CORPORATE FINANCE

General Objectives

To understand the evolution of the theory of business enterprise and the procedures of corporate control necessary to protect the interests of the shareholders.

To observe and analyze the market in order that the operational decisions and the strategies of the firm will be made in the interest of the shareholders.

Specific Objectives

The student will have the ability to :

Understand the changes occuring in the management and control of the business enterprise tracing the neoclassical model to the modern day organization.

Know, understand, and explain the process of agency between the owners and operators of a firm and the relationship of the shareholders, Board of Directors, and the management.

Understand, analyze, and interpret the financial statements of a firm (Balance Sheet, Income Statement, Statement of Changes in Financial Position, and the Statement of Cash Flow) and to render some conclusions on the operational decisions and the strategies made in the interest of the shareholders.

Evaluate and analyze a firm's business risk and financial risk using the leading theories of risk and return including the Capital Asset Pricing Model and the Growth Model.

Calculate and analyze the market value of an individual share and the value of the firm.

Maximize the value of a firm for the shareholders through the selection of the optimal financing structure, i.e., combination of debt and equity.

Analyze an investment project with the objective of maximizing owner value utilizing various analytical tools (payback, IRR, NPV).

Program

Course content **Pages**

1. Corporate governance – Historical development of the firm **4**

- Corporate economic description : the neoclassical model
- The agency theory
- Corporate governance
- Corporate Governance in different countries : USA, Japan, Germany
- The organizational structures

Mandatory reading : *R.A. Brealey and S.C. Myers, chapter 14*
Mandatory study : *course manual, B. Jaquier, chapter 1*

- The WACC rule
- The Net Present Value (NPV) rule
- The payback period rule
- The Internal Rate of Return (IRR) rule

Mandatory reading : *R.A. Brealey and S.C. Myers, chapters 5, 6, 7, 8 & 9*
Mandatory study : *course manual, B. Jaquier, chapter 7*

Chronology

Periods

3	Corporate governance
4	Understanding, interpreting, and using financial statements
4	Risk
6	Valuation of the firm
5	The financial structure of the firm
5	The investment decision
3	Exams

Evaluation

One written midterm exam : 30 %, with documentation
One written final exam : 40 %, with documentation
One cas study : 30 %

Course material

R.A. Brealey and S.C. Myers, Principles of Corporate Finance, 6th Edition , Mc Graw Hill

R.A. Brealey and S.C. Myers, Principes de gestion financière des entreprises, EDISCIENCE International, Mc Graw Hill

Course manual by B. Jaquier

Set of exercises by B. Jaquier

Bibliography

Finance

R. A. Brealey and S.C. Myers, Principles of Corporate Finance, Fifth Edition -Mc Graw Hill

R. A. Brealey and S.C. Myers, Principes de gestion financière des entreprises, EDISCIENCE International -Mc Graw Hill

Robert C. HIGGINS, Analysis for Financial Management, 5th edition, Irwin / Mc Graw Hill 1998

Tom COPELAND, Tim KOLLER, Jack MURRIN, Valuation : Measuring and Managing the Value of Companies, 2nd edition, (McKinsey & Company Inc), Wiley 1996

Pierre VERNIMMEN, Finance d'entreprise, 3ème édition, Dalloz gestion, Paris, 1998 Site internet : http://www.vernimmen.dalloz.fr

Organization of the firm

Paul Milgrom et J. Roberts, Economie, Organisation et Management, P.U.G. De Boeck, 1997 Edition originale 1992 – Prentice Hall Inc. NJ USA

Paul Milgrom et J. Roberts, Economics, Organisation and Management, Originale edition 1992 – Prentice Hall Inc. NJ USA

Bernard de Montmorillon et J.P. Pitol Belin, Organisation et Gestion de l'Entreprise, Litec, Paris, 1995

Gérard KOENIG, De nouvelles théories pour gérer l'Entreprise du XXIè siècle, Collection Gestion, Economica, Paris 1999

Gérard CHARREAUX, La théorie positive de l'agence, in « De nouvelles théories pour gérer l'entreprise », Economica, 1998

1. Corporate governance

A. Evolution of the corporate theory

3 hypotheses characterizing the neoclassical corporate model:

Atomicity:

One single will, which is that of the owner – entrepreneur. The company is subject to the "price taker" price. The company is in a situation of perfect competition. It cannot change all by itself the market price.

Univocity:

One single power, which is that of the owner – entrepreneur.

Homogeneity:

The typical model of supply and demand may not be applied if the product is not homogeneous. Various markets: goods and services, labour, capital.

The neoclassical model is based on 2 general hypotheses:

Information : information is freely accessible to all economic participants.
The markets are efficient (perfect competition).

Individual behaviour : each individual is rational and maximizes his/her satisfaction.

Significant contributions of the neoclassical model: calculation of the marginal, average and optimal costs, profit maximization, management tools: productivity, break-even point, elasticity, optimal size, productivity of scale, experience curve.

The above-mentioned hypotheses have been questioned:

Atomicity

It is no longer acceptable. The reason for that is the growth of economic groups : parent companies, independent subsidiaries and branches, etc. The company is a "**price maker**". The part played by the main center is to plan and coordinate.

Univocity

The ownership – management is being questioned.

Homogeneity

With the emergence of service companies, the neoclassical model is no longer applicable. A

service may not be stored. It is a co-construction. The competition on the market is based on service transactions.

B. The agency theory (from the 1960's onwards)

Foundations of the Agency theory

There is an agency-type relationship when a principal or main party (for instance, the shareholder) delegates all or part of his decisional power to another party called an authorized agent (the manager).

Agence – "agency" – delegation – mandate theory – agency theory

That is the necessary required delegation of power within the company.

Example: the division of power between the owner (shareholder) and the manager. The opening of capital to investment causes a dilution of capital and separates ownership from management.

If the owner is the manager

If the owner is the manager, there is **no mandate**. This is, for instance, the case when a company's shareholders are also the managers of that same company (classical company).

If there is **no delegation** (the shareholders are also the managers), there is no agency and therefore no agency costs.

In other words, if **the corporate structure is non-diversified** (3 functions):

Ownership : Shareholders
Management : Managers
Control : Board of Directors

There is only one party (owner – manager) and therefore no agency costs.

If the owner and manager are separate

A mandate is needed. In this case the ownership and technostructure are separate.

Advantages of a diversified structure:

Financial means: opening of the capital to the public
Increase in the number of shareholders: increase in capital
Specification of management contributions: efficiency, specificity
Allows a control
Minimizes the risks for shareholders, who may then diversify their investment portfolios.

Agency costs

As soon as relationships are created, **agency costs** are brought about. These costs are due to:

Bounding expenditures : costs granted by managers in order to convince shareholders that they are acting in the shareholders' best interests. For instance: expenses incurred to inform the shareholders.

Monitoring expenditures incurred by the Board of Directors : time cards, overhead expenses.

Residual loss : difference between the actual growth rates and the rates expected by shareholders.

Opportunity costs : they make up the profit a company gives up when a duty is delegated to an authorized agent.

C. Corporate governance

Definition : process and structure used to run and manage corporate business and affairs in order to **enhance the company's value vis-à-vis its shareholders**.

The process and structure **determine the division of power** and establish mechanisms to fulfil all duties towards the **shareholders**, **Board of Directors** (BoD) and **management team**.

Governance problems during the 1970's and 1980's

Corporate managers were criticized for their lack of accountability (1970's) and for being concerned about **their own personal interests**.

Why? It stems from an agency problem that is the separation between, on the one hand, ownership and control (dispersed shareholders and managers who were shareholders as well) and, on the other hand, self-interest. The conflicts were mainly due to the distribution of free cash-flow.

During the 1980's, the CEOs' incomes increased by 212%, while during the same period of time the increase in S&P was only 78%.

The consequences were a drop in market shares, a drop in profitability and poor mergers.

Changes since the 1980's

The most important changes were due to the growing importance of **institutional investors** (mutual funds with seats on the BoD – 55% in the USA – creation of shareholder pools, dialogue between owners and managers, relationship investing).

The BoD moved towards **a greater involvement**. The BoD is responsible for protecting the shareholders' interests.

BoD duties

Define the general direction in which the company should be heading
Approve the Mission and overall strategies
Advise the CEO
Select and assess the CEO (for instance, on a yearly basis)
Plan for the CEO's succession
Approve the capital allocation
Define ethical values and social responsibility

Determine the composition, structure, process and specific features of the BoD:

- Term limit
- Number of members
- Mandatory retirement
  etc.

BoD : negative aspects

Insufficient knowledge, **no ideas** for changes (market and technology), **lack of information or overabundance of information** from the management team, **lack of consensus**, **too many members**, **members staying too long on the Board**, **CEO holding too much power**.

A good corporate governance

It is supposed to make sure that **the shareholder's interests** be protected.
It requires an **accountability system**: management – BoD – shareholders
It requires **vigilance**: BoD – CEO / shareholders – BoD

The BoD must consist of **qualified members who do not belong to the company's staff** (external). The company should provide **guidance and training** for the new BoD members. The **positions of CEO and Chairman should be separate** (external member). The voting procedure should be that of a **secret ballot**. The BoD should consist **at the most of 9-11 members**, who will not serve on the Board for more than two terms of office.

See Sairgroup case, B. Jaquier

USA

Ownership:

- Extremely dispersed shareholding.
- If shareholders are dissatisfied, they may form a block and stand together when voting. But that is expensive and attempts usually fail.
- They may also choose to sell their shares.

The sale of shares by dissatisfied shareholders gives an important signal to the market. The stock price may drop. In that case the part played by the market is that of applying sanctions.

The drop in the price of shares, following which the company is faced with the threat of aggressive takeover bids, is dangerous for the managers, their reputation and income because part of their earnings is made up of bonuses linked with both overall results and "stock options" (interesting when the stock price rises).
How do managers react when the stock price drops? It should prompt them to increase the earnings and stock price and therefore to act in the shareholders' interest.

Control by the Board of Directors. The administrators are the company's managers.

BoD is elected by shareholders

- The BoD approves main investments and major financing decisions.
- It selects the managers.

There is no control block (managers or one single investor). In 1988, the percentage held by BoD chairmen amounted to 0.037% among the 120 major companies.

Thus there is a clear split between ownership and control.

How are administrators encouraged to act in the shareholders' interest? This is called an agency or mandate matter.

In the USA, the rules are the following: the income depends on the variations in earnings and stock price. Therefore, administrators are legally forced to act in the shareholders' interest.

GERMANY : Daimler-Benz AG

There is a **clear concentration of shareholders** in large blocks (cross-holding of shares with other companies and banks). Aggressive takeover bids are unusual or even impossible to achieve.

This **cannot be the case in the USA** where the federal law prohibits equity investments by banks in non-financial corporations).

Small investors have a lot less influence than they do in the USA. The large blocks of investors do not need them. This pattern implies a major risk of collusion between majority investors and managers in order to ensure a comfortable life for themselves.

JAPAN

The features specific to the Japanese system of corporate governance are the **Kiretzus**: this system consists in a network of companies organized around a major bank. They maintain lasting business relationships.

The shareholding consists in a cross-holding of shares. The banks hold shares of the various companies. The companies hold shares of both the banks and the other companies.

The managers may sit on the Boards the other companies making up the group. A Board of Chairmen is formed and gathers together the Chairmen of the Boards of Directors of all major companies in the group.

The number of shares available on **the market** is a lot lower than the number of existing shares. Therefore, takeover bids are almost unthinkable.
The power is divided between the major bank, the largest companies and the group as a whole.

The financial advantages are the possible access to internal financing. When a company is faced with financial problems, a solution may usually be found within the group. The management team may be replaced by executives coming from other companies of the group and financing may easily be found.

The investments made by the group are more stable and less exposed to risk. This system enables the members to invest in the long term.

The disadvantage is that the managers' incomes are only seldom linked with the performance and returns recorded by shareholders.

3. The organizational structures

The functional organizational structure :

Strategic advantages:	permits a centralized control of strategic results, suited for structuring a single business, etc...
Strategic disadvantages :	works against creative entrepreneurship ; can lead to inter-functional rivalry and conflict, rather than cooperation ; may promote overspecialization and narrow management viewpoints ; functional specialists often attach more importance to what is best for the functional area than to what is best for the whole business ; etc...

The geographic organizational structure :

Company with several geographical units

Strategic advantages : allows to adapt strategy to each geographical market ; delegates Profit / Loss responsibility to lowest strategic level ; takes advantage of economies of local operations ; etc...

Strategic disadvantages : difficulties : coordination, cooperation, area managers more interested in their unit than in the corporate aspect; etc...

The decentralized organizational structure :

The matrix-organization structure

In the matrix-organization structure, the teams are divided into areas of competences (management by project). This structure is therefore an organization by project.

Strategic advantages : gives formal attention to each dimension of a strategic priority; facilitates the capture of strategy ; people think on a corporate level; etc..

Strategic disadvantages : complex to manage ; promotes bureaucracy ; etc...

The horizontal corporation

Is managed across, not up and down, without hierarchy, where self-managing teams are responsible for running key processes, eliminating departmental boundaries;

The horizontal structure eliminates most internal tasks of the organization; focuses almost all of the company's resources on its customers; etc...

Key elements of a horizontal corporation :

- Organized around process, not task
- Flattened hierarchy
- Lets customers drive performance
- Rewards team performance
- Maximizes supplier and customer contact
- Informs and trains all employees
- Etc.

2. Understanding financial statements

Financial management involves the understanding and interpretation of accounting figures in order to assess the company's performance and plan future actions. The skills of financial diagnosis are essential to a broad range of people, including shareholders, lenders, financial analysts, tax authorities and regulators. But they are also, and above all, of prime importance to managers, whatever their functions within the company. Without a clear understanding of financial data, they will be unable to diagnose their firm's problems, recommend useful remedies, take specific actions and anticipate the financial consequences of their decisions.

What is a company from an accounting and financial point of view?

A company is:

- a certain number of uses of funds (accountants call it assets)
- which are financed by some financial resources coming from different origins (the owners or shareholders, the lenders, ..) (Accountants call them equity and liabilities)

With the assets, we carry out various operations, which are classified as revenues and expenses in order to explain the generation of profit, or income, or earnings. This is the Profit & Loss Statement, or Income Statement.

So the firm gathers a certain number of financial resources in order to:

- finance some assets, with which it will operate to
- generate a profit and also
- to generate a cash flow :
    - reward the investors (shareholders) (dividend)
    - self-financing (retained earnings). Consequence for the following period : increase in financial resources, increase in assets, increase in operations, increase in profit, increase in cash flow, part of it will be reinvested in the company, and so on and so forth.

  This third statement is the Statement of cash flow.

Financial management is basically the management of 3 fundamental aspects:

- The financial structure (balance sheet): "Is the mix of resources used by the company the right one or not?" "Is the mix of assets satisfactory?"...

- The profitability (Profit & Loss Statement): "How do we assess the profitability of the company?" "How do we measure it?"...

- The liquidity (the Cash Flow Statement): What is the cash flow generated from the operations? "How can we improve it?"...

The reason why financial management is a complex matter is that we have to try and be good as regards all 3 aspects at the same time:

- optimizing the profitability
- and the liquidity of the firm
- with the best possible financial structure

Many companies are quite good at one or two of these three essential aspects but that is not enough.

First financial statement : the BALANCE SHEET

From the balance sheet, we are going to derive 3 fundamental concepts:

- Working capital (WC)
- Working capital requirements (WCR)
- Net cash position

WC	Permanent capital :
Net fixed assets	. LT debts . Owner's equity (common stock or capital, retained earnings)

WORKING CAPITAL

WC = Permanent capital - net fixed assets

WC represents the funds available over its long-term basis, to work in the operating cycle of the company.
WC is not going to change every day (if WC is computed as the difference between Current assets and Current liabilities, it gives the impression that WC is affected by daily transactions).

WC is dependent only upon:

- the strategy of the firm
- with respect to its long-term decisions.

WORKING CAPITAL REQUIREMENTS

Inventories + Accounts receivable (sales not collected) + Prepaid expenses (insurance, rent, etc…) - Accounts payable (purchases not paid) - Accruals (tax, social security contributions, customs payments, etc…)
= WCR

WCR is the balance between the portion of current assets and the portion of current liabilities which are directly and exclusively associated with the operating cycle [purchasing - storage - production - storage - sales - collection]. It represents the funds necessary to run the daily operations.

WCR is positive

That means a net requirement of funds. WCR is most often positive.

WCR can be negative

It means a net source of funds. In a few economic sectors such as the supermarket business, WCR can be negative: firms collect their sales before they pay their suppliers, high inventory turnover

WCR increases with the firm's sales even if:

- same inventory turnover
- same collection period
- same suppliers' credit terms

Thus, a firm in a period of growth should expect an increase in its WCR. As a consequence, the induced investment should be considered as an integral part of the firm's CAPEX program in any new production investment project. Finally, the WCR change with the seasonal activity of the business, if there is any.

NET CASH POSITION

If :

- WC represents the funds **available** after we have financed the long-term assets, to work in the operating cycle of the company and if
- WCR measure the funds **necessary** to finance this operating cycle

the Balance Sheet can be viewed as a **dialogue** between WC and WCR.

WC says: how much I bring to the operating cycle

WCR answers: how much I need for the operating cycle
The difference between the two is the Net Cash Position (NCP).

Fundamental Balance sheet equation: NET CASH POSITION = WC - WCR

If WC > WCR : we have a positive net cash position
If WC < WCR : we have a negative net cash position (need for short-term borrowings)

The NCP is equal to the liquid assets (cash, marketable securities and short-term investments) minus short term borrowings (short-term bank loans).

<table>
<tr><td rowspan="2">Net cash position</td><td rowspan="2">Liquid assets</td><td>Short-term borrowings</td></tr>
<tr><td>Accounts payable
- Accruals</td></tr>
<tr><td rowspan="2">WCR</td><td rowspan="2">Inventory
Accounts Receivable
Prepaid expenses</td><td rowspan="2">Permanent capital
- Long-term debts
- Equity
- Retained Earnings</td></tr>
<tr><td>WC</td><td>Net fixed assets</td></tr>
</table>

The fundamental Balance sheet equation leads to 3 main comments:

- The liquidity position of a company is the result of strategic (long-term) and operating (short-term) policies of the firm.

- What is important is not the level of WC as such but its relation with the WCR.

  A company with a high WC might be in financial difficulties if its WCR are even higher. On the other hand, a firm with a tiny WC (or even a negative one) might be in a good financial position if its WCR are even smaller (or more negative) than its WC.

- Finally, this relation will be used more often in its dynamic version (instead of its static one), where the variations, the changes would be considered (and not the absolute amounts).

Δ Net Cash position = Δ WC - Δ WCR

Liquidity is a direct consequence

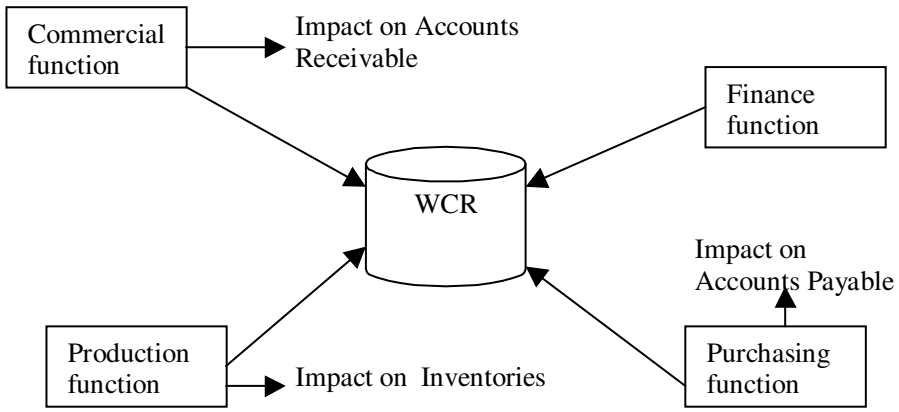
- of decisions affecting the WC : strategic decisions : investment or divestment, stock issue or share repurchases, long-term debt issue or retirement, dividend decisions which have an impact on the retained earnings level...
- and decisions affecting the WCR : operating decisions changing the level of inventories, accounts receivable, accounts payable or net accruals.

Operating managers (in the production field, commercial activities or purchasing functions)

influence the liquidity of the firm every day.

That is why the concept of WCR is essential. The control of its level and its fluctuations through time is of prime importance to the liquidity of the firm.

WCR represent the meeting place of the various functions within the company



Second financial statement : standard "PROFIT & LOSS STATEMENT"

Net sales - Cost of sales	
= Gross margin	
Other operating expenses : - Salaries & Wages - Selling expenses - Administrative expenses - Depreciation - Other expenses	
= Earnings (or Profit) before interests and Taxes (EBIT) - or - Operating Profit	The EBIT is independent of the financial policy of the firm. It allows relevant comparisons of profitability between firms with different financing policies and subject to different tax systems.
- Interest expenses + Interest income +/- Exceptional items	
Profit before taxes (PBT)	
- Taxes	
Net profit after taxes (PAT) - or - Net Profit	PAT will be, for one part, paid in dividends to the shareholders and, for the other part, reinvested in the company, under the so-called "Retained Earnings"
+ Depreciation	
Internally generated funds (or funds provided by operations)	

Third financial statement : the "STATEMENT OF CASH FLOW"

Net profit after taxes (PAT) - or -
Net Profit
+ Depreciation

= Internally generated funds (IGF) (or funds provided by operations)

- Increase in WCR - or -
+ Decrease in WCR

= Operating cash flow (OCF) (cash flow provided by operations)

It is a central and crucial concept for financial management. It measures the ability of the firm to generate, through its day-to-day operations, a flow of cash, and therefore evaluates its capacity for survival and for long-term growth. If it is low (or worse, negative) over a certain period of time, it shows the inability of the company to meet its financial obligations and to make the necessary Capex required to operate efficiently and produce funds for future periods.

It is the long-term engine of the company.

It is quite possible that OCF < IGF : reasons : the accounts receivable have increased due to problems faced by our customers, the inventories might have gone up because of difficulties in the marketplace...
If IGF - Δ WCR = -300 : it means that you have to find outside resources, and this before talking about strategic expenses such as new investments and financial obligations.
The OCF is the basic and fundamental source of cash for the investment policy of the company.

The higher it is, the better it is, the more freedom and flexibility it gives to the firm to build its LT strategy without constraint and interference from finance. The meaning of an optimization of OCF is twofold:

- Optimization of the IGF, through increased profitability
- Efficient management of the WCR, through inventory management, credit policy management and suppliers' payment management.

- New Capex — Capex program, acquisition of other long-term assets (investment in other companies)
+ Sale of fixed assets
- Purchase of fixed assets

= Cash flow available (or needed) after investing activities

- Repayment of LT debt
+ New LT borrowing
+ Issue of shares
- Repurchase of shares
- Dividend (Net profit - Retained earnings)

= *Total Cash Flow* : it is equal to the variation of the Net Cash Position.

The Cash Flow Statement is nothing other than an extended version of the Balance Sheet equation, described earlier:

Δ in Net Cash Flow Position (or Total Cash Flow) = Δ WC - Δ WCR

+ Net change in short-term debt (new short-term debt - repayment of short-term debt)
- Net change in marketable securities and other short-term investments

= Net increase (or decrease) in cash

Source: Understanding Financial Statements, Marc Bertonèche, Professor, University of Bordeaux I, Ph.D. in finance of Northwestern University, visiting Professor at Harvard Business School and at Oxford University

3. Interpreting and using financial statements

In order to properly interpret and efficiently use the financial statements of a firm, we need a certain number of financial ratios. They are fundamental tools to assess the financial health of the firm, understand the various levers on which management has control and compare across firms. But in order to be helpful tools, 2 basic conditions must be met:

- To have a limited number of well-selected and meaningful ratios.
- To use these financial ratios efficiently in a managerial way.

Main financial ratios classified into 4 main categories:

- Profitability ratios
- Financial structure ratios
- Activity ratios
- Liquidity ratios

Profitability ratios

Profitability can be measured from 3 different points of view:

- commercial one : how much profit a company is generating per $ of sales
- economic one : how much profit the firm is generating from the use of its assets
- financial one : how much profit the owners are making on their investment in the company.

Commercial profitability : ROS (Return on sales)

$$ROS = \frac{PAT}{Sales} x100$$

Net profit (PAT) can be affected by taxes (change) or interest (change in financial policy). So, it is better to take EBIT. Taxes and Interests are outside the control of operating managers.

$$ROS = \frac{EBIT}{Sales} x100$$

Economic profitability : ROA (Return on Assets)

ROA does not depend upon the way the firm finances its assets. We usually define ROA on a pre-tax basis to make international comparisons and compare profitability across firms with different financing strategies.

$$Pre\text{-}tax\ ROA = \frac{EBIT}{Assets} x100$$

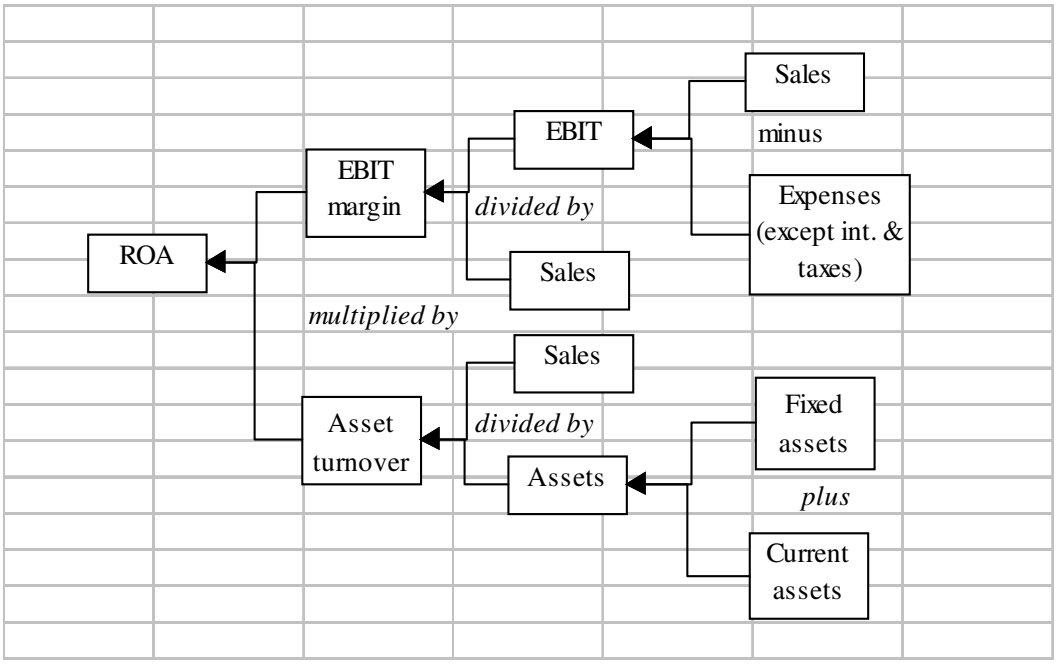
ROA ratio can be decomposed into 2 elements: ROA = Profit margin x Asset turnover

$$Pre\text{-}tax\ ROA = \frac{EBIT}{Total\ Assets} = \frac{EBIT}{Sales} \times \frac{Sales}{Total\ Assets}$$

You can impact the company ROA either by improving the Profit margin (through cost control or Revenue increases) or by improving the Asset turnover (through a better capacity utilization or a more efficient WCR management).

The Dupont Chart is a very useful managerial tool, because it is a quick and simple way to show to the various managers, in charge of different functions (production, purchasing, administrative, marketing and sales, etc...) their impact on the overall ROA. It provides an interesting tool to explain to commercial managers that increasing the profit margin, through a price rise, may have an adverse effect on the ROA of the company if, at the same time, the Asset Turnover decreases because of a much longer collection period, for example.

Making everybody in the organization sensitive to his/her potential role in the improvement of the ROA is a real benefit of such decomposition.



If, for any reason, we want to consider the ROA after tax, the definition will be the following:

$$After\text{-}tax\ ROA = \frac{EBIT.(1\text{-}t)}{Assets} \times 100 = \frac{Net\ Profit + (net\ interest)}{Assets} \times 100$$

"t" is the corporate tax rate. Net interest represents the net cost of interest after taxes.

Financial profitability : ROE (Return on Equity)

This is an after-tax measure, since the shareholders are interested in what is left and therefore what belongs to them after everything has been taken into account including the tax payments.

$$After\text{-}tax\ ROE = \frac{Net\ Profit}{Equity}\ x\ 100$$

While ROA is a fundamental measure of the efficiency with which a firm manages its assets (the Overall company's point of view), ROE is a basic measure of the efficiency with which the firm employs the owners' capital and estimates the earnings per dollar of invested equity capital (the shareholders' point of view). It incorporates the consequences of the financing policy of the firm that is the way the assets are financed. This is called the "financial leverage".

ROE ratio can be decomposed into 3 elements:

ROE = Profit Margin x Asset Turnover x Financial Structure

$$ROE = \frac{Profit}{Equity} = \frac{Profit}{Sales}\ x\ \frac{Sales}{Assets}\ x\ \frac{Assets}{Equity}$$

This decomposition shows the 3 levels for managerial control of ROE. It also demonstrates that 2 companies may have the same ROE, but resulting from very different cocktails or strategies. A ROE may be based on high operating margins combined with a rather poor asset turnover and a low indebtedness but it may very well be the combination of low operating margins capitalized by high productivity of assets and a high financial leverage.

Why do we want to maximize ROE? Because we want to make our shareholders happy. That is the fundamental objective of the firm if it wants to keep open all possible access to any source of money. How can we expect to raise additional funds from our shareholders if we do not provide them with a return, given the risk they are accepting to take in investing their money in our firm? If you do not make your shareholders happy, somebody else is going to make them happy... If the shareholders do not receive an acceptable reward, they will be open to any offer to sell their shares at what they consider to be a good price.

There is a second fundamental reason why we want to maximize ROE: it is to maximize our Self-Sustainable Growth (SSG). What is SSG? It is the rate of growth that a company can maintain (can sustain) internally without changing its financial structure (D/E). Therefore, the basic question is: given the firm's characteristics how large a growth rate can it support without distorting its D/E ratio and without raising an additional outside equity capital?

Example : Assets : 1000 ; Debt : 500 ; Equity : 500 ; ROE : 20 % ; retention rate (r) : 40 % (the dividend payout ratio is 60 %)
Net profit : 100 ; Dividend : 60 ; retained earning : 40 ;

Therefore, the equity of the firm is going to increase by 40. The firm could, without changing its D/E ratio, add 40 to its existing debt. The Asset base of the company could therefore increase by 80, which means 8 % of the starting 1000 base.

If we assume a constant Asset Turnover (Sales / Total Assets), it means that sales can grow at a rate of 8 %. SSG represents a kind of financial constraint to growth.

SSG = ROE x r

How can we increase SSG? Essentially by acting on 2 parameters:

- Improving ROE : it requires 3 types of action, as we have seen earlier :
  - Improving the operating margin
  - improving the asset turnover
  - improving the leverage factor
- Increasing the profit retention rate (which means decreasing the Dividend Payout Ratio)

Some companies are constrained to accept a low rate of growth (while their competitors are able to grow at a much higher rate) because of a basic weakness in their ROE (often combined with a rather high dividend payout ratio). No surprise that they have a hard time competing and maintaining their market shares.

The fundamental relation between ROA and ROE: the concept of "financial leverage"

2 firms completly identical except the financing

Firms		A	B
Assets		2000	2000
Financing :	Equity	100 %	50 %
	Debts	0 %	50 %
Interest rate			15 %
EBIT		500	500
Interest		0	(150)
EBT		500	350
Tax 50 %		(250)	(175)
PAT		250	175
Lenders : net interest		0	75
Shareholders		250	175
Total		250	250
Before tax	ROA	25.00%	25.00%
	ROE	25.00%	35.00%
After tax	ROA	12.50%	12.50%
	ROE	12.50%	17.50%

For company A, ROA = ROE. That is no surprise since only shareholders brought money in the company. The return shareholders' money is therefore equal to the return on the company assets.

The ROA of firm B is the same as the ROA of firm A, which is normal since we considered 2 identical companies (the only difference being the way they financed their assets)

The ROE of firm B is higher than the ROE of firm A and higher than its ROA. Why ?
Because every time firm B borrows 1$ it costs the firm 15 % (before taxes or 7.5 % after taxes). This $ is invested in the company at a return rate of 25 % (before taxes or 12.5 % after taxes). This positive differential is going into shareholders' pockets. This is called financial leverage. In other words, financial leverage is the ability of the company (or an individual) to invest borrowed money at a higher rate than the interest rate.

Let's generalize this example into a more formal relation. Let's consider a firm with the following balance sheet:

A (total assets)	D (debt) ≡ i
	E (Equity)

What is the Profit (π) Equation of this company?

$$ROE = ROA + [(ROA - i).\frac{D}{E}]$$

$$Leverage\ factor = [(ROA - i).\frac{D}{E}]$$

What is this formula telling us ?

The ROE of a company (the financial profitability) is equal to the ROA (the economic profitability) plus a Leverage factor which is dependent upon 2 elements :

- the difference between ROA and the cost of interest
- the Debt Equity ratio, sometimes also called the "gearing ratio"

Firm A : no debt : If D = O Leverage factor = 0. In that case ROE = ROA
Firm B : D is positive : 3 possible situations :

- ROA > i : the company is able to invest the borrowed money at the rate which is higher than the cost of interest. In that case, the Leverage factor is positive.

- ROA = i : in that case (ROA - i) = 0, which means that the Leverage factor = 0. We have therefore ROE = ROA, the shareholders of the company are not benefiting from the use of borrowed money by the company.

- ROA < i : In that case (ROA-i) is negative, which means that the Leverage factor is negative. Then, ROE is less than ROA, the return to the shareholders being deteriorated by the use of borrowed funds by the company.

Some comments

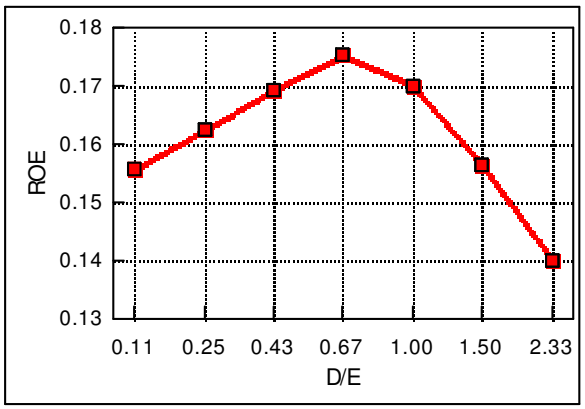
The formula of financial leverage can be used on a pre-tax or on an after-tax basis, as long as we are consistent in the definition of the concepts.

The Leverage equation reminds us of the tremendous competitive advantage of companies living in environments where interest rates are low. If a company in one country can borrow funds at 5 % per year, it will just need to generate a 6 % ROA to enjoy positive leverage.

Negative financial leverage can appear when firms face high levels of interest rates and depressed ROA caused by rising costs, increased competition, price controls, etc.
We should be very careful in interpreting the leverage formula. An easy conclusion would be to say that as long as the differential between ROA and i is positive, we should borrow as much as possible. It should be obvious that the more the firm borrows, the higher i is going to be, due to increased financial risk

As long as ROA > i, ROE is going to increase. But at some point in time, because the interest costs are going to increase and the average ROA is going either to stabilize or even go down, we reach a "plateau" and then if we insist on incurring more debt, we will reach a situation of negative leverage, that is a situation where shareholders are penalized by the debt policy of the firm. This area, where ROE is optimal, is referred to as the **optimal capital structure**.
Many well managed firms have a Debt/Equity ratio which is much lower than their optimal one (Ford, IBM,…). The reason for this is Financial risk and Flexibility. Keeping a debt potential is a fantastic strength, since the company is able, if there is a need for it, whether for an aggressive strategy or for a defensive one, to borrow without any problem a huge amount of money (financial flexibility).

D / E	0.11	0.25	0.43	0.67	1.00	1.50	2.33
ROA	15.00%	15.00%	15.00%	15.00%	14.50%	14.00%	14.00%
i	10.00%	10.00%	10.50%	11.20%	12.00%	12.90%	14.00%
ROA - i	5.00%	5.00%	4.50%	3.80%	2.50%	1.10%	0.00%
Leverage	0.55%	1.25%	1.94%	2.55%	2.50%	1.65%	0.00%
ROE	15.55%	16.25%	16.94%	17.55%	17.00%	15.65%	14.00%



There are some variations of the ratios we defined, especially as far as Return on Assets is concerned.

$$ROA=\frac{Profit}{E+Interest\text{-}bearing\ debt}$$

Equity and Interest-bearing debt is the sum of all company capital on which a return must be earned, because they are bearing a cost. Therefore, all non-interest liabilities (Accounts payable, accrued taxes, accrued liabilities…) are excluded, since they carry no explicit cost. The idea is that if, in a firm, non interest-bearing liabilities are increasing, it could - everything else being constant - decrease the ROA.

For an evaluation of the performance of divisions, branches or profit centers, we should adapt the tools defined at the company level, since divisions, branches or profit centers seldom have debt or equity of their own, and the financing being done at the corporate level. The most common technique for assessing profitability at that level is the ROI. This is defined as the division (or branch or profit center) earnings divided by the division (branch or profit center) assets.

$$ROI=\frac{Profit\ of\ Division\,(branch,\ profit\ center)}{Assets\ of\ Division\,(branch,\ profit\ center)}\ x\,100$$

More precisely this ROI divides the unit EBIT by the assets over which the operating manager has direct control, that is, in most cases, fixed assets and WCR.

$$ROI\ of\ a\ unit=\frac{EBIT}{Fixed\ assets+WCR}$$

Financial structure ratios

$$Total\ Debt\text{-}Equity\ ratio=\frac{Total\ Debt}{Equity}$$

We already met this ratio. This ratio considers the total borrowed funds including interest and non interest-bearing debt. But we can only take into consideration the financial debt that is the interest-bearing debt.

$$Debt\ -\ Equity\ ratio=\frac{Interest\ -\ bearing\ Debt}{Equity}$$

Determining the appropriate level of debt for a company is a major responsibility for corporate financial officers and one of the most difficult problems in finance. It varies very much according to countries. Within one country, it varies also very much according to companies. The name of the game here is Risk.

The business risk : risk associated with the nature of the business in which the firm is operating.

The financial risk : risk created by the way the firm finances its assets.

Basic rule : if a company is operating with a high business risk (highly competitive environment, low barriers of entry in the industry, high potential substitution of products, etc), it should not add a high financial risk to it in order to maintain the overall risk within acceptable limits. In that case, the ratio D/E should be rather low. This is the reason why some industries today (Ford, High-Tech sector) have a very conservative financial policy.

Conversely, firms having a low business risk (monopolies, low substitution of products, high barriers of entry in the industry, etc…) can safely take more financial leverage and sustain more debt in their financial structures. This explains why in recent years, we have experienced most of the LBO's (Leverage-Buy-Out), that is acquisitions of firms with a very high D/E ratio (Energy industries, Food and Drinks Industry, Cigarette business...)

World's 1000 largest companies : D/E ratio	
USA	1.1
Switzerland	1.4
Germany	2.7
France	4
Japan	5.3

Coverage ratios

The objective of these ratios is to assess the ability of the firm to meet the financial contractual obligations linked with debt. We select 2 coverage ratios.

$$Interest\text{-}coverage = \frac{EBIT}{Interest\ expenses}$$

This ratio relies on a basic implicit assumption, i.e. that the company can always roll over its maturing obligations by taking out new loans as it repays old ones. That is why we add a second coverage ratio which includes as financial obligation not only the interest expenses but the part of debt principal amount to be repaid during the period.

$$Total\ Coverage = \frac{EBIT}{Interest\ expenses + \frac{Principal\ repayments\ of\ the\ period}{(1\text{-}tax\ rate)}}$$

Let's assume a company borrows 1000, bearing an interest rate of 10 % and to be repaid with 5 years in 5 equal instalments.

EBIT	300	500
Interest expenses	(100)	(100)
EBT	200	400
Tax 50 %	(100)	(200)
Net profit	100	200

Interest-coverage	3.0	5.0
Total coverage	0.6	1.0

We can clearly see that in order to cover the total burden of our debt, we would have to generate an EBIT of 500 so that after deducting the interest expenses of 100, we would be left with an EBIT of 400, 200 of which would go to taxes and the other 200 would be available to face the principal repayment.

This second ratio appears to be more realistic than the first one but it relies on a basic implicit assumption, i.e. that the company will repay its existing debt down to zero. In that sense, it may often be too drastic.
It is therefore logical to conclude that the Interest-coverage ratio is too liberal, since it assumes a complete and permanent roll over of all the company debt obligations as they mature and the total-coverage ratio is too conservative or drastic since it assumes a total payment by the firm of all its existing debt down to zero. This means that both ratios have to be closely and carefully analysed, since it is clear that a company failing to meet an interest payment and / or a principal repayment can be forced by its creditors into bankruptcy.

Activity ratios

The purpose of these ratios is to evaluate the efficiency with which the firm operates. We will define 4 main ratios:

The Asset Turnover (ATO)

$$Asset\ Turnover = \frac{Net\ sales}{Tot\ Assets}\ x\ 100$$

It measures the sales generated by each $ of assets. More than the level of this ratio, what is important is the trend. But the conclusions derived from it have to be drawn very carefully.

An improvement in the ATO may indicate a great deal of efficiency and creativity in managing and controlling the company assets. But it may also reveal that some assets (especially fixed assets) are not renewed, which may create some long-term efficiency problems.

A deterioration in ATO may give a signal of poor asset management but it may also be the result of an ambitious program of asset renewal or an aggressive policy of acquisitions.

In some companies, sales may not be the best indicator of activity. Some financial analysts will then prefer the concept of Added Value, defined as the Production of the period minus the goods and services acquired by the firm outside and used during the same period.

Among these assets, currents assets, especially Inventories and Accounts Receivable, may be very heavy. They may sometimes account for 50 % or more of total assets. It is therefore crucial to manage and control these assets efficiently. The next 2 ratios deal with them.

The inventory turnover (IT)

$$Inventory\ turnover = \frac{Cost\ of\ sales}{Average\ Inventory}$$

More than the level of this ratio, what is crucial to assess is the trend.

The Average Collection Period (ACP)

$$Average\ Collection\ Period = \frac{Accounts\ Receivable}{Average\ daily\ sales}$$

It measures the average time lag between sale and receipt of cash from the sale.
The ACP varies a great deal among industries. Almost nonexistent in the supermarket business, it may be very long in some industries. It varies also very much among countries.

The Average Payment Period (APP)

$$Average\ Payment\ Period = \frac{Accounts\ Payable}{Average\ Daily\ Purchases}$$

It measures the average length of credit given to the company by its suppliers.

Liquidity ratios

There are 2 traditional, very popular and widely accepted liquidity ratios. Let's recall them just to emphasize their weaknesses and how misleading they can be sometimes for managers.

$$Current\ ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

The idea is that the higher this ratio is, the more liquid the company is. There are at least 3 weaknesses in this ratio.

- Not all current assets can be quickly transformed into liquidity to meet maturing short-term obligations (inventories).

- This ratio can improve for the wrong reasons. If a firm is facing difficulties due to an economic recession, it is quite possible that its inventories are going to pile up and that the customers, being themselves in trouble, are increasing the period of credit, therefore increasing the amount of Accounts Receivable of the company. Are we going to conclude that the liquidity of the firm is improving? No, it is just the reverse. How can we trust a liquidity ratio which is improving when the liquidity of the firm is deteriorating. In fact, it is a Liquidation ratio more than a liquidity ratio.

- This a very static measure, since it is not using any flows but only amounts at some specific time. If a company has to pay its suppliers at the beginning of the month (let's say on the 5th), while its customers are paying the firm at the end of the month (for example on the 25th), it may very well have constant liquidity problems. Despite a good current ratio, the firm is likely to run after cash every month between the 5th and the 25th.

$$Quick\ ratio = \frac{Current\ Assets - Inventories}{Current\ Liabilities}$$

This second traditional ratio is a little better since it recognizes the first criticism that is the potential relative illiquidity of inventories. But the 2 other criticisms hold: it takes a liquidation approach. There again, it is a static ratio.

Having stressed the weaknesses of the traditional ratios, we propose 2 liquidity ratios using the fundamental concepts derived from the Cash Flow Statement of the company.

$$Operating\ liquidity = \frac{Operating\ Cash\ Flow}{Sales}$$

How much, per $ of sales, are the operations of the firm generating in cash? This ratio also shows the impact that fast growing sales may have on the cash flow provided by operations.

$$Total\ liquidity = \frac{Total\ Cash\ Flow}{Sales}$$

How much, per $ of sales, is the firm generating in cash, after considering operating, investing and financing activities? What is the ability of the firm to build up some cash reserves, for future strategic or financial moves?

Now we have built our check-list of the main financial ratios. They are quite sufficient to undertake any diagnosis and evaluation of the financial performance of any company. The only problem is how to use them effectively, whether we are managers, shareholders, bankers, or regulatory authorities.

Some guidelines for an effective use of financial ratios

- Effective use of financial ratios requires trend analysis
- Effective use of financial ratios involves industry norms for comparison purpose, but
    - there is no guarantee that the industry as a whole is giving the truth
    - remember that these industry norms and key business ratios are averages and one should sometimes be sceptical when it comes to averages.

- Use financial ratios for future assessment and not only for past financial performance evaluation.

Financial ratios are too often used only on past and present data but it should also be

complemented by some future assessment. This is a much more future-oriented and relevant philosophy for decision-makers.

These ratios give us signals, as in the cockpit of a plane. Managing a company, like piloting a plane, requires a good understanding of the signals and of their interrelationships, a good ability to react if an unexpected red signal starts to flash, and a precise knowledge of the levers to activate in order to make the necessary adjustments and have a safe and enjoyable trip.

Source: Interpreting and using financial statements, Marc Bertonèche, Professor at University Bordeaux I, Ph.D. in finance of Northwestern University, visiting Professor at Harvard Business School and at Oxford University.

4. THE RISK

Market risk and specific risk

Market risk (or systematic risk, or non diversifiable risk) is due to the global evolution of an economy, of fiscal policy, of interest rates, of inflation, etc... It is inevitable. The dangers that are inherent to these factors affect the entire economy.

Specific risk (or intrinsic risk, or non-systematic risk, or diversifiable risk) is entirely independent of global phenomenon, it is a direct result of a specific event affecting one group or individual : a new technological progress, a fire in a factory,...

Diversification of investments largely reduces this risk (not putting all one's eggs in the same basket). If I have one share, the risk is high. If I have 20 shares, the risk is almost zero.

Expected return on a firm's stock

$R_s = R_f + p$

Rs = Risk free rate (Rf) + Business risk premium (BRP) + Financial risk premium (FRP)

p :	Business risk premium + Financial risk premium
BRP	depends on the volatility of sales and operating leverage (fixed costs / variable costs)
FRP	depends on the financial leverage
Unlevered firm :	Rs = Risk free rate + Business risk premium
Levered firm :	Rs = Risk free rate + Business risk premium + Financial risk premium

CAPM (Capital Asset Pricing Model)

It models the risk expected and expected return trade-off in the capital market.

$R_s = R_f + p\ (BR_P + FR_P)$
$R_s = R_f + p$
$R_s = R_f + [\beta\ (R_m - R_f) = p]$
$R_s - R_f = \beta\ (R_m - R_f)$
Risk premium required on a stock : $(R_s - R_f)$
Risk premium required from the market : $(R_m - R_f)$

R_s :	Expected profitability of a share : is equal to the risk free rate increased by the market risk premium of the share.
R_f :	Risk free rate. For example, the rate of T- Bills or national Bonds: these investments are not affected by the markets' ups and downs. Their β is equal to 0. (Average return on T - Bills from 1926 to 1994: 3.7 %)
R_m :	Expected market profitability rate. (Standard & Poors Index of 500 stocks):

average annual profitability rate from 1926 to 1994: 12.2 %)

(R_m - R_f) : Risk premium of the market. The market risk premium is the difference between the rate of profitability expected by investors and the risk free rate. The current rate is between 3 and 4%. Over a period of 69 years, the US market risk premium rate has been 84% (historic risk S & P 1926 to 1994)

By market we mean the total portfolio of shares.

Important : we will be using the CAPM to determine the rate of actualisation of cash flows generated by a new investment.

Beta (β)

β is the most widespread measure of risk used for a single share. It indicates the relationship between the value of the share and the market's fluctuations. In other words, it shows the sensitivity or reaction of a share compared to the variation of total portfolio of market shares.

The **β** of debt shares (bonds) ranges from 0 to 0.5
The **(β)** of shares is most often superior to 0.5

$$[Rs-Rf=\beta(Rm-Rf)]$$

$$\boxed{\beta=\frac{Rs-Rf}{Rm-Rf}}$$

Parametres on which **(β)** depends

- **The volatility of economic assets** : the higher the volatility of the value of economic assets, the higher the rate of **(β)**. For example, if an economic sector explodes or has a high level of increase economically speaking, then the companies within that sector should have a **(β)** superior to 1. The volatility of the results of a company is directly related to the structure of its operational costs (fixed and variable costs). The closer the company gets to its break-even point, the higher the rate of **(β)**.

- **The financial structure** : the financial structure of a firm influences the level of volatility of its net profits, and therefore influences the rate of **(β)** through financial leverage. The higher the company's debt, the higher the rate of **(β)**.

- **The quality of information** : the less information given by a company, and the less the quality of that information concerning the company's evolution, the higher the rate of **(β)**, as the market takes a risk of "non-visibility" into consideration.

Example 1

R_f : 6 % **;** expected market premium $(R_m - R)_f$: 8.4 %

Stocks	β^L	$Rs = R_f + \beta (R_m - R_f)$	R_f	p
Eurodisney	0.49	10.12 % (least risky)	6 %	4.12 %
Accor	1.04	14.74 %	6 %	8.74 %
Club Med	0.78	12.55 %	6 %	6.55 %
Heineken	0.66	11.54 %	6 %	5.54 %
Danone	0.96	14.06 %	6 %	8.06 %
Biogen	2.20	24.50 % (riskiest)	6 %	18.50 %
Market	**1.00**	**14.40 %**	**6 %**	**8.40 %**

The weighted average cost of the capital (WACC)

The WACC is the basis to judge a project.

$WACC = K_e + K_d$

To calculate K_e we can use 2 models:

CAPM model (it looks at the company on the market):

$R_s = K_e = R_f + \beta^L . (R_m - R_f)$

Growth model (it looks at the company internally): $K_e = \frac{EPS}{Price\ of\ the\ share} + g$

where g = ROE x Retention rate

Example 2 : EPS : 6.25 $; price of share : 50 $; R_m : 16 % ; R_f : 5 % ;
β : 0.90 ; retention rate of dividend : 30 % (same rate in the future)

Growth model : ROE = 6.25 $ / 50 $ = 12.50 % (same rate in the future)

g = 30 % x 12.50 % = 3.75 %

Market capitalization rate : 12.50 % + 3.75 % = **16.25 %**

	year 1	year 2	year 3	Variation
EPS	6.25	6.48	6.73	+ 3,75 %
Price of share	50.00	51.88	53.82	+ 3,75 %
RR 30 %	1.88	1.95	2.02	+ 3,75 %
Div 70 %	4.38	4.54	4.71	+ 3,75 %
ROE	12.50%	12.50%	12.50%	
g (PAT)	3.75%	3.75%	3.75%	
g (Price)		3.75%	3.75%	
Ke	16.25%	16.25%	16.25%	

CAPM : $K_e = R_f + \beta^L . (R_m - R_f)$

$K_e = 5\ \% + 0.9\ (16\ \% - 5\ \%) =$ **14.90 %**

β of levered and unlevered firms

β^U unlevered firm (no debt) : business risk

β^L levered firm (with debts) : business risk + financial risk.

β^L is given by the market and published by various investment advisory services.

$$B^L = \beta^U \left(1 + \frac{D}{E}\right)$$

$$B^U = \frac{\beta^L}{\left(1 + \frac{D}{E}\right)}$$

Note : these two formulas are available only if β of debts = 0.

FRP : $\beta^U \left(\frac{D}{E}\right)(R_m - R_f)$

BRP : $\beta^U (R_m - R_f)$

By definition : $K_e = R_s$

$$K_e = R_f + \beta^{L_{stocks}} (R_m - R_f)$$

Example 3 : ACCOR

R_f 4 %
R_m 15 %
β^L 1.04
D/E 0.4
Interest rate : 6 %
Tax rate : 40 %
D/E Accor = 0.4

Beta lev	D/E	Rs (CAPM)	Rf	BRP	FRP	P
0.743	0.000	12.17%	4.00%	8.17%	0.00%	8.17%
0.966	0.300	14.62%	4.00%	8.17%	2.45%	10.62%
1.040	**0.400**	**15.44%**	**4.00%**	**8.17%**	**3.27%**	**11.44%**
1.115	0.500	16.26%	4.00%	8.17%	4.09%	12.26%
1.189	0.600	17.08%	4.00%	8.17%	4.90%	13.08%
1.263	0.700	17.89%	4.00%	8.17%	5.72%	13.89%

WACC ACCOR using CAPM

Assets	14	Debts	4
		Equity	10
Total	14	Total	14

WACC = Rs(Ke) . E/V + Kd . D/V
15.44 % . (10/14) + (6 % - 40 %) . (4/14) = **12.06 %**

WACC using growth model

Retention rate of dividend : 80 %
Distribution rate of dividend 20 %
ROE 10 %

g = ROE . RR = 10 % . 80 % = 8 %
Ke = 18 %

WACC = 18 % . (10/14) + (6 % - 40 %) . (4/14) = **13.88 %**

Example 4 : Calculate the WACC :

K_e	$= R_f + \beta^L (R_m - R_f)$
K_d	= interest rate - tax rate
R_f :	8.4 %
β^L :	0.7
$(R_m - R_f) = p$	6 %
Interest rate :	10 %
Tax rate :	50 %
Total assets (V) :	325
Total debts (D) :	145
Total Equity (E) :	180

$WACC = [R_f + \beta^L (R_m - R_f)].[E/V] + [i - \text{Tax rate}].[D / V]$
$WACC = [(8.4\ \% + (0.7 \,.\, 6\ \%) \,.\, (180/325)] + [(10\ \% - 50\ \%) \,.\, (145/325)]$

WACC = 9.21 %

Note : Cost of equity $= K_e = [R_f + \beta^L (R_m - R_f)].[E / V] = 6.98\ \%$
Cost of debts $= K_d = [i - \text{Tax rate}.[D / V] = 2.23\ \%$

Note :

The calculations above are based on the following hypothesis : "p" from the market portfolio (S &P) is stable in time and for the future.

R_f is not stable over time. It is better to use the current R_f at the time of evaluation.

The main critique concerning **(β)** is its instability over time. It synthesizes a large amount of information in a single value, and this strength equally represents its main weakness.

The CAPM is a forecasting model which allows the calculation of expected profitability using anticipations of risk. To use it correctly, one should therefore, in theory, use a forecasted **(β)** rather than a historic **(β)**, even more so as this coefficient is not stable over time.

Source : BM, part II, Chapter 7 : The risk ; chapter 8 : Risk and return
Financial leverage, the CAPM and the Equity cost of capital, Marc Bertonèche, Professor at University Bordeaux I, Ph.D. in finance of Northwestern University, visiting Professor at Harvard Business School and at Oxford University

5. Valuation

Valuing an office building : cost of building : 350.

Probability	Sales price in year 1
20 %	480
60 %	400
20 %	320
Average	400

If the risk in this investment = the risk on the capital market = 7 %,
then the opportunity cost of capital (OCC) = 7 %

	0 %	7 %	12 %
Cash flow	400	374	357
Investment	350	350	350
NPV	50	24	7

NPV rule : accept investments that have positive NPV

Conclusion : NPV > 0 ≡ IRR > 7 %

The Rate-of-Return rule $\boxed{\frac{Profit}{Investment} =}$ $\frac{400 - 350}{350} = 14.29\%$

The Rate-of-Return rule: accept investments that offer rates of return in excess of their opportunity cost of capital

Conclusion : Rate of Return > 7 % (the opportunity cost of capital).

Estimate the Opportunity Cost of Capital (OCC)

Example 1 : **investment project** : 100,000 $

State of the economy	Cash flow in year 1	Chance of each outcome
Slump	80,000.00	1
Normal	110,000.00	1
Boom	140,000.00	1
Expected payoff	110,000.00	3

Investment in stock : today's price : 95.65 $; expected price at the end of the year : 110 $

Present price	Expected price (end of the year)	Probability
95.65 $	80.00	1
	110.00	1
	140.00	1
Average	110.00	1

Expected return on stocks : $\frac{(110 - 95.65.100)}{95.65} = 15\%$

This is the expected return that you are giving up by investing in the project rather than the stock market. In other words, it is the project's **opportunity cost of capital**.

Expected return on the project : $\frac{(110{,}000 - 100{,}000)}{100} = 10\%$

Conclusion : we do not invest in the project.

Valuation rules

The required Rate of Return (r)

$$r = R_f + p$$

r : Required Rate of Return
R_f : risk free rate
p : risk premium rate

$$NPV = (CF_0) + \frac{CF_1}{(1+r)1} + \frac{CF_2}{(1+r)2} + \ldots + \frac{CF_n}{(1+r)n}$$

2 rules for accepting a project :

- NPV > 0
- Return > OCC (WACC)

Example 2 :

$$NPV = -500 + \frac{400}{(1.12)1} + \frac{400}{(1.12)2} = 176$$

CF_0 : investment -500
CF_1 : cash flow at year 1 +400
CF_2 : cash flow at year 2 +400
r = Rf + p
Rf = 7 %
p = 5 %
r = 12 % = OCC = WACC = discounted rate

Regular perpetuity

Somebody wants to provide 100,000 $ (C_1) a year in perpetuity. If the rate of interest is 10 % the amount that must be set aside today is:

Present value of perpetuity is:

$$\frac{C_1}{r} = \frac{100000}{0.10} = 1{,}000{,}000\$$$

How to value growing perpetuity ?

If 100,000 $ grow at 4 % a year, the amount that must be set aside today is:

r = 12 % = 0.12
g = 4 % = 0.04

$$PV = \frac{C_1}{r - g} = \frac{100000}{0.08} = 1{,}250{,}000\$$$

Stock price

The cash payout to owners of common stocks comes in 2 forms :

- cash dividend
- capital gains or losses

Example 3 :

P_o : Current price of a Eurodisney share : 100 $
P_1 : expected price at the end of the year : 110 $
Div_1 : Expected dividend on share : 5 $

The expected rate of return to the shareholders is :

$$r = .\frac{Div_1 + P_1 - P_0}{P_0} \qquad r = \frac{5+110-100}{100} = 15\%$$

This return that is expected by shareholders is often called the "market capitalization rate" that can be earned in the capital market on securities of comparable risk.

Example 4 :

Correspondingly, if you are given shareholders' forecasts of dividend and price and the expected return offered by other equally risky stocks, you can predict today's price :

$$\boxed{P_o = \frac{Div_1 + P_1}{1 + r}}$$

P_0 : ?
P_1 : 110
Div_1 : 5 $
r : 15 %

$$P_0 = \frac{5 + 110}{1.15} = 100\$$$

How do you know that 100 $ is the right price ? Because no other price could survive on a competitive capital market.

What if P_o where above 100 $? Then Eurodisney stock would offer a "r" that was lower than other securities of equivalent risk. Shareholders would shift their capital to the other securities and in the process would force down the price of Eurodisney stock.

If P_o were less than 100 $, the process would reverse. Eurodisney stock would offer a higher "r" than comparable securities. In that case, shareholders would rush to buy, forcing the price up to 100 $.
The general conclusion is that at each point in time all securities in an equivalent risk class are priced to offer the same expected "r". This is a condition for equilibrium on well-functioning capital markets.

What determines next year's price ?

If shareholders are interested at stock's price at the end of year 1 (P_1) it means they are interested at Div_2 and P_2 . We can forecast P_1 by forecasting Div_2 and P_2 .

$$P_1 = \frac{Div_2 + P_2}{(1+r)^1}$$

We can also express P_o in terms of Div_1, Div_2 and P_2 :

$$P_0 = \frac{Div_1}{(1+r)^1} + \frac{Div_2 + P_2}{(1+r)^2}$$

Example 5 :

P_o :	?
P_2	121
Div_1 :	5 $
Div_2 :	5.50 $
r :	15 %

$$\frac{5.00}{1.15} + \frac{5.50 + 121}{(1.15)^2} = 100\$$$

General stock price formula:

$$P_0 = \sum_{t=1}^{H} \frac{Div_1}{(1+r)^1} + ... + \frac{Div_H}{(1+r)^H} + \frac{P_H}{(1+r)^H}$$

Constant Infinite stream of dividend

$$P_0 = \frac{Div_1}{r}$$

In principle the horizon period H could be infinitely distant if we exclude corporate hazards such as bankruptcy or acquisition. As H approaches infinity the present value of terminal price ought to approach zero. We can therefore forget about the terminal price entirely and express today's price as the present value of a perpetual stream of dividend.

Example 6 : Div_1 : 6 ; r = 15 % ; $$Po = \frac{6}{0.15} = 40\$$$

40 $ is the present value of a constant infinite stream of dividend of 6 $ a year.

Constant Infinite stream of dividend growing annually at the rate "g"

Example 7 : constant infinite stream of dividend growing at 10 % a year
Div_1: 6 $; r = 15 % ; g = 10 %

$$P_0 = \frac{Div_1}{r - g} \qquad P_0 = \frac{6}{(0.15-0.10)} = 120\$$$

120 $ is the present value of an infinite stream of dividend growing annually at a rate of 10 %.

Estimate "g"

We can use the above formula to estimate "r" where DIV_1/P_0 is the expected dividend yield and "g" the expected rate of growth of dividends. Estimating "g" is a difficult task. One option is to consult the views of security analysts who study the prospects for each company (they often forecast growth rate over the next 5 years).

Example 8 : DIV_1 : 1.87 $; P_o : 36 $; g : 4.1 %

Value of share	36.00	37.48	39.01	40.61	42.28
Dividend	1.87	1.95	2.03	2.11	2.20
Dividend growth rate		4.1%	4.1%	4.1%	4.1%
Div / Value of share = ROE	5.2%	5.2%	5.2%	5.2%	5.2%
Market capitalization rate		**9.3%**	**9.3%**	**9.3%**	**9.3%**

Dividend yield : 1.87 $ / 36 $ = 5.2 %

$$r = \frac{Div}{P_0} + g$$

r = 5.2 % + 4.1 % = **9.3 %**

Alternative approach

An alternative approach to estimate long-run growth "g" starts with (Div / EPS) ratio (payout ratio or distribution rate of dividend)

Example 9 :

Distribution rate of dividend: 70 % (that means a retention rate of 30 %: reinvestment rate).
EPS : 12.5 % (ROE) (do not change in the future)

Dividend growth rate = g = 30 % x 12.50 % = 3.75 %
Market capitalization rate = 5.2 % + 3.75 % = **8.95 %**
In well-functioning capital market shareholders - or investors - capitalize the dividends of all securities belonging to the same class of risk at exactly the same rate. Good practice does not put too much weight on single-company cost-of-equity estimates. It is preferable to collect samples of similar companies and estimate "r" for each, and take an average. This average gives a more reliable benchmark for decision taking.

Is "g" infinite ?

Resist the temptation to take firms having high current rates of growth. Such growth can rarely be sustained indefinitely.

Example 10 :

P_o : 50 $	Year 1	Year 2	Year 3	Year 4
Book value of equity	10 $	12 $	14.40 $	15.55 $
ROE	25 %	25 %	16 %	16 %
EPS	2.50 $	3 $	2.30 $	2.49 $
Distribution rate of dividend	20 %	20 %	50 %	50 %
Retention rate of dividend	80 %	80 %	50 %	50 %
Dividend per share	0.50 $	0.60 $	1.15 $	1.24 $
Growth rate of dividend per share		20 %	92 %	– 8 %

In practice, the return on investment will decline gradually over time. Let's assume that ROE drops from 25 % to 16 % at year 3. The firm responds by reinvesting only 50 % of its earning instead of 80 %. In this case "g" drops at 8 % at year 4. Let's assume that this "g" of 8 % will stay constant for the following years. P_0 = 50 $

"r" = 9.96 %

$$P_0 = \frac{Div_1}{(1+r)^1} + \frac{Div_2}{(1+r)^2} + \frac{Div_3}{(1+r)^3} + \frac{\frac{Div_4}{(r-g)}}{(1+r)^3}$$

$$P_0 = \frac{0.50\$}{(1+r)^1} + \frac{0.60\$}{(1+r)^2} + \frac{1.15\$}{(1+r)^3} + \frac{\frac{1.24\$}{(r-0.08)}}{(1+r)^3}$$

If we had chosen the following estimates: DIV_1 : 0.50 $; P_0 : 50 $; retention rate of dividend : 80 % ; ROE : 25 %

$$g = 80\ \% \times 25\ \% = 20\ \%$$

$$r = DIV_1 / P_0 + g = 0.50\ \$ / 50\ \$ + 20\ \% = \mathbf{21\ \%}$$

It is a very different rate but less realistic than 9.96 %

Company valuation

Valuation methods

- **Balance sheet methods**
  Generally, it is a very poor basis on which to value a company.

- **Multiple of profits**

  Quoted company

  Based on price earnings (P/E) ratio $\boxed{\frac{(Share\ price)}{(EPS)} = P/E\ ratio}$

  Company value: **P/E . PAT of the company**

  Based on market capitalization (market value of the company):

  Price per share . Number of shares

  Non quoted company

  Find a quoted company which is in similar business and using its P/E ratio. Adjust that P/E ratio to allow for the fact that the unquoted company you are valuing may have worse prospects and higher risk than the quoted company (a reduction of 25-40 % is common). Determine the sustainable profit after tax of the unquoted company. The PAT is the profit you believe will be maintainable in the future.

  Multiply the adjusted P/E ratio by the adjusted sustainable profit, to give a valuation.

- **Discounted cash flow basis**

  The value of the company represents the present value of the future cash flows it is expected to generate.

  Steps :

  1. Determine a suitable initial time period for the valuation, generally the period over which you expect the company to maintain a competitive advantage.

2. Estimate the free cash flows (amount of cash generated by the business before allowing for financing).

   Operating profit (EBIT)
   + Depreciation
   - Taxes
   - Capex
   +/- Change in working capital

   FCF
   ---

3. Estimate the Terminal value (TV) - what you think the business will be worth at the end of that initial period.

   How to evaluate TV ?

   TV could be :

   Assets value
   PAT . P/E ratio
   Annuity in x years : eg. 300 in 6 years
   Perpetuity : growing or not

4. Determine a suitable WACC (discount rate) for the investment

5. Discount the cash flows, using the WACC.

6. Add the value of non-operating assets

At this point you have calculated the enterprise value - the value of the whole business, which has been financed in several ways.

6. In order to calculate the value of the equity of the company, deduct the current amount of debt from the enterprise value.

Example :

	1	2	3	4	5	6	7
EBIT	103	99	94	89	85	81	83
- Taxes	(52)	(50)	(47)	(45)	(43)	(41)	(42)
+ Depreciation	22	22	22	22	22	22	22
- Capex	(26)	(26)	(26)	(26)	(26)	(26)	(26)
+/- Change in WC	(18)	(17)	(16)	(15)	(14)	(13)	(13)
FCF	30	29	27	26	25	24	25

Current debts: 110 $
WACC (discount rate): 9.25 %

PV of FCF: 134 $

Terminal value (TV) at year 7: constant perpetuity : $\frac{25}{0.0925} = 270\$$

PV of TV : $\frac{270}{(1.0925)^7} = 145\$$

Value of the company : 134 $ + 145 $ = 279 $

Value of equity : 279 $ - 110 $ = 169 $

Various reasons justifying the evaluation of a company **:**

Issue of new shares
Acquisition of a firm :

Reasons :

- To support growth that cannot be achieved organically
- To complement business strategy : products, markets, risk reduction, supply of raw material.
- Geographic expansion
- To prevent a competitor making the acquisition
- To show better financial results
- Managerial utility (bad reason)

EVA (Economic value added)

$$EVA = [EBIT \times (1\text{-tax rate})] - [WACC \times C]$$

Example 1 :

Discounted EVA analysis

	0	1	2	3	4
Net assets		100.00	75.00	50.00	25.00
WACC		10.00%	10.00%	10.00%	10.00%

Revenue		80.00	80.00	80.00	80.00
Cash expenses		(13.33)	(13.33)	(13.33)	(13.33)
Depreciation		(25.00)	(25.00)	(25.00)	(25.00)
EBIT		41.67	41.67	41.67	41.67
Tax 40 %		(16.67)	(16.67)	(16.67)	(16.67)
EAT and before interest		25.00	25.00	25.00	25.00

EAT and before interest		25.00	25.00	25.00	25.00
Cost of assets : WACC x Net assets		10.00	7.50	5.00	2.50
EVA		**15.00**	**17.50**	**20.00**	**22.50**

EVA discounted at 10 % **58.5**

Standard NPV analysis

	0	1	2	3	4
Initial investment	(100.00)				
Revenue		80.00	80.00	80.00	80.00
Cash expenses		(13.33)	(13.33)	(13.33)	(13.33)
Depreciation		(25.00)	(25.00)	(25.00)	(25.00)
EBIT		41.67	41.67	41.67	41.67
Tax 40 %		(16.67)	(16.67)	(16.67)	(16.67)
EAT		25.00	25.00	25.00	25.00
Depreciation		25.00	25.00	25.00	25.00
After tax Cash flows	**(100.00)**	**50.00**	**50.00**	**50.00**	**50.00**

NPV at discounted rate of 10 % **58.5**

Conclusion : discounting an investment=s annual EVA stream is equivalent to calculating the investment's NPV.

Example 2 :

	Firm A	Firm B	Firm C
Net assets	10,000	10,000	10,000
EAT and before interest	1,000	2,000	500
Cost of assets : WACC x Net assets	1,000	1,000	1,000
EVA : economic profit	0	1,000	(500)
ROI : EAT & before interest / Net assets	10.00%	20.00%	5.00%
WACC	10.00%	10.00%	10.00%
EVA %	0.00%	10.00%	-5.00%

If ROI > WACC -or- if EVA > 0 : you create value for shareholders
EVA = Net assets . (ROI - WACC)

Example 3 :

Net assets : 1000 ; ROI : 10 % ; WACC : 8 %
Profit of the company : 10 % on 1000 = 100
EVA : (10 % - 8 %) on 1000 = 20

Value of the company

Value of perpetuity : $\frac{100\,(profit)}{0.08\,(WACC)} = 1{,}250$

- or -

Value of perpetuity based on EVA : 20 / 0.08 = 250
+ Net assets 1,000

Value of the company : 1,250
====

Source : BM, chapter 4 ; Analysis for financial management, R.C. Higgins, 4th edition, Irwin; Company valuation, Ruth Bender, professor in finance, Cranfield University, UK

6. Capital structure

Traditional approach

Does an optimum liability and equity structure exist, in other words, a combination of D/E that would allow a maximization of the value of the economic assets for the shareholders? Or, does a totally reliable financial structure such as the WACC (defined hereafter) is as low as possible?

r_d : required rate on return to debtholders
r_e : required rate on return to equity
r_{assets} : the rate of profitability required by all investors (or suppliers of funds) to accept financing. This is the cost of financing the company, and it is the minimum rate of profitability of investments required. It is the weighted average of the two sources of capital : share capital and debts. The weighting is established according to the quantity of share capital and debt in the financing of the value of the economic assets.
D : market value of the debt
E : market value of the equity
V market value of economic asset (D+E)

Before-tax WACC

$$r_{assets}=WACC=r_e\cdot\frac{E}{V}+r_d\cdot\frac{D}{V}$$

		A	B
Example 1 :	Assets value (economic asset)	100	100
	Debt value	50	60
	Equity value	50	40
	K_d : 10 %		
	K_e : 20 %		

A WACC = 20 % . (50/100) + 10 % . (50/100) = 15 %
B WACC = 20 % . (40/100) + 10 % . (60/100) = 14 %

An increase in debt reduces the WACC.

After-tax WACC

$$r_a=WACC=r_e\cdot\frac{E}{V}+r_d\cdot(1-t)\frac{D}{V}$$

Example 2 :

Book value			Market value	
Assets	V	10	Assets	12.5
Debt	D	5	Debt	5
Equity	E	5	Equity	7.5
D/V		0.5		0.4
E/V		0.5		0.6

r_e 14.6 % ;
r_d 8 %
Tax : 35 %

Calculation of the WACC = [14.6 % . 0.6] + [(8 %-35%) . 0.4] = 10.84 %

Other way to calculate the WACC :

Dividend =	14.6 % x 7.5	=	1,095,000.00
Interest =	(8 % - 35 % tax) x 5	=	260,000.00
			1,355,000.00

WACC = (1,355 . 100) / 1,250,000.00 = 10.84 %

Value of the firm :	EBIT (perpetuity)	2,085
	- tax 35 %	730
		1,355

PV of the firm : 1,355 / 0.1084 = 12,500

According to the traditional approach, an optimal financial structure does exist, which will allow the company to maximize its value through the right amount of debts and financial leverage. The company minimizes its WACC, in other words, the cost of financing.

The cost of debt is lower than the cost of equity ($K_d < K_e$) as there is less risk. From that standpoint, any increase in debt will reduce the WACC.

However, increasing debts creates a higher risk for shareholders. The market will therefore require a higher K_e.

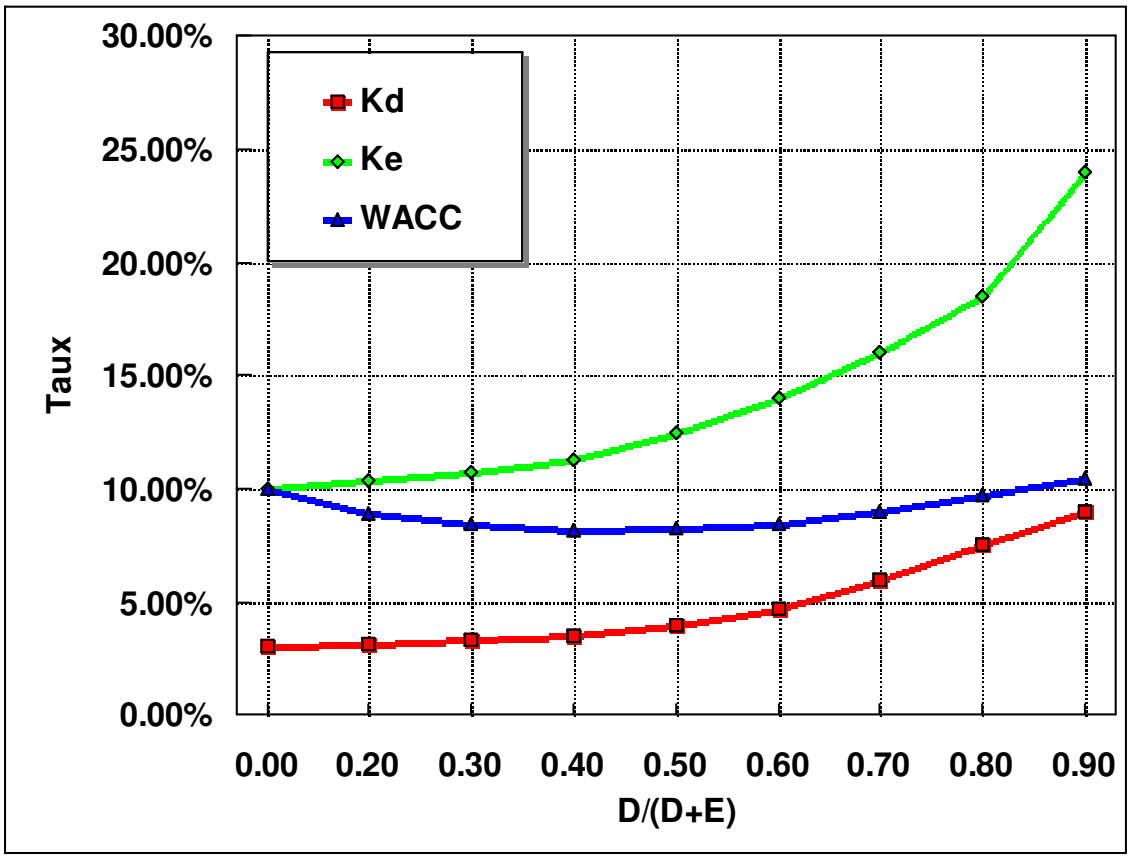
The more the company borrows, the higher the rate of interest as the risk increases.

The optimal structure is therefore one in which the WACC is minimal. At this rate, the value of the company is maximized (D : 40 % ; E : 60 %).

D/(D + E)	0.00	0.20	0.30	0.40	0.50	0.60	0.70	0.80
Kd	3.00%	3.10%	3.30%	3.50%	4.00%	4.70%	6.00%	7.50%
Ke (market)	10.00%	10.40%	10.70%	11.30%	12.50%	14.00%	16.00%	18.50%
WACC	10.00%	8.94%	8.48%	8.18%	8.25%	8.42%	9.00%	9.70%

EBIT	2,085	2,085	2,085	2,085	2,085	2,085	2,085	2,085

Value of the firm	20,850	23,322	24,587	25,489	25,273	24,762	23,167	21,495



"Modern" approach

Source : Franco Modigliani and Merton Miller : "The cost of capital, corporate finance and the theory of investment", American Economic Review (June 1958), pp. 261-277.

According to M & M, and on the contrary to what has been previously stated, the traditional approach is incorrect: an optimal financial structure does not exist. The global rate of profitability K_w (WACC) is constant, whatever the quantity of debt is. Two identical companies, with two different financial structures, have the same economic value of assets.

Firms	X	Y	Z
Debt	0	80	100
Equity	200	120	100
Value (assets)	200	200	200
EBIT	20	20	20
- Interest	0	4	5
EBT = DIV	20	16	15
Ke	10.00%	13.33%	15.00%
Kd	5.00%	5.00%	5.00%
E/ V	1.0	0.6	0.5
D/ V	0.0	0.4	0.5
(Kw) WACC	10.00%	10.00%	10.00%

If EBIT is a perpetuity, the value of the firm is:

$$\frac{EBIT}{WACC} = \frac{20}{0.10} = 200$$

Increasing debt would automatically imply an increased risk for shareholders. This increase in risk can be translated as an increase in the rate of return required on equity, but the financial implications for shareholders remain unchanged.

Example proving the **proposal I of MM**

MSR Ltd is reviewing its capital structure. The firm's CEO has come to the conclusion that shareholders would be better off if the company had equal proportions of debt (bonds) and equity (shares). He therefore proposes to issue 5,000 $ of debt at an interest rate of 10 % and uses that to repurchase 500 shares. To support his proposal, the CEO has analyzed the situation under different assumptions about operating income. The results of his calculations are shown below.

The CEO reasons as follows :

The effect of leverage depends on the company's EBIT.
If EBIT > 1000 $, the ROE is increased by leverage.
If EBIT < 1000 $, the return is reduced by leverage.

The return is unaffected when EBIT = interest rate on the debt. At this point, the return on the market value of the assets is 10 %, which is exactly equal to the interest rate on the debt.
The capital structure decision, therefore, depends on what we think about EBIT prospects.

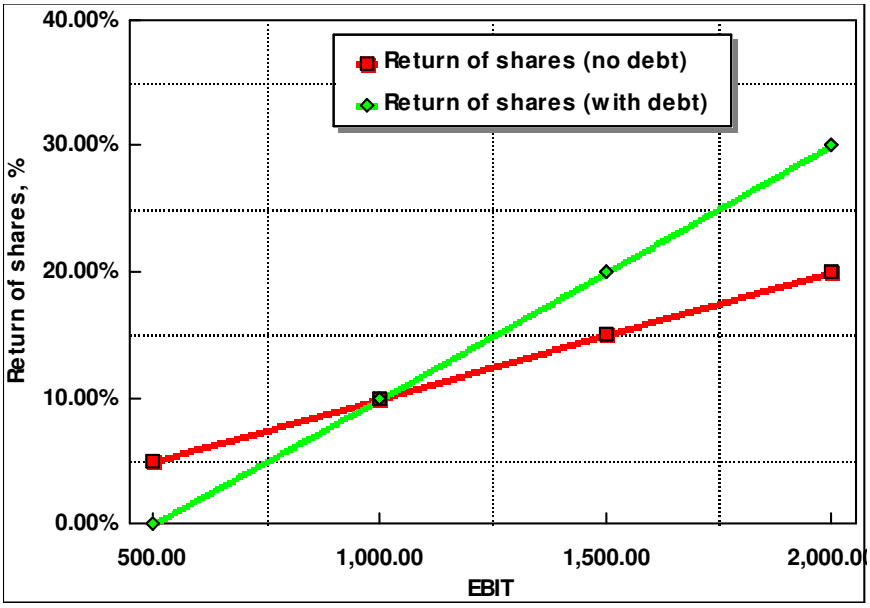
Since we expect EBIT to be above 1000 $, we can help our shareholders by issuing the 5000 $ debt (bonds).

	Before	**After**
Number of shares	1,000.00	500.00
Price per share	10.00	10.00
Market value of shares (assets)	10,000.00	5,000.00
Market value of debts	0.00	5,000.00
Total of assets	10,000.00	10,000.00

Interest rate : 10.00% ; Taxes : 0.00%

Before			**Expected**	
Operating income, (EBIT)	500.00	1,000.00	**1,500.00**	2,000.00
Interest, 10 % of 5000	0.00	0	0	0
Earnings after interest	500.00	1,000.00	1,500.00	2,000.00
Earnings per share (EPS)	0.50	1.00	**1.50**	2.00
Return of shares, % (ROE)	5.00%	10.00%	**15.00%**	20.00%
Return on assets (ROA)	5.00%	10.00%	**15.00%**	20.00%
WACC	5.00%	10.00%	**15.00%**	20.00%
Leverage factor = (ROA-i).(D/E)	0.00%	0.00%	0.00%	0.00%

After			**Expected**	
Operating income (EBIT)	500.00	1,000.00	**1,500.00**	2,000.00
Interest 10 % of 5000	500.00	500.00	500.00	500.00
Earnings after interest	0	500.00	1,000.00	1,500.00
Earnings per share (EPS)	0	1.00	**2.00**	3.00



Return of shares, % (ROE)	0.00%	10.00%	**20.00%**	30.00%
Return on assets (ROA)	5.00%	10.00%	**15.00%**	20.00%
WACC	5.00%	10.00%	**15.00%**	20.00%
Leverage factor = (ROA-i).(D/E)	-5.00%	0.00%	5.00%	10.00%

As financial managers we reply as follows :

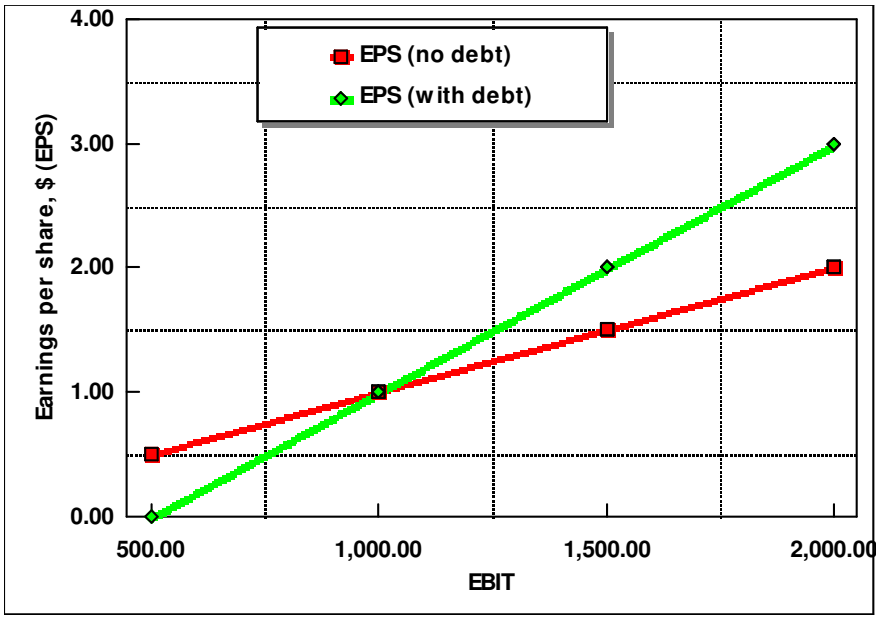
The leverage will help the shareholders as long as the EBIT > 1000 $.
But the shareholders have the alternative of borrowing on their own account as shown below.
If the CEO borrows, it will not allow shareholders to do anything that they could not already do and will not increase value. Individual shareholders can replicate the company's leverage.

Data

Number of shares	2
Price per share	10.00
Market value of debts (bonds)	10.00
Interest at 10 %	

Before		**After**	
Assets (2 shares)	20.00	Assets (2 shares)	20.00
Debts	0.00	Debts	10.00
Equity	20.00	Equity	10.00
Total EPS (2x1.5$)	3.00	Total EPS (2x1,5$)	3.00
Interest 10 %	0.00	Interest 10 %	1.00
Net income	3.00	Net income	2.00
Return on investment %	**15 %**	Return on investment %	**20 %**

Leverage increases the expected EPS (from 1.50 $ to 2 $, that is from 15 % to 20 %) but not the share price. Therefore the market value of firm's assets is not affected [EBIT / Total value of assets] = 15 % The company's borrowing decision does not affect either the firm's EBIT or the total market value of its securities (assets).



Suppose that an investor holds all of the firm's debt and all its equity (bonds and shares). This investor would be entitled to all of the firm's EBIT of 1500 $. Therefore, the expected return on the portfolio would be equal to a weighted average of the expected returns on the individual securities.

Expected return on assets (or on a portfolio: stocks + bonds) :

$$r_{assets} = WACC = r_e \frac{E}{V} + r_d \frac{D}{V}$$

Expected return on the equity (stock) of a levered firm :

$$r_e = r_a + \frac{D}{E}(r_a - r_d)$$

$$Leverage\ factor = \frac{D}{E}(r_a - r_d)$$

Expected return on the equity (stock) of an unlevered firm :

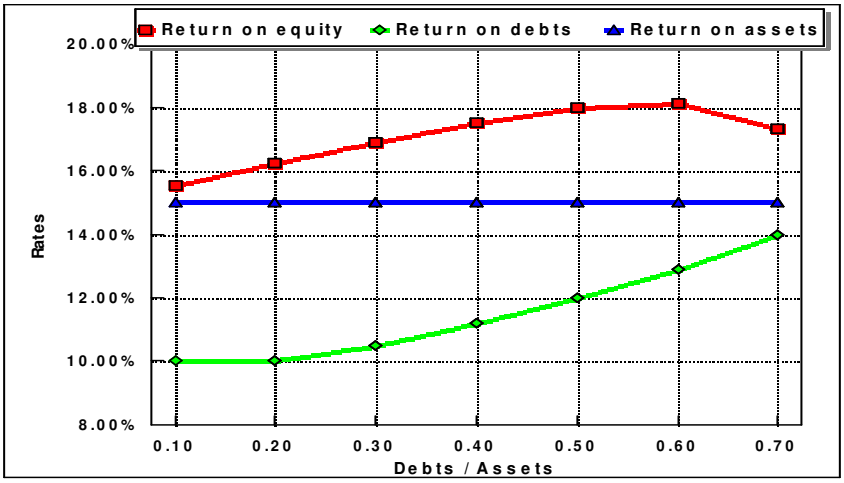
$$r_{assets} = r_e$$

Proposal II of MM

The firm's bonds are essentially risk-free at low debt levels. As the firm borrows more, the risk of default increases and the firm is required to pay higher rates of interest. When this occurs the rate of increase in $\mathbf{r_e}$ slows down. As the firm borrows more, more of that risk is transferred from shareholders to bondholders.

E / V	0.90	0.80	0.70	0.60	0.50	0.40	0.30
D / V	0.10	0.20	0.30	0.40	0.50	0.60	0.70
V	1.00	1.00	1.00	1.00	1.00	1.00	1.00
D / E	0.11	0.25	0.43	0.67	1.00	1.50	2.33

Ra	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
Re	15.56%	16.25%	16.93%	17.53%	18.00%	18.15%	17.33%
Rd	10.00%	10.00%	10.50%	11.20%	12.00%	12.90%	14.00%



Beta

β of assets (portfolio)

$$\beta_{assets} = \beta_e \frac{E}{V} + \beta_d \frac{D}{V}$$

β of the equity of a levered firm

$$\beta_{equity} = \beta_a + \frac{D}{E}(\beta_a - \beta_d)$$

β of the equity of an unlevered firm

$$\beta_{equity} = \beta_a$$

Example :

Market value of the stock	60
Value of the debts	40
Assets (market value)	100
β_e of stock	1.5
β_d of debt (if risk free)	0
R_f	8 %
Interest rate	8 %
R_m	18 %
Risk premium (R_m - R_f)	10 %

a) β_{assets} = 1.5 . 60/100 + 0 . 40/100 = **0.9** (risk of total portfolio)

Firm assets β is weighted average of portfolio of debt and equity β

r_e = R_f + β_e (Rm - Rf)
= 8 % + 1,5 . 10 % = **23 %** (what investors expect)

b) If investment, what discount rate use for computing NPV of the project?

$r_{assets} = WACC = r_e \cdot \frac{E}{V} + r_d \cdot \frac{D}{V}$ 23 % . (60/100) + 8 % . (40/100) = **17 %**

c) <u>The firm repaid 20 by increasing the equity</u> :

β_{assets} (no change) = **0.9**

β_e (of stocks) = $\beta_e \frac{E}{V} + \beta_d \frac{D}{V}$ = **1.125**

r_e = $R_f + \beta_e (R_m - R_f)$

= 8 % + 1,125 . 10 % = **19.25 %** (what investors expect)

$R_{assets} = = WACC = r_e \cdot \frac{E}{V} + r_d \cdot \frac{D}{V}$

19.25 % . (80/100) + 8 % . (20/100) = **17 %**

<u>Source</u> :

R. A. Brealey and S.C. Myers, <u>Principles of Corporate Finance</u>, Fifth Edition -Mc Graw Hill, Chapter 17

R. A. Brealey and S.C. Myers, <u>Principes de gestion financière des entreprises</u>, EDISCIENCE International -Mc Graw Hill

7. The investment decision

How to analyze a 1 million $ investment project ?

- **Forecast the CF** generated by the project over its economic life.

- **Determine** the appropriate **opportunity cost of capital** of this project (OCC).

  The OCC is equal to the return that shareholders can earn if they invest the funds on their own (financial assets).
  The OCC is a standard of profitability for the project which we use to calculate how much the project is worth. The OCC is established in capital markets. It is the expected rate of return offered by other assets equivalent in risk to the project being evaluated.
  Do not confuse IRR and the OCC (WACC). IRR is a profitability measure which depends solely on the amount and timing of the project CF.

- **Discount the future CF** by using the OCC (WACC).

  The discount rate is the opportunity cost of investing in the project rather than in the capital market. In other words, instead of accepting a project, the firm can always give the cash to the shareholders and let them invest it in financial assets. But beware! The fact that investors expect only 12 % on stock A does not mean that we should purchase stock B if it offers 13 %. The opportunity-cost concept only makes sense if assets of equivalent risk are compared.

- Use the OCC to discount the future CF of the project. **We invest if NPV > 0**.

The WACC rule

Many companies estimate the rate of return required by investors in their securities and use the company WACC to discount the CF on all new projects. But the company WACC rule can also get the firm into trouble if **the new projects are more or less risky than its existing business**. Each project should be evaluated at its ***own*** OCC. The true OCC depends on the use of capital.

If a firm uses the company cost of capital rule, it would reject many good low-risk projects and accept many poor high-risk projects.

CAPM model is widely used by large corporations to estimate the discount rate.

$$R_s = R_f + (\beta \text{ of project}).(R_m - R_f)$$

$$WACC = R_s \cdot \frac{E}{V} + R_d \cdot \frac{D}{V}$$

To calculate this formula, we have to estimate the project beta. This can be achieved by looking at an average of similar companies.

Cost of capital and capital structure

The Cost of capital is the norm to be respected for capital budgeting decisions. It depends on the business risk of the firm's investment opportunities. The risk of a common stock reflects the business risk of the real assets held by the firm. But shareholders also bear financial risk to the extent that the firm issues debt to finance its real investments. The more a firm relies on debt financing, the riskier its common stock is.

Example :

Market values	Financial structure I	Financial structure II
Value of the stocks (E)	60	70
Value of the debt (Bonds) (D)	40	30
Value of the economic asset (V)	100	100
Return on asset (portofolio)	12.20 %	12.20 %
β_{assets}	0.8	0.8
β_{stocks}	1.2	1.1
β_{debt}	0.2	0.1
R_s	15 %	14 %
R_d	8 %	8 %

Financial structure I

The investors expect a return of 15 % on the equity and 8 % on the debt.

If you owned all of the firm's securities (total portfolio of bonds and stocks) you would own the firm assets.

The β_{stocks} before refinancing is 1.2 and the β_{debt} is 0.2 :

$\beta_{assets} = 1.2\ (0.6) + 0.2\ (0.4) = 0.8$

Expected return on the assets (total portfolio) :

$$r_{assets} = r_{portfolio} = r_e \cdot \frac{E}{V} + r_d \cdot \frac{D}{V} = 12.20\%$$

If a project that has the same risk as the firm's existing business, the OCC for this project is the same as the firm's OCC (12.20 %).

The change in financial structure does not affect the amount or risk of the CF on the total package of the debt and the equity. Therefore, if investors require a return of 12.20 % of the total package before the refinancing, they must require a 12.20 % return on the firm's assets afterward.

The risk of total package is unaffected, but both the debt and the equity are now less risky. Suppose that debt beta falls to 0.1. What is the new β_{stocks}?

But a **change in financial structure does affect** the required return (r_a) on the individual securities (bonds and stocks).

What is the stock's required rate on return?

$$r_e = 12.20\% + \frac{30}{70}(12.20\% - 8\%) = 14\%$$

$$12.20\% = r_e(0.7) + 8\%(0.3) = 14\%$$

Since the firm has less debt, the risk for shareholders decreases and reduces the return that they require from 15 % to 14 %.

$\beta_{assets} = \beta_{stocks} . (E/V) + \beta_{debts} . (D/V)$
$0.8 = \beta_{stocks} . (0.7) + 0.1 . (0.3)$
$\boldsymbol{\beta_{stocks} = 1.1}$

Since the company has less debt than before, the debtholders are likely to be satisfied with a lower return. We will suppose that the expected return on the debt falls from 8 % to 7 %.

$$r_e = 12.20\% + \frac{30}{70}(12.20\% - 7\%) = 14.43\%$$

$$12.20\% = r_e(0.7) + 7\%(0.3) = 14.43\%$$

Capital structure and beta

We have looked at how changes in financial structure affect expected returns. Let us now look at the effect of beta.

Shareholders bear much more risk than debtholders. Debt beta of large firms are close to zero, close enough that for such companies many financial analysts just assume that $\beta_{debt} = 0$.

$$\beta_{assets} = \beta_{portfolio} = \beta_{stocks}\frac{E}{V} + \beta_{debt}\frac{D}{V}$$

Remember :

- It is the company cost of capital (WACC) that is relevant in capital budgeting decisions, not the expected return on common stock.

- The cost of capital is a weighted average of the returns that investors expect from the various debt (bonds) and equity (stocks) securities issued by the firm.

- The asset beta can be calculated as a weighted average of the betas of the various securities.

- When the firm changes its financial structure, the risk and expected returns of individual securities ($r_{stock} + r_{debt}$) change. The β_{assets} and the company cost of capital do not change.

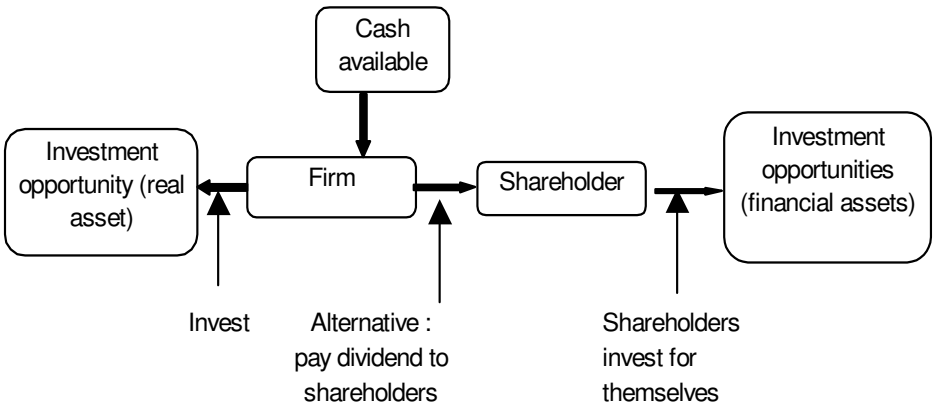
NPV rule

Why is NPV so important?

Stockholders want to make their shares as valuable as possible.
Let's suppose that total market value (price per share x number of shares outstanding) of the firm is 10 million $. That includes 1 million $ cash we can invest in project X. The value of the other assets of the firm must therefore be 9 million $. We have to decide whether it is better to keep the 1 million $ cash and reject project X or to spend the cash and accept project X.

Market value, millions of $		
Asset	Reject project X	Accept project X
Cash	1	0
Other assets	9	9
Project X	0	Present value (PV)
Total	10	9 + PV

The project X is worthwhile if its present value (PV) is greater than 1 million $ - that is, if NPV is positive. **In this case, you create value for shareholders**.



The undiscounted payback period rule

The payback period of a project is found by counting the number of years needed before cumulated forecast CF equals the initial investment.

Example :

Projects	CF_0	CF_1	CF_2	CF_3	CF_4	Pay back (years)	NPV at 10 %
A	-1000	500	500	300	0	2	93
B	-1000	300	300	400	500	3	163
C	-1000	400	300	300	400	3	110
D	-1000	380	370	250	550	3	215

If the firm used the payback rule with a 2-year cut-off period, it would accept only project A. If it used the payback rule with a 3-year cut-off period, it would accept A, B, C & D.

Therefore, regardless of the selected cut-off period, the payback rule gives a different answer from the NPV rule. The reason for the difference is that payback gives equal weight to all CF before the payback date and no weight at all to subsequent CF.

According to payback rule, if the selected cut-off period is 3 years, projects A, B, C and D are all equally attractive. According to NPV rule, only project D must be accepted because it has a higher NPV than either A, B or C.

The discounted-payback rule

Some companies discount the CF before they compute the payback period. But this rule is a whisker better than undiscounted payback.

Projects	CF_0	CF_1	CF_2	CF_3	CF_4	PV of CF at 10 %	Pay Back
A	-1000	500	500	300	0	1093	1.093
B	-1000	300	300	400	500	1163	1.163
C	-1000	400	300	300	400	1110	1.110
D	-1000	380	370	250	550	1215	1.215

If the firm used the payback rule, project D - having the highest value created for the shareholders - would be rejected.

The IRR (Internal Rate of Return)

The IRR is defined as the rate of discount which makes NPV=0. It means that to find the IRR for an investment project lasting "n" years, we must solve for IRR in the following expression:

$$NPV = -CF_0 + \frac{CF_1}{(1+IRR)^1} + ... + \frac{CF_n}{(1+IRR)^n} = 0$$

Example :

CF_0	CF_1	CF_2	CF_3	CF_4	CF_5
-4000	1000	1100	1300	1500	1400

$$NPV = -4000 + \frac{1000}{(1+IRR)^1} + ... + \frac{1400}{(1+IRR)^5} = 0$$

IRR is 16 %.

If the WACC < 16 % (IRR), the project has a positive NPV.

The IRR rule contains several pitfalls.

Problem 1 : **Multiple rates of return**

In most countries there usually is a short delay between the time the company receives income and the time it pays tax on income.

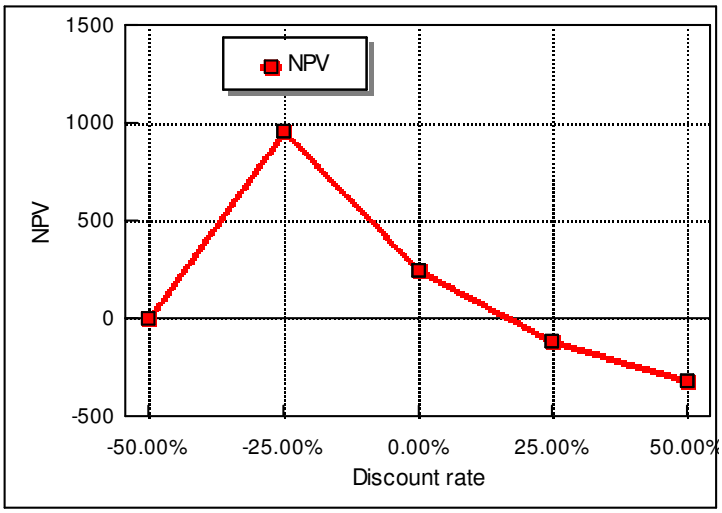
Example :

An investment involves an initial outlay of 1000 but is expected to increase the CF by 300 in each of the next 5 years. The tax rate is 50 %. Taxes are paid with a delay of 1 year.

	Years						
	0	1	2	3	4	5	6
CF	-1000	300	300	300	300	300	
Tax		500	-150	-150	-150	-150	-150
Net CF	-1000	800	150	150	150	150	-150

Note : the 1000 outlay in year 0 reduces the company's taxes in year 1 by 500, thus we enter + 500 in year 1.

Years	0	1	2	3	4	5	6
CF	-1000	800	150	150	150	150	(150)
Discount rate	-75.00%	-50.00%	-25.00%	0.00%	25.00%	50.00%	75.00%
NPV	(408,200)	0	952	250	(116)	(319)	(446)



In this case, we have 2 IRR : -50 % and 15.24 %.

The reason for this is the double change in the sign of the CF stream. It is caused by a lag in tax payments, but this is not the only way that it can occur. For example, many projects involve substantial costs at the end of their economic life (mining companies).

Problem 2 : **Mutually exclusive projects**

Example 1

Projects	CF_0	CF_1	CF_2	CF_3	IRR	NPV at 10%
A	-10000	5000	7000	8000	40.42 %	6341
B	-20000	9000	12000	13000	29.80 %	7866
Incremental CFs	-10000	4000	5000	5000	18.14 %	1525

Firms often have to choose from among several alternative ways of doing the same job or using the same facility. In this example, we have to choose between project A and project B.

According to the IRR rule, we choose project A.
According to the NPV rule, we invest in project B

If your heart is set on the IRR rule, you can use it as long as you look at the IRR on the incremental CF. In this case, IRR is 18.14 %, which is higher than the OCC of 10 %. Therefore, we must choose project B.

Example 2

Projets	CF_0	CF_1	CF_2	CF_3	IRR	NPV at 10%
A	-10000	5000	7000	8000	40.42 %	6341
B	-20000	8000	11000	12000	23.68 %	5379
Incremental CFs	-10000	3000	4000	4000	4.69 %	-962

In this case, the IRR is 4.69 %, which is lower than the OCC of 10 %. Therefore, we must reject project B and accept project A.

However, we can establish that the NPV rule remains the best method.

Choosing the capital expenditure program when one resource is limited

It is the situation where there are limitations on the investment program that prevent the firm from undertaking all such projects (capital rationing). When capital is rationed, we need a method of selecting the package of projects that is within the company's resources but gives the highest possible NPV.

Example : limited spending : 10 millions

Projects	CF_0	CF_1	CF_2	NPV at 10 %	Profitability Index
A	-10	30	5	21	2.1
B	-5	5	20	16	3.2
C	-5	5	15	12	2.4

Classification according to the NPV rule : A, B and C
Classification according to PI : B, C, and A

Here we cannot choose between projects solely on the basis of NPV. When funds are limited, we must choose the projects that offer the highest NPV per dollar of initial outlay. This is known as the **Profitability Index (PI).**

$$\frac{NPV}{Investment}$$

All 3 projects are attractive, but suppose that the firm is limited to spending 10 million $.
In that case, it can invest either in project A or in projects B and C, but it cannot invest in all 3 projects. Although individually B and C have lower NPV than project A, when taken together they have the higher NPV (28).

Project B has the highest PI and C the next highest. Therefore, if our budget limit is 10 $ million, we should accept these 2 projects.

Choosing the capital expenditure program when more than one resource is limited

Unfortunately, there are some limitations to this simple ranking method. One of the most serious ones is that it breaks down whenever more than one resource is limited.

Example : suppose that the firm can raise 10 million $ for investment in each of year 0 and 1 and that the menu of possible projects is expanded to include an investment next year in project D. Can we do it?

Projects	CF_0	CF_1	CF_2	NPV at 10 %	Profitability Index
A	-10	30	5	21	2.1
B	-5	5	20	16	3.2
C	-5	5	15	12	2.4
D	0	-40	60	13	0.4

Possible strategies

One strategy is to accept projects B and C which have the best PI (capital expenditures of 10 million $ at year 0). However, if we do this, we cannot also accept D at year 1 because there is a lack of 30 million $ (40 million $ less CF_1 of projects B and C).

Projects B and C have the best PI and a total NPV of 28.

Alternative

An alternative is to accept project A in period 0. Although this has a lower NPV than the combination of B and C, it provides a 30 million $ positive CF in period 1. When this is added to the 10 million $ budget, we can also afford to undertake D at year 1. A and D have lower PI than B and C, but they have a higher total NPV (34).

The reason why ranking on the PI fails in this example is that resources are constrained in each one of the 2 periods.

Exercice

B	1.3	P/E ratio	10.3
R_m	15.4 %	EPS	3.09
R_f	7.9 %	Long-term Debt	250
K_d	11 %	Equity (book value)	409
Tax rate	40 %	Number of shares	15,160,000
Price stock :	high :38 ; low : 26		

CF generated by an investment:

Years	**0**	**1**	**2**	**3**	**4**
CF	-118	44	68	95	133

Solution

Price of a share : P/E ratio x EPS = 10.3 x 3.09 = **31.827 $**

Market value of equity : number of shares x price of shares
15,160,000 x 31.827 = **482.5 $**

Assets		Liabilities & equity	
Market value of assets (V)	732.5	Debt (D)	250
		Equity (E)	482.5

Cost of equity (K_e) using CAPM : $\mathbf{K_e} = R_f + \beta (R_m - R_f)$	K_e = 7.9 % + 1.3 (15.4 % - 7.9 %) = **17.65 %**
Net Cost of debts **(K_d)**	11 % - 40 % = **6.6 %**
WACC = K_e . [E/V] + K_d . [D/V]	17.65 % x [482.5 / 732.5] + 6.6 % x [250 / 732.5] = **13.88 %**
NPV of CF	**116**
TV (CF of year 4 : constant perpetuity)	Value of TV at the end of year 4 : 133 / 0.1388 = **958** PV of TV : 958 . $(1.1388)^{-4}$ = **570**
Total NPV	116 + 570 = **686**

Source : **R. A. Brealey and S.C. Myers,** Principles of Corporate Finance, Fifth Edition -Mc Graw Hill, chapters 5, 6, 7, 8 and 9