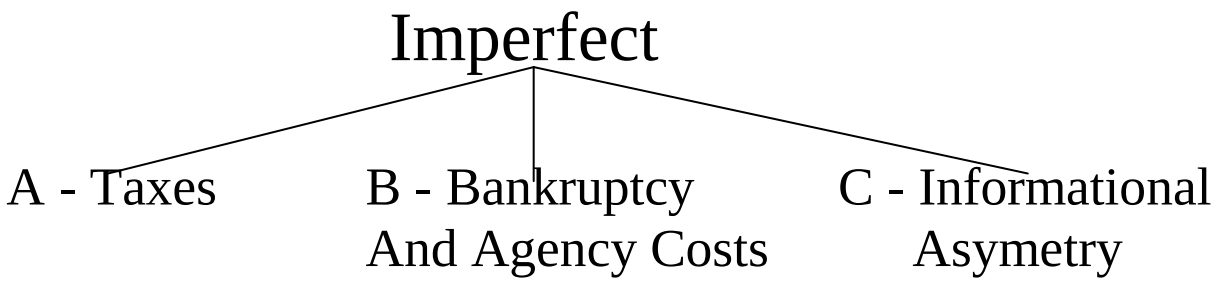
Dr Laurent GERMAIN
Professor of FINANCE

CAPITAL STRUCTURE ISSUES

1. Effects of leverage

2. Capital structure in perfect capital markets
   Capital structure irrelevance (MODIGLIANI and MILLER)

3. Optimal capital structure in <u>imperfect</u> capital markets



D – Impact of the Financing on the Capital Structure

1 –EFFECTS OF LEVERAGE

Dr Laurent GERMAIN
Professor of FINANCE

1 - EFFECTS OF LEVERAGE

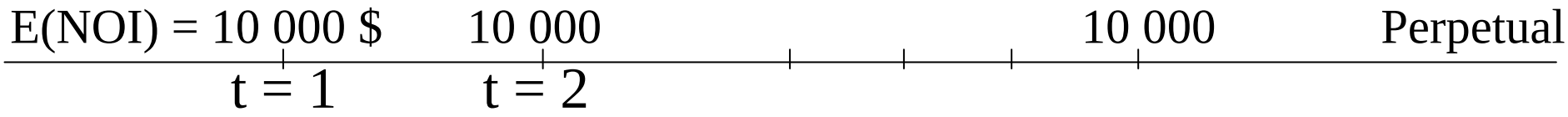
Leverage may affect each of the following :

- Net Income NI
- Earning per share EPS
- Return on equity ROE
- Risk to equity holders
- Price / earnings ratio (P/E)
- Company value V
- Stock value (market reaction)
- Cost of Equity Capital
- Corporate and personal tax bills
- Proba of bankruptcy and expected bankruptcy costs
- Debt ratings and future costs of debt
- Operating and financial flexibility
- Managerial incentives

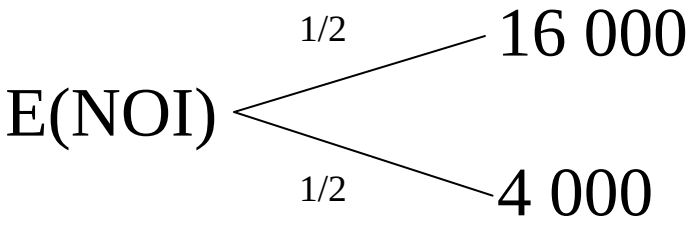
Dr Laurent GERMAIN
Professor of FINANCE

EFFECTS OF DEBT WITH NO TAXES

Characteristics of the firm : 10 000 shares outstanding P/E = 10



Thus : E (ROE) = 10 % (i.e E (ROE) = E/P)
Price per share = 10 $



Consider the following possibility : to borrow $ 80 000 at an interest rate of 5 % to repurchase 8 000 shares

Reminder

NOI : Cash available from exploitation

also called EBITDA : Earning Before Interest Taxes Depreciation and Amortization

NI : Cash available from exploitation after payment of Tax Income

often NI = NOI*(1 - t_c)

CF : Cash available for shareholders and debtholders

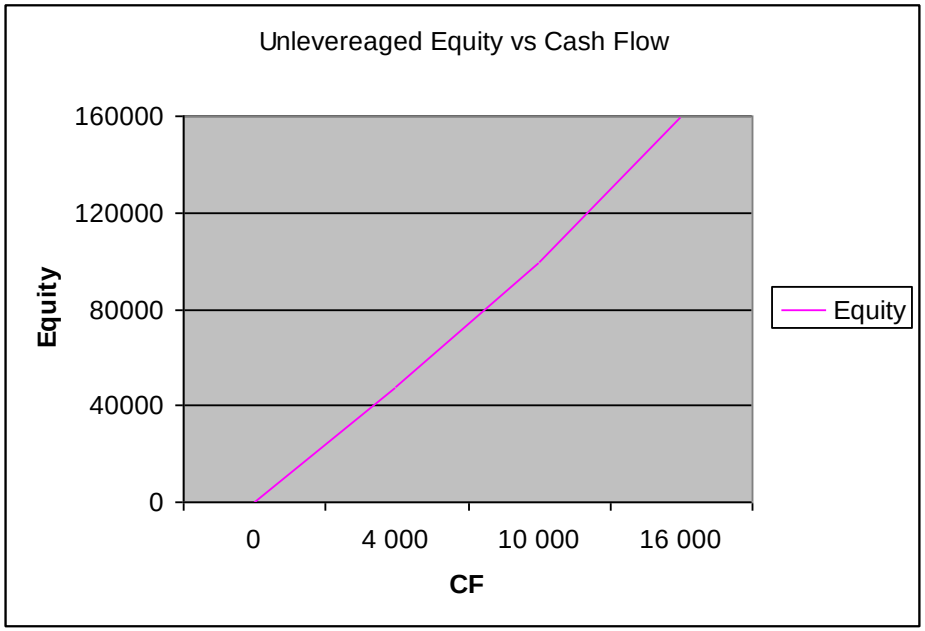
Often NI = CF

Scenario # 1 : No Debt – 10 000 Shares

	Expected	P = 0,5	P = 0,5
NOI	$ 10 000	$ 16 000	$ 4 000
Interest	0	0	0
NI	$ 10 000	$ 16 000	$ 4 000
EPS	$ 1.0	$ 1.6	$ 0.4
ROE	10 %	16 %	4 %
Price	$ 10	$ 16	$ 4
Value	$ 100 000	$ 160 000	$ 40 000

Hypothesis : P/E remains constant at 10 (quotation by the market)

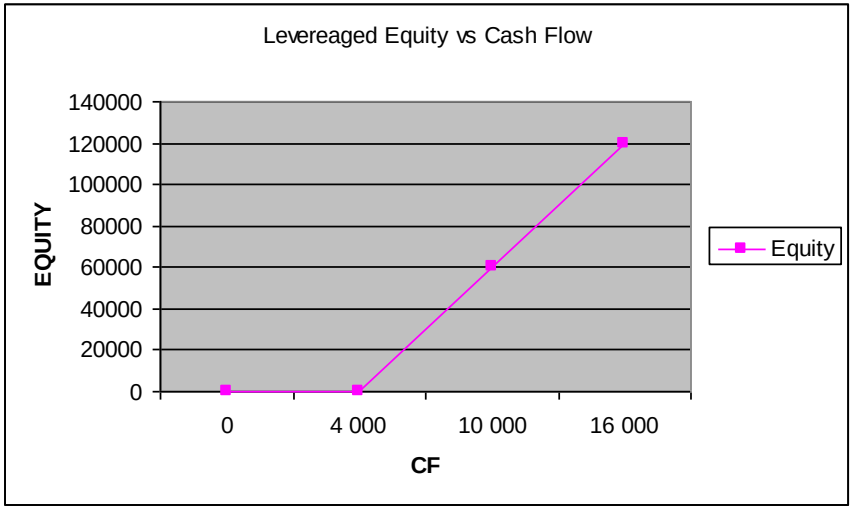
Note : it is a stationary vision of the value of the firm



Scenario # 2 : $ 80 000 Debt (5%) – 2 000 Shares

	Expected	P = 0.5	P = 0.5
NOI	$ 10 000	$ 16 000	$ 4 000
Interest	$ 4 000	$ 4 000	$ 4 000
NI	$ 6 000	$ 12 000	$ 0
EPS	$ 3.0	$ 6.0	$ 0.0
ROE	30 %	60 %	0 %
Price	$ 30	$ 60	$ 0
Value of Equity	$ 60 000	$ 120 000	$ 0

The market keeps on quoting the company at a P/E of 10



CONCLUSIONS : DO NOT FORGET THE RISK

- E(NI) goes down from $ 10 000 to $ 6 000

- E(EPS) increases form $ 1 to $ 3
- BUT the variability of the E (EPS) has increased too.

    - You can not win of both sides at the same time : the riskier the more profitable !

Remark : Relations between NOI and EPS break even point $ 5 000

CONCLUSIONS : DO NOT FORGET THE RISK

EPS are smoother for the all-equity firm

EPS for levered equity holders are riskier
(both β and variance risk)

E(ROE) goes up from 10 % for the all-equity
Firm to 30 % for the levered firm

Variability of ROE goes up as well

⇒ Just the compensation for the added risk

TAXES

- Corporate tax bill is reduced as more debt is used ⟶ corporate interest payments provide tax shield for the corporation as they are deductible from the corporate tax payment ≠ dividend

- Tax advantage = Corporate level can be mitigated to some extend by personal tax disadvantage of debt relative to equity

BANKRUPTCY COSTS

DEFINITION Difference between the value of the assets before and after bankruptcy

Magnitude of costs
- Firms with tangible Assets
- Firms with intangible Assets (moveable human capital)

⟶ Without formal bankruptcy : costs of financial distress

PROBA (NOI < INTEREST) increases with leverage since interest is increased and NOI remains the same.

OPERATING AND FINANCIAL FLEXIBILITY

Periodic debt payment reduce the discretion managers have ⇨

They are obliged to pay earnings as interests payments.

MANAGERIAL AND INVESTMENT INCENTIVES

Risky debt

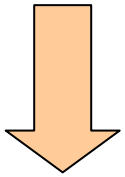
- Pressure on managers to work harder engage in cost reduction ⇨ programs, "remove the fat from the firm".
- Shareholders oriented managers incentives to engage in riskier projects because the down-side risk is being imposed on the debt holders (as share holders enjoy limited liabilities).
- Reduces the incentives for the shareholders to contribute investment funds to the firm because shareholders investment increases debt value (add value to debt holders)

SUMMARY : LEVERAGE

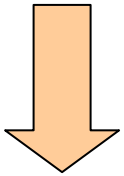
- Increases expected return on equity
- Increases the risk of equity
- Increases the probability of bankruptcy and therefore increases the probability of incurring bankruptcy costs
- Increases the tax shield
- Provides incentives to managers
- Destroy investment incentives

COMPLEXITY OF THE DETERMINANTS OF OPTIMAL CAPITAL STRUCTURE

To gain understanding of theses complex issues



We will start analysing them in an highly idealised world



Highly idealised world = perfect (absolutely frictionless) capital markets

2 - OPTIMAL CAPITAL STRUCTURE UNDER PERFECT CAPITAL MARKETS

Dr Laurent GERMAIN
Professor of FINANCE

PERFECT CAPITAL MARKETS

DEFINITION

1. No transaction costs or bid-ask spreads
2. Individual can borrow and lend at the same rate which is the same as the one faced by corporations
3. Competitive securities markets : firms are price takers
4. No bankruptcy costs
5. No taxes
6. Symmetric Information

PROPOSITION 1 : MODIGLIANI & MILLER

Under perfect capital markets, capital structure is irrelevant ; the value of the firm is unchanged whatever the proportions of debt and equity.

Intuition

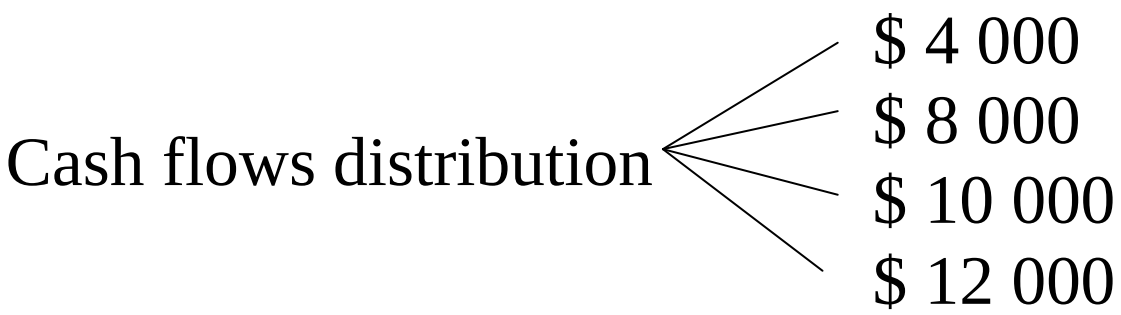
Investors can do on their own exactly what the firm can do ⇨ firms financial decisions are of no consequences.

Different capital structure are simply different ways of splitting the same fixed cash flow.

CAPITAL STRUCTURE IRRELEVANCE

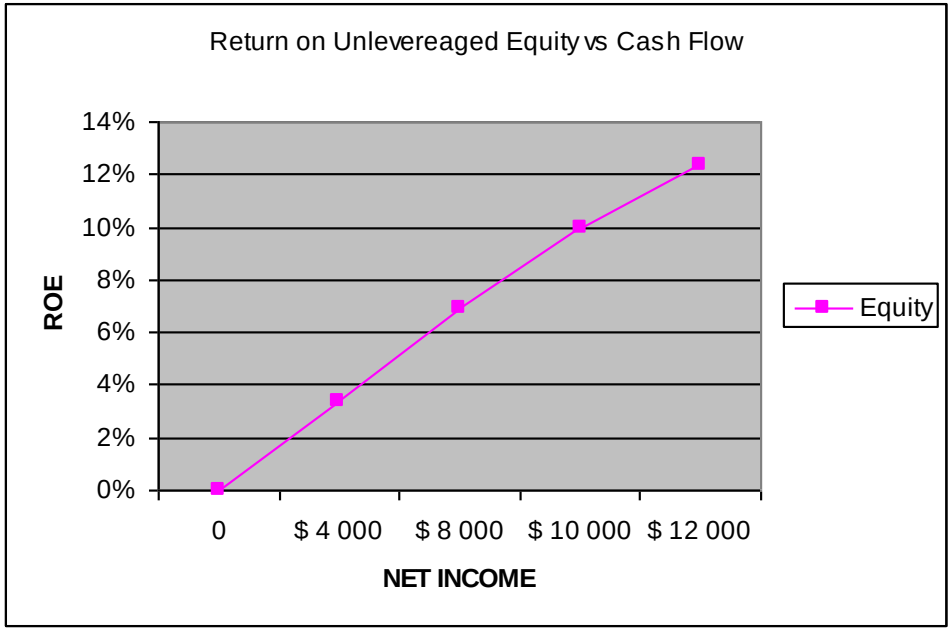
Consider two firms identical in all things but their capital structure – same assets, same cash flows…

	Firm U unlevered	**Firm L Levered**
Value of the firm	$ 100 000 10 000 shares out-standing	$ 20 000
Value of equity	$ 100 000	$ 20 000 2000 shares out-standing
Value of debt	0	r_D = 5 % $ 80 000



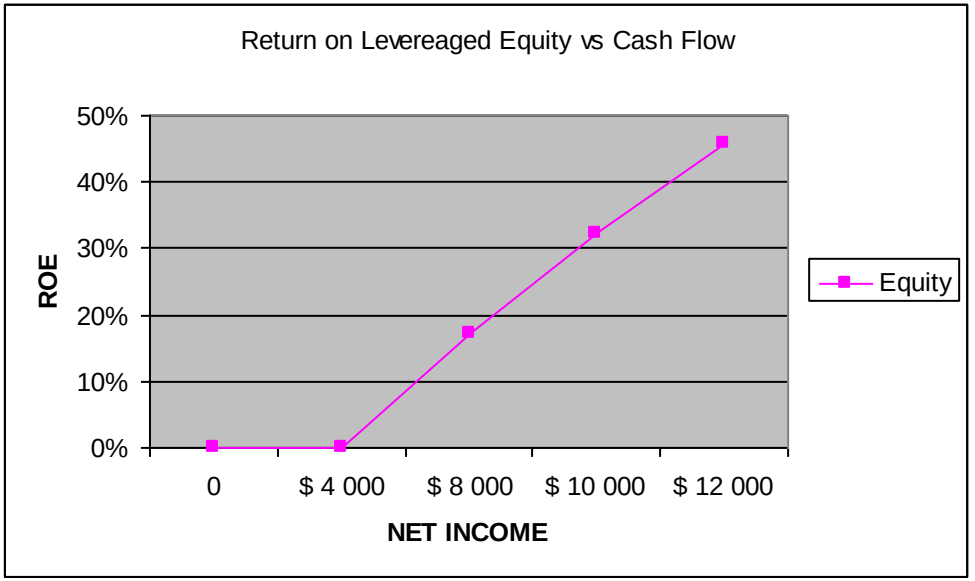
CONSIDER FIRM U – 10 000 SHARES

NOI	$ 4 000	$ 8 000	$ 10 000	$ 12 000
Int	0	0	0	0
NI	$ 4 000	$ 8 000	$ 10 000	$ 12 000
EPS_U	$ 0.4	$ 0.8	$ 1.0	$ 1.2
ROE	4 %	8 %	10 %	12 %



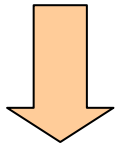
CONSIDER FIRM L - 2000 SHARES

NOI	$ 4 000	$ 8 000	$ 10 000	$ 12 000
Int	$ 4 000	$ 4 000	$ 4 000	$ 4 000
NI	$ 0	$ 4 000	$ 6 000	$ 8 000
EPS_L	$ 0	$ 2.0	$ 3.0	$ 4.0
ROE	**0 %**	**20 %**	**30 %**	**40 %**

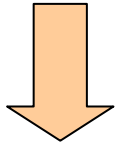


A O A RULE

Absence of opportunity of arbitrage (AOA): pocketing money today without assuming (additional) future liability, is called arbitrage.



MONEY MACHINE



Immediately eliminated by arbitrageurs who will take advantage of the opportunity and drive prices to where they should be, until the opportunity disappeared.

PROOF OF THE PROPOSITION

Suppose investors don't like leverage, so that $V_u > V_L$.

Investor who holds a fraction of U :

1. Sells
2. Simultaneously buys α of the equity and the debt of firm L

$\Longrightarrow \alpha (V_u - (E_L + D_L)) = \alpha (V_u - V_L) > 0$

investor trades a return of α NOI for αNOI and is pocketing in the process

$\longrightarrow$ Price pressure on V_L to increase and on Vu to decrease.

SUMMARY

Investors can utilise "Home-made leverage" to duplicate the effects of a firm's leverage

⇒ Not pay a premium for firms to lever or unlever for them

Capital structure simply split up the pie

FIRM'S COST OF CAPITAL

Definition

The minimum rate of return the firm should expect to earn on its invested funds so that all providers of funds just their required rate of return.

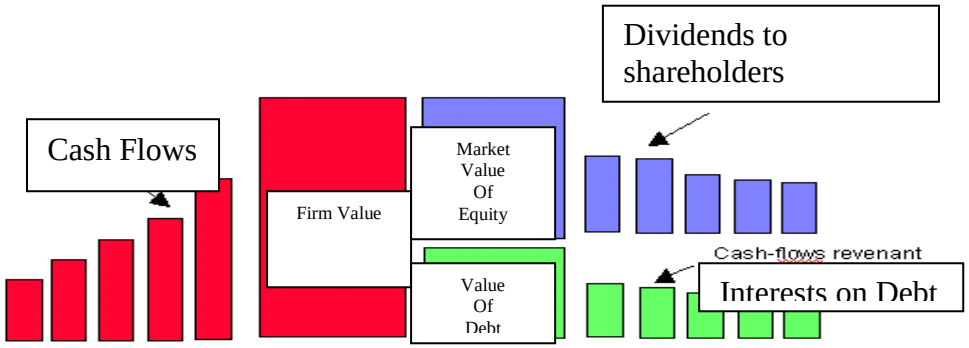
Implementation

To figure this return ⟹ calculate the required rate of return, and then weigh the individual returns by their relative contribution to the total capital.

⇓

Weighted average cost of capital

$$\text{WACC} = r_D \frac{D}{V} + r_E \frac{E}{V} = r_A \text{ [Proposition 1.0]}$$



Which is also called the Opportunity Cost of Capital is the sum all investors' return.

r_D = Expected return on the firm's debt ⟹ use the debt's YTM.

r_E = Expected return on firm's equity ⟹ incorporates both the business (r_A) and the financial risk ($r_A - r_D$) that the share holders are exposed to -> Intuition : $r_E = f(r_D, D/E, r_A)$

$$r_A = r_D \frac{D}{V} + r_E \frac{E}{V} \qquad \text{where} \quad V = E + D$$

ALL EQUITY FIRM WACC = $r_A = r_E$

COST OF CAPITAL UNDER PERFECT FINANCIAL MARKETS

⇨ In perfect financial markets, a firm's cost of capital equals the expected return on its assets WACC = r_A, regardless of the firm's capital structure (in a specific sector r_E.and r_D adjust in function of D/E)

⇨ The capital structure that maximises firm value is the one that minimises the cost of capital – Proposition 1 of Modigliani / Miller gives the result.

⇨ Practise used in capital budgeting : we ignore the effects of financing on a project's cost of capital and evaluate all projects as if they were all-equity financed.

⇨ This will be reconsidered under imperfect capital markets.

COST OF LEVERED EQUITY

Modigliani & Miller proposition 2

Expected rate of return on levered Equity is :

From $r_A = r_D \frac{D}{V} + r_E \frac{E}{V}$ we guess $r_E = r_A + \frac{D}{E}(r_A - r_D)$ **[HAMADA]**

- The same relation holds for the betas $\beta_E = \beta_A + (\beta_A - \beta_D)\frac{D}{E}$

Intuition : Equity becomes riskier as leverage increased.

⇒ Share holders require
- Compensation for the business risk r_A
- Financial risk premium

The proof of proposition 2 is straightforward by proposition 1.

FORMULAS SUMMARY

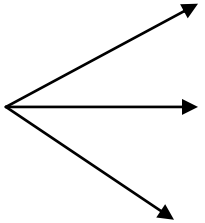
- $\text{WACC} = r_D \frac{D}{V} + r_E \frac{E}{V} = \text{K}$
- $r_E = r_A + \frac{D}{E}(r_A - r_D)$ **[HAMADA]**

  - **V^L = CF / k and V^L = Div / r_E** in a stationary world

  - **V_L = CF / (k-g)**
  - **E_L = Div / (r_E–g)**

  model with growth g **[GORDON SHAPIRO]**

- $\mathbf{V_L = CF_1 / (1+k) + CF_2 / (1+k)^2 +...+ + CF_T / (1+k)^T + V_T / (1+k)^T}$

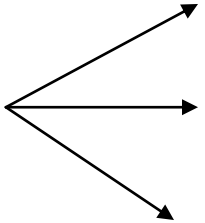
  - **Where V_T =** 

    CF_T / k in a stationary world

    CF_T / (k-g) [GORDON SHAPIRO]

    Accounting Value of the Balance Sheet (Historicalpoint of view)

- $\mathbf{E_L = div_1 / (1+r_E) + div_2 / (1+r_E)^2 +...+ + div_T / (1+r_E)^T + E_T / (1+r_E)^T}$

  - **Where E_T =** 

    div_T / r_E in a stationary world

    div_T / (r_E-g) [GORDON SHAPIRO]

    Cumulated Accounting Value of the Equity in Balance Sheet

EXAMPLE

Consider an all-equity firm with E(NOI) of $ 10 000. Suppose the Expected return on the firm's assets is r_A = 10 %.

Thus, $V_u = E(NOI) / r_A$ = $ 100 000

The firm's management has decided to issue $ 80 000 of perpetual debt with r_D = 5 % and use it to retire equity. Suppose you want to find the followings.

V_L = $ 100 000
R_E = 10% + (10% - 5%)*80 000 / 20 000 = 30%
WACC = 10% = r_A
E_L = $ 20 000

CAPITAL STRUCTURE AND E/P RATIOS

Let g be the growth rate of Expected NI :

- Non- growth unlevered firms : $E/P = r_E$
- Growth unlevered firms : $E/P = (r_E - g) / (1+g)$ (Gordon-Shapiro see in appendix 1)
- Leveraged firms E/P is function of r_E and increases with leverage[1]

Remark Rule of thumb : "Buy stocks with a higher E/P ratio (or a lower P/E) than their industry average".

⟹ Firms in the same industry are exposed to similar business risk (same unleveraged beta) but not necessary the same financial risk

⟹ High P/E reflects availability of growth opportunities (because large earnings are expected) The expectations in Earnings enable to find the market price of P by discounting E by WACC, this gives the P/E[2].

Indeed, analysts and the market give a Fair market Value to a company by discounting expected incomes at an appropriate discount rate

[1] This result is demonstrated later
[2] See at the end of the chapter

CAPITAL STRUCTURE AND EXPECTED EPS

In MM's world expected EPS increases with leverage : this result is not that intuitive because there is a tradeoff between a loss in NI (due to interests $D*r_D$) and less equity invested by share holders (replaced by debt)

We found that leverage increases :

- Return on equity (ROE) and thus E/P.