Entrepreneurship and new ventures finance

Overview and Introduction

Prof. Antonio Renzi

FACOLTÀ DI ECONOMIA

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First part: Foundations of entrepreneurship and new ventures finance (6 credits)
Antonio Renzi

Second part: Cases and applications (3 credits)
Marco Guarna

It is just about the distribution of lectures hours. So in terms of final grade the course must be considered as unique and it worth 9 credits.

Class schedule:

Monday 10am-12pm (Classroom 8a); Tuesday 6pm-8pm (Classroom "acquarietto")

Wednesday 10am-12pm (Classroom 9b);

Information posted on the website:

Course Syllabus; Slides; Other Materials

ANTONIO RENZI | Catalogo dei Corsi di studio (uniroma1.it)

Exam:

Interview, Applicative Work, Project Work

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Office hour

Friday from 6:00pm

Send me an email to confirm

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General overview

1. Course goals
2. Course motivations
3. Course topics
4. Details about the exam

Entrepreneurship and new ventures finance

Issues of entrepreneurship

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Issues of ventures finance

Goals:

1. **Acquisition of basic skills for becoming an entrepreneur**
2. **Acquisition of basic skills for working in the field of venture finance**

The traditional issues of management regard big corporations

The entrepreneurship subject is focused on new small businesses that promise a potential growth

Two general kinds of entrepreneurship:

1. External entrepreneurship – Focus: start ups

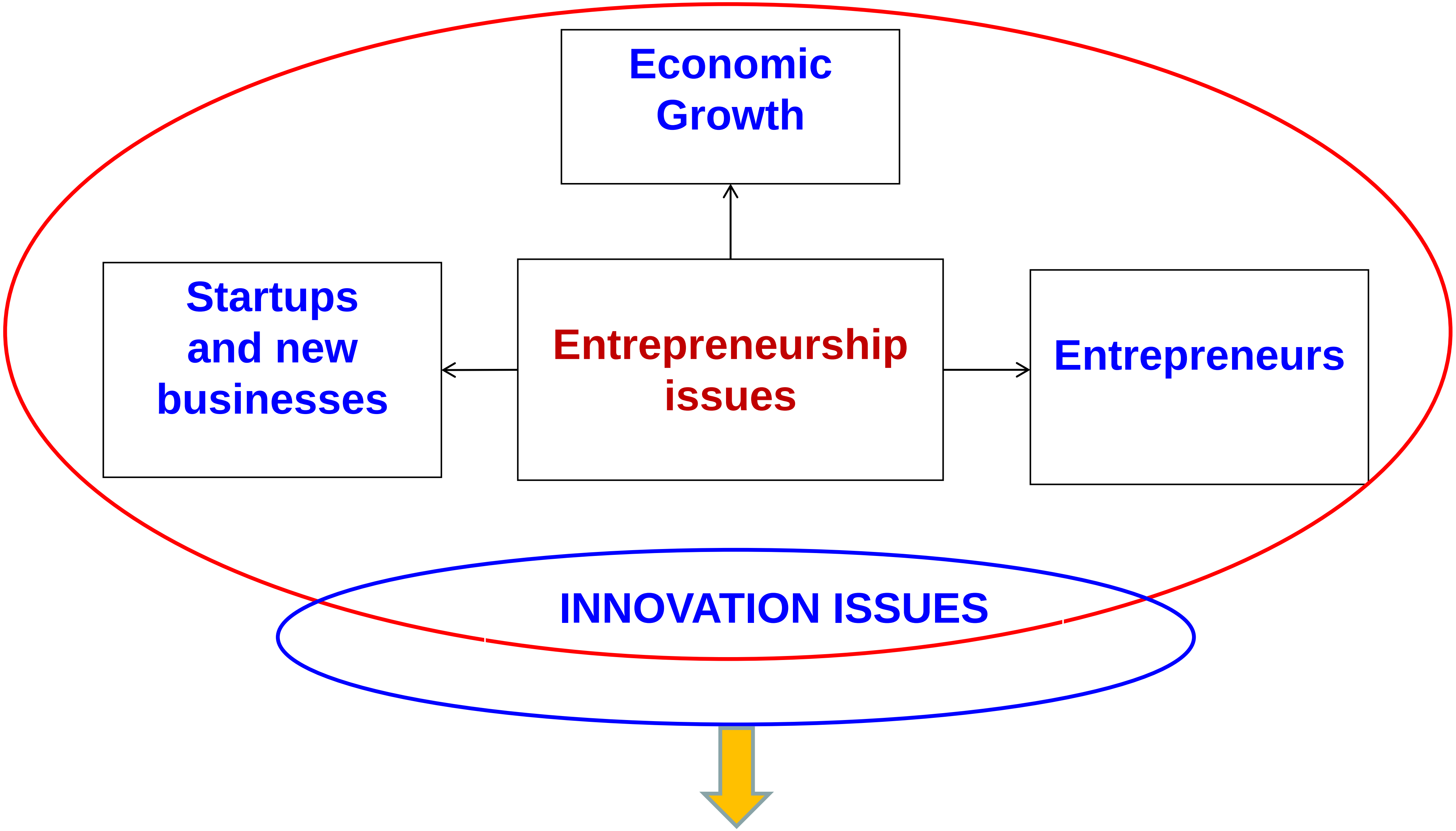
2. Internal entrepreneurship - Focus: manage a big company with entrepreneurial spirit

The external entrepreneurship affects the number of new firms

The internal entrepreneurship affects the size of existing firms. It is a way for developing new projects

In some cases big corporations make investments in external entrepreneurship (corporate venture capital). This allows an externalization of the risk

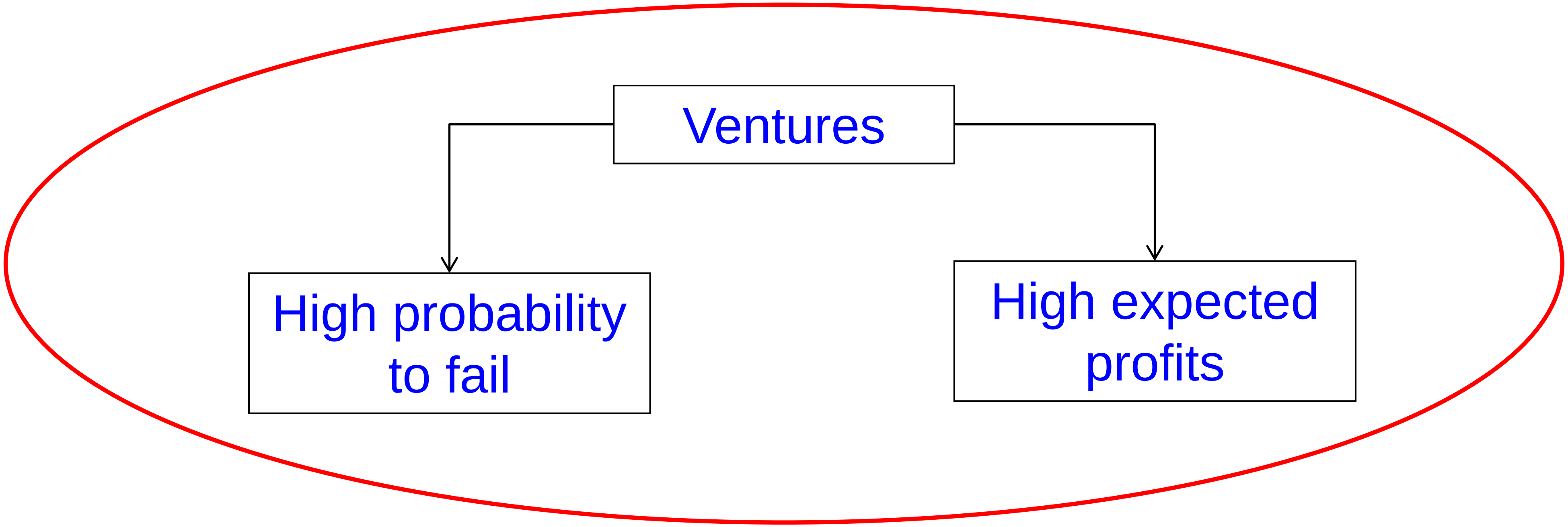
Overview - Entrepreneurship and ventures



Entrepreneurial Risk →Venture concept

Overview - Entrepreneurship and ventures

An entrepreneurial activity is a venture when it is based on an innovative project that entails high expected profits and high risk.



Ventures imply an extreme risk-return relationship

Overview –Failure rate of new ventures

Year	Percent Failed
Year 1	25 %
Year 2	36 %
Year 3	44 %
Year 4	50 %
Year 5	55 %
Year 6	60 %
Year 7	63 %
Year 8	66 %
Year 9	69 %
Year 10	71 %

Source: Statistic Brain Institute

Typically, an extreme risk-return relationship arises when a firm challenges a big corporation with an innovative product.

For example Google arose thanks to a new product better than that of Yahoo (large profits).

At the beginning of "Google Project" few investors believed in its success, because the possibility to compete with Yahoo seemed improbable.

New ventures need speculators. This explains why the venture finance exists.

Overview - Ventures finance (financial side of entrepreneurship)

Entrepreneurial Risk →Venture's concept

Financial need of new ventures ← **Venture finance** → **Risk of new ventures**

Venture financing:

- **Venture financing tools;**
- **Venture capitalist and other investors.**

Venture valuation:

- **Traditional financial models;**
- **Innovative financial models.**

Good side and bad side of venture finance

Good side:

-**Venture finance affects positively the number of entrepreneurial opportunities;**

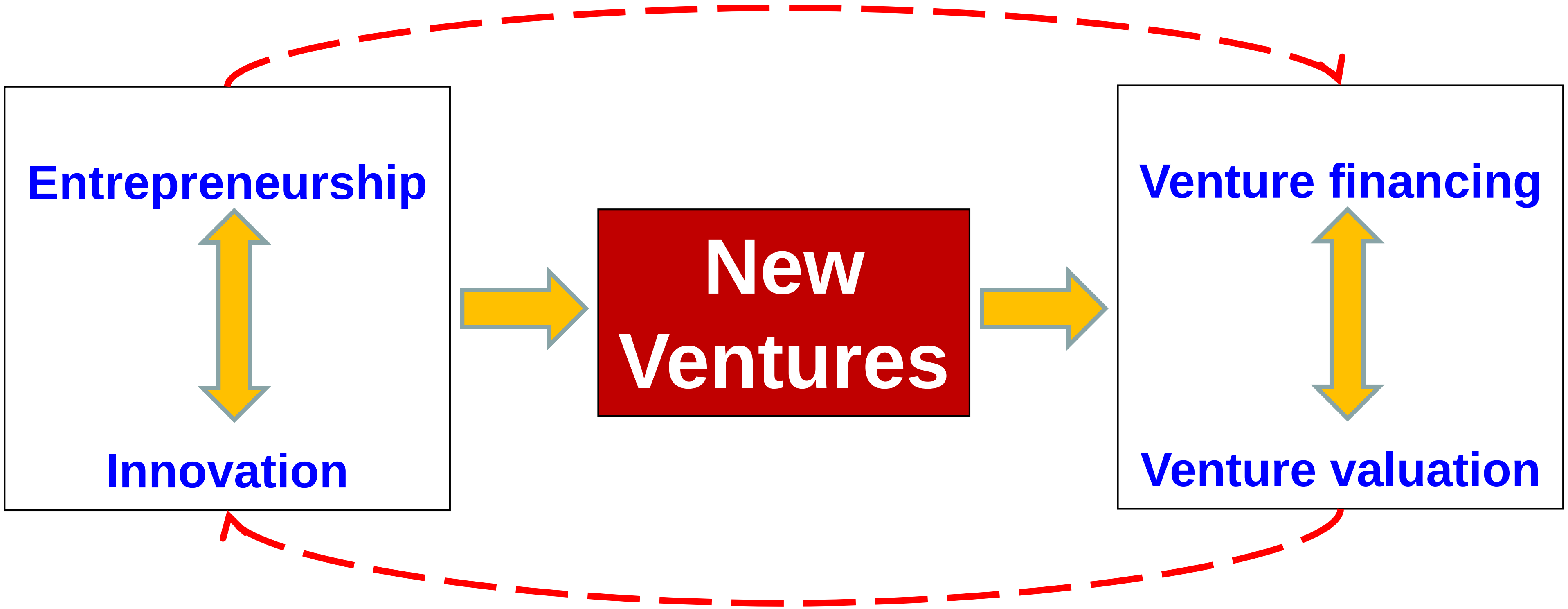
- **Venture finance is based on “good speculation” (long period).**

Bad side:

-**Venture financing operations amplify the systemic risk of financial system.**

- **The “venture finance power” can decrease the creativity of entrepreneurs**

Overview – General framework



Synthesis:

1. **Ventures as a consequence of the double combination between entrepreneurship and innovation phenomena.**
2. **The characteristics of new ventures explain the role of venture finance.**
3. **Venture finance means venture financing and venture evaluation**
4. **Ventures finance is a driver of both entrepreneurship and systemic risk**

Overview - Topics

1. Entrepreneurs, entrepreneurship and innovation
2. Entrepreneurial design: business model and business plan
3. Venture financing
4. Venture evaluation
5. Open innovation and business model. WC Cases + simulation in class (Marco Guarna)

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1.1.Theoretical qualification of the entrepreneur

1.2 Theoretical qualification of the entrepreneurship

1.3 Theories of entrepreneurial opportunities

1.4. Entrepreneurship, innovation, internal resources and external relationships (open innovation)

Overview - Topics (2): Entrepreneurial design

2.1 Entrepreneurial design as internal tools to estimate the feasibility of entrepreneurial projects

2.1 Business model: Qualitative analysis of the project

2.3 Business plan : Economics

Feasibility analysis

Business model

Business plan

Internal valuation

External communication

A design process plays a double role: first it provides an internal valuation as well as a planning of resources and activities; second it plays the role to communicate to external actors the project profile in terms of its strategic and operative characteristics, and in terms of its capacity to generate economic and financial performances.

Business plan as "calling card" of a new business

Overview - Topics (3): Venture financing

3.1 Life cycle of ventures , financial need and venture financing processes

3.2.Venture capital and business angel

3.3. IPO (Initial Public Offering)

3.4 Corporate venture capital

Overview - Topics (4): Venture evaluation

4.1 Venture evaluation: basic methods (DCF and APV)

4.2 The equity cost analysis: tradition approach (CAPM)

Traditional valuation models

4.3. The equity cost analysis: bottom up approach

4.4 Real option analysis: the value of strategic flexibility

Innovative valuation models

4.5. Shadow option analysis

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Exam

1. Applicative work: exam on practical issues (Venture evaluation)
2. Group work about business model (Second part)
3. Final exam: oral test (exam on theoretical frameworks)

Exam

Applicative work – First midterm test

The applicative work will based on a simulation about a valuation process of a start-up

Group work – Second midterm test

The group work will based on a simulation about a business model

Oral test (Interview) – Formal sessions

Final valuation

Attendance of lectures is recommended, but it is not mandatory. Students who attend lectures will have the possibility to take two midterm tests (the first one will take the place in November; the second one in December).

Dates of midterm tests will be communicated in class. The maximum midterm tests grade is 26/30.

However, all students are required to take the final oral test in a formal exam sessions. The midterm tests grade will be considered for the formal score

Entrepreneurship and new ventures finance

Entrepreneurs and entrepreneurship

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Agenda

1. **The entrepreneur concept**
2. **The entrepreneurship concept**
3. **The entrepreneurial opportunities: discovery theory and creation theory**

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The entrepreneur concept

The most general definition considers the entrepreneur like an economic actor who creates a new business and manages it in the long run.

The entrepreneur concept

The entrepreneur is not a pure capitalist

Actor	Action	Expected Goal
Pure capitalist	Capital investment	Profit

Actor	Action	Expected Goals
Entrepreneur	Capital investment Strategic firm's decisions	Profit Social prestige Family wealth Relationships with other actors …

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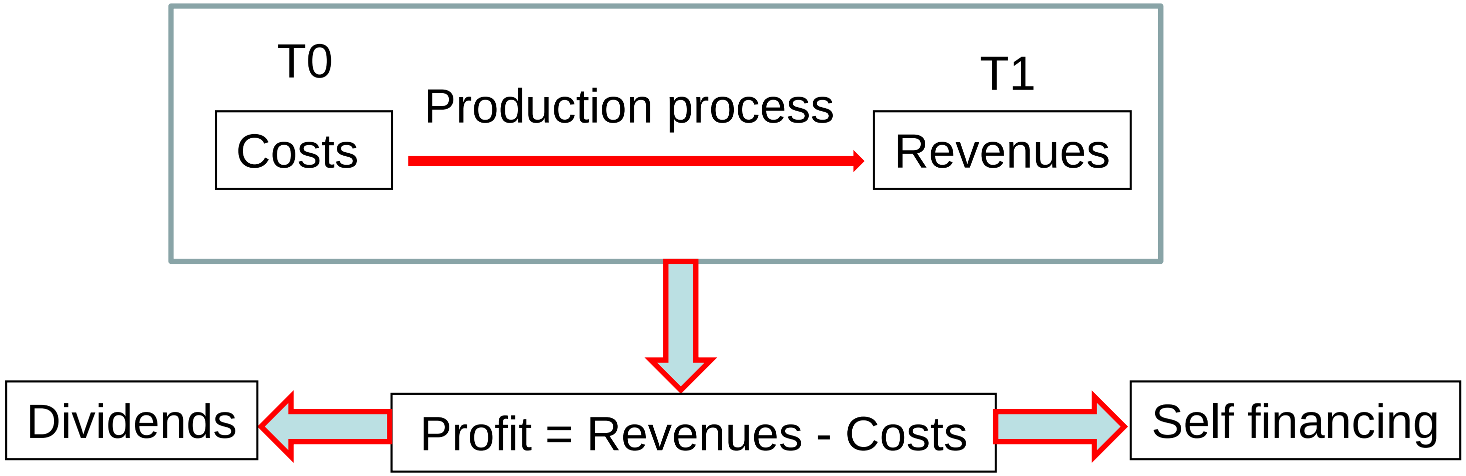
Capitalists and entrepreneurs: Two profit views

The pure capitalist tends to consider the profit as the final goal

The entrepreneur tends to consider the profit as a tool for the firm’s survival

The entrepreneur perspective about the profit looms larger: He looks at his economic benefits in a long run.

Capitalists and entrepreneurs: Two dividend policies



Capitalists first tend to satisfy themselves with a large distribution of dividends and then they use the residual part of profit for making new investments

Entrepreneurs first tend to use profit for making new investments and then they take the residual part of profit (dividends)

Diversification and concentration risk

Capitalists face risk especially through diversification processes

Entrepreneurs must face a larger risk due to a higher degree of investments concentration on one or few activities

The generational turnover

Often entrepreneurs prefer to maintain their firm rather than to get large profits that could come from the firm's sale.

It happens especially when an entrepreneur aims that one day a single or more components of his family will manage the firms.

Instead, a pure capitalist tends to disinvest his businesses when it produces large profits in a short period.

In the real world this distinction between entrepreneurs and capitalists is not so rigid.

For example, it is possible that an entrepreneur assumes over time the typical capitalist behavior. That’s the case of both serial entrepreneurs and those entrepreneurs who have changed their entrepreneurial firms into public companies.

The entrepreneur is not a manager

Actor	Action	Goal
Manager	Giving managerial solutions to solve technical problems	personal remuneration

Actor	Action	Goals
Entrepreneur	Capital investment	Profit
	Strategic firm's decisions	Social prestige
		Family wealth
		Relationships with other actors
		…

The entrepreneur concept

The decisional power

Entrepreneurial firms

In an entrepreneurial firm the decision-making power belongs to the entrepreneur.

The managers have a residual decision power tied to their skills. The residual manager power arises during the phases of strategies implementation

Dimensional goals

Decisional power changing

Public companies

The decision-making power of managers is higher in the case of public companies, where the ownership of the company is diluted among many investors.

The power of shareholders regards the control activity on decisions of managers and their behavior

The transformation of an entrepreneurial firms in a public company causes a change in relation to the decisional power. This kind of transformation is often due to dimensional goals. In fact the margin growth of a firm can be amplified by new financial resources that come from the capital market.

The entrepreneur definitions linked to specific capabilities. Two extremes

The entrepreneur as an investor who owns managerial capabilities

The entrepreneur as an “artist” able to reason in a creative way and to be innovative

The main definitions of the entrepreneur in the economic theory

Increasing dynamism of the entrepreneur role

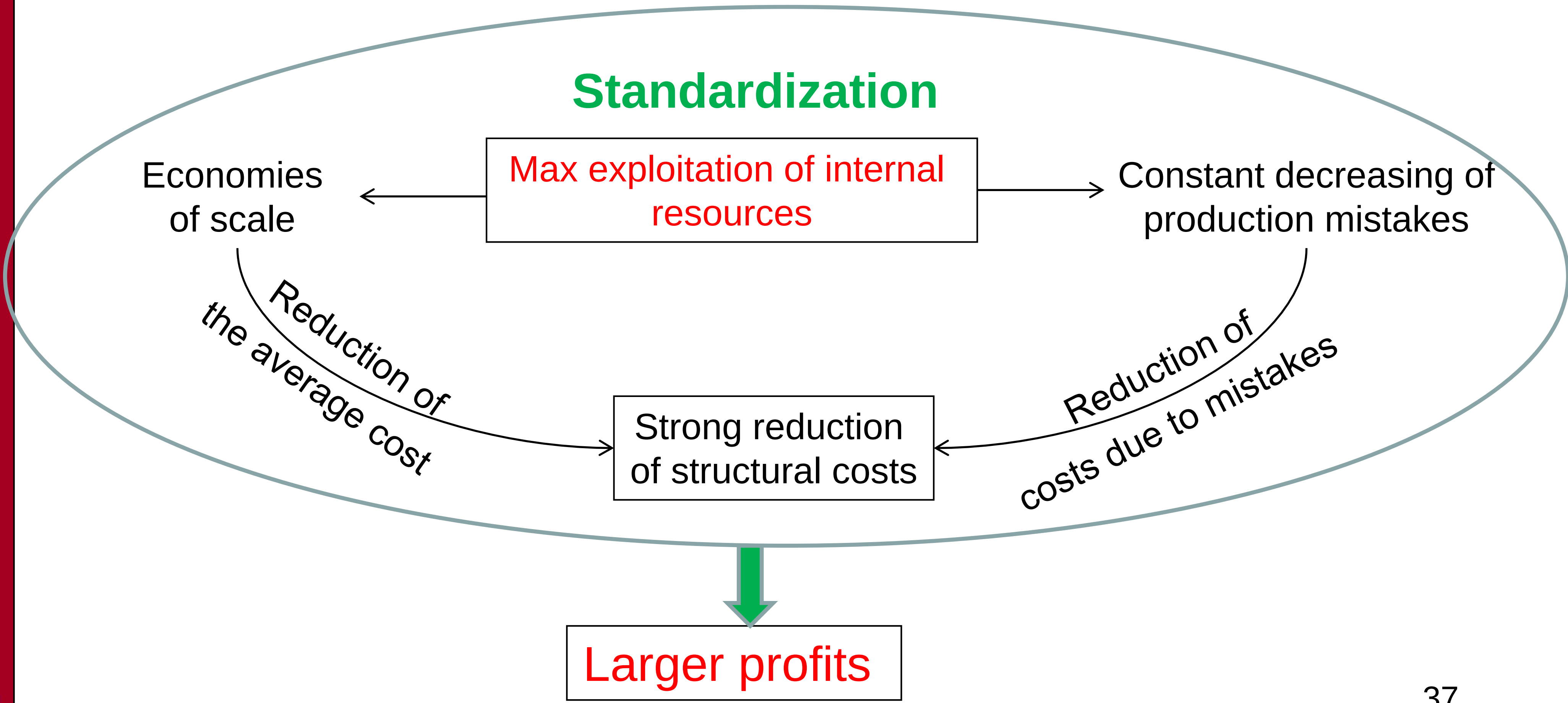
Activity	Definition
Coordination of inputs	Entrepreneur as an organizer (Neoclassical theory)
Arbitrage	Entrepreneur as a decision-maker (Kirzner, 1973).
Risk taking	Entrepreneur as a risk taker (Knight, 1921)
Innovation	Entrepreneur as an innovator (Schumpeter, 1942)

Increasing complexity

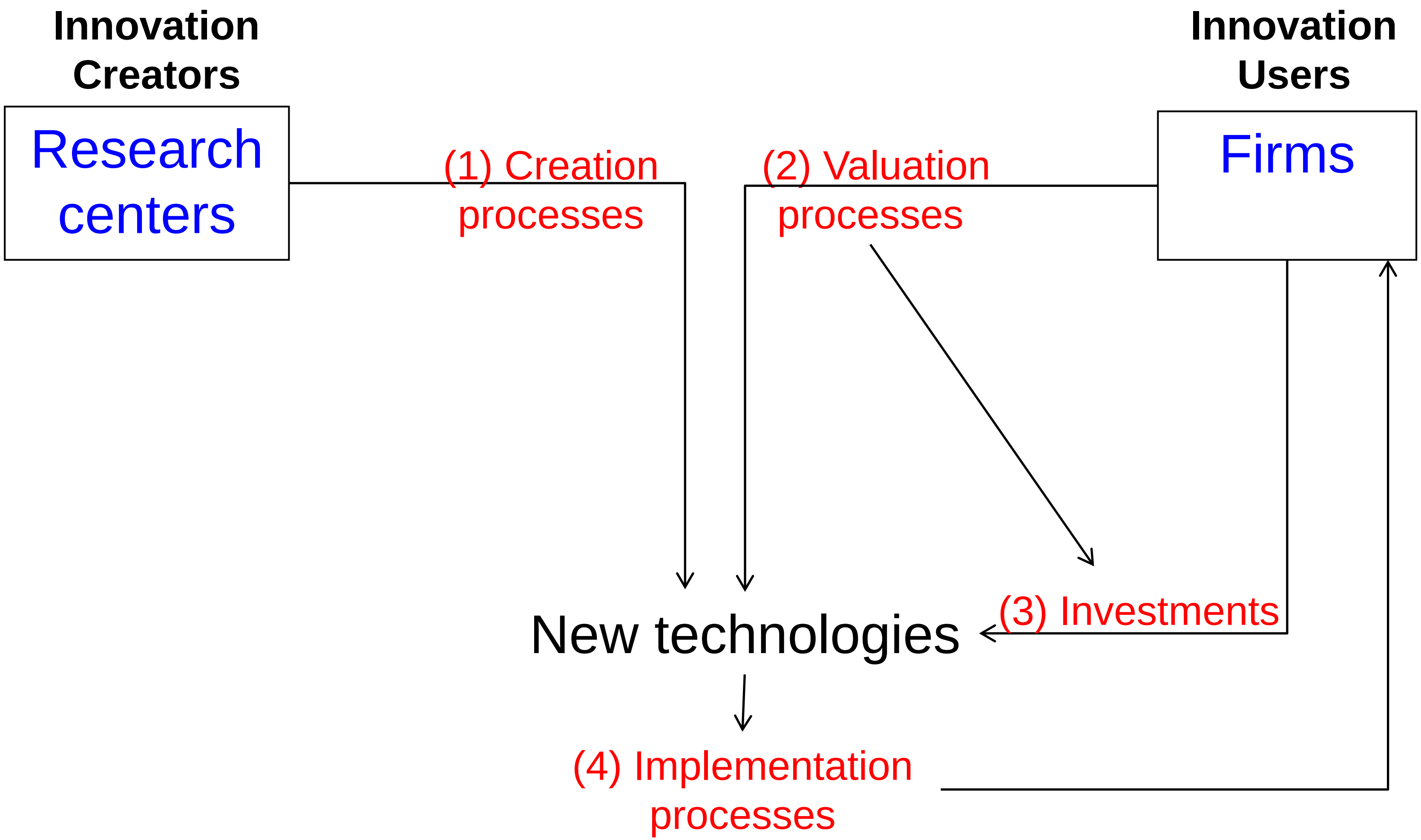
The entrepreneur as an organizer: the standardization logic

The idea of entrepreneurs as organizers implies that the most successful entrepreneurs are able to find competitive advantage in terms of higher efficiency.

They are able to exploit all resources necessary to do a certain business.



The entrepreneur as an organizer: innovation as external phenomenon



The entrepreneur as decision maker

The idea of entrepreneur as a decision maker has been proposed by Kirzner who was an Austrian Economist.

According to Kirzner the entrepreneurial behavior is linked to a double uncertainty:

1. Economic uncertainty due to the volatility of prices and technologies
2. Social volatility due to possible changes in the behaviors of economic actors (customers, competitors, financiers etc.)

The two sides of uncertainty:

The uncertainty affects the level of volatility of all businesses and, at the same time, it produces a higher number of entrepreneurial opportunities.

According to Kirzner the best entrepreneurs arise during unstable phases, because the main capability of successful entrepreneurs is to figure out future trends before they happen.

The entrepreneur as decision maker : arbitrage profit

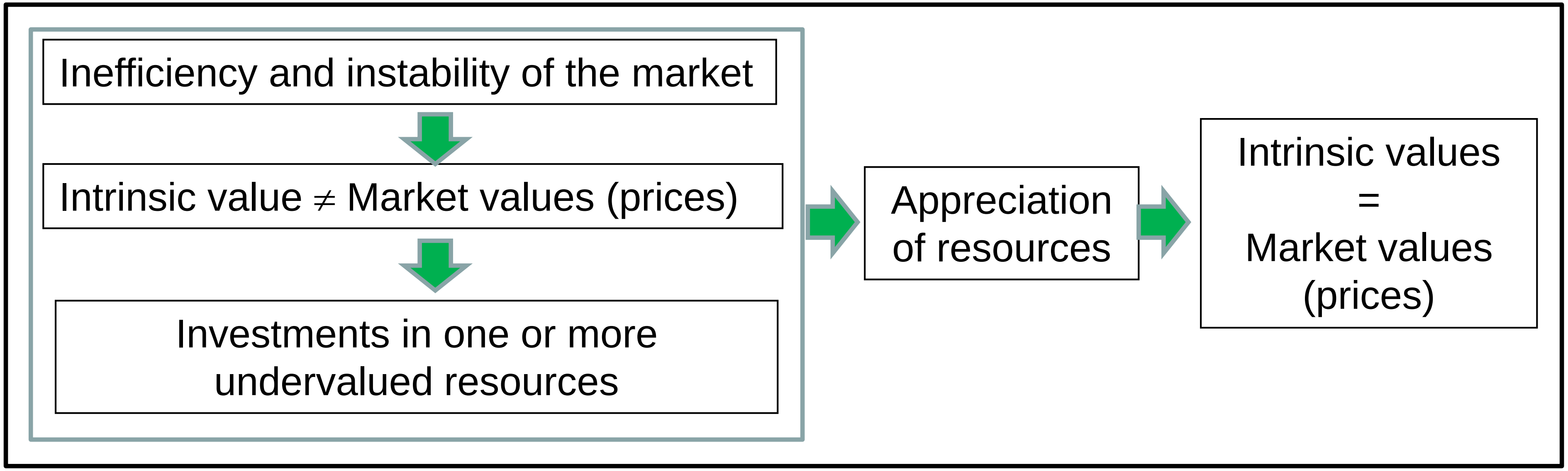
Mistakes done by other entrepreneurs became the main driver of arbitrage profits.

The entrepreneur is able to exploit mistakes in terms of arbitrage profit: he buys (or sells) when the price of a product is lower (of higher) than its real value.

Market efficiency	Market inefficiency
Intrinsic value = Market value (price)	Intrinsic value ≠ Market value (price)
Arbitrage profit = 0	Arbitrage profit > 0

The entrepreneur as decision maker: arbitrage activity

The higher capacity of successful entrepreneurs to make new strategies in advance than new phenomena gives them the opportunity to take a large economic value through ***arbitrage operations based on the exploitation of the resources' intrinsic value.***



Arbitrage value = Final Value – Initial Value

The entrepreneur as decision maker: the arbitrage capabilities

The arbitrage activity is linked to one or more of the following capabilities:

- Capability to connect different markets (e.g. connection between ICT services and health sector);
- Capability to integrate a market (e.g. new space for connecting supply and demand, as in the case of Amazon);
- Capability to make new uses of strategic resources or products (e.g. the passage of the product bicycle from a simple tool of transport to a recreational tool; the transformation of old industrial buildings into hotels).
- Capability to make organizational changes for exploiting better synergies between several types of knowledge (e.g. marketing knowledge and sociological knowledge).

The entrepreneur as risk taker

The idea of the entrepreneur like a risk taker is based on the distinction between risk and uncertainty.

Risk means a measurable volatility

Uncertainty is about that part of volatility that’s impossible to measure.

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The entrepreneur as risk taker

The entrepreneur undertakes very uncertain investments in relation to their capacity to generate future profits.

This implies:

1. **High propensity to risk**
2. **Decisional responsibility: the entrepreneur is ready to pay all consequences that come from a high propensity to risk**
3. **The capacity to absorb possible strong losses**
4. **The capacity to figure out the risk-return relationship**

The entrepreneur as innovator (Schumpeter Theory)

According to Schumpeter the entrepreneur is able to make the following innovation activities:

- **Product innovation;**
- **Process innovation;**
- **Acquisition of a new production factor**
- **Organizational innovation**

Creativity is the main characteristic of entrepreneurs

The entrepreneur as innovator: the creative destruction

The markets have discontinuous curves, in the sense that the stability phases (equilibrium) are followed by strong shocks (disequilibrium).

During the stable periods, the firms that have dominant positions tend to maximize profits thanks to the inertia of given drivers of competitive advantage.

On the contrary, during shocks, the success of firm depends on entrepreneur ability to exploit the chaos through the destruction of pre-existing factors of success and the creation of new drivers of competitiveness.

This phenomenon is known as "the process of creative destruction"

Some examples of creative destruction

1. Innovations about new apps in Internet have destroyed (or decreased in a strong way) the value of several businesses such as travel agencies, music industry etc.

2. The born of personal computer sector (1980s) has destroyed the industry of typewriters

3. The first product of Microsoft (DOS) has destroyed (or decreased in a strong way) the value of IBM's software.

The timing of innovation: the strange case of Olivetti

Olivetti was the first firm to develop a personal computer (1960s).

The new product did not succeed because it was not aligned with the marked needs.

Then, Olivetti decided to abandon the new product for increasing the investments in the sector of typewriters.

Twenty years later (1980s), the sector of typewriters was destroyed by the new personal computer.

Serendipity processes of innovation

Often innovative paths don't arise thanks to a planning process. In some cases they are a consequence of casual events or mistakes (serendipity).

The limits of the Internet algorithm (in the military field) have allowed its large diffusion worldwide.

Several new medicines are used in a different way than the initial goals assumed during their design process.

Successful entrepreneurs have the capability to exploit casual events and/or mistakes in entrepreneurial opportunities

Innovation, entrepreneurial risk and entrepreneur reward according to Schumpeter

The main task of an entrepreneur is to provide innovative ideas at the right time.

This causes that the entrepreneur takes the innovation risk. So, his reward depends on the innovation degree that comes from entrepreneurial choices.

A comaparison between neoclassical theory theory and other theories

Neoclassical theory	Other theories
The entrepreneur tends toward a rational behavior He is able to provide capital, organizing firm inputs and finding economic efficiency	The uncertainty as a driver of the entrepreneurial activity The entrepreneur as speculator who earns large profits through arbitrage processes The entrepreneur as an innovator who causes turbulence

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Current qualification of the entrepreneur

- Strong influence of Schumpeter Theory

- Synthesis between four entrepreneur concepts: entrepreneur as organizer; entrepreneur as decision maker; entrepreneur as risk taker; entrepreneur as innovator.

- Contextualization of the entrepreneur figure in relation to each industrial sector.

Entrepreneurship concept

The entrepreneurship concepts come from entrepreneur concepts

- Entrepreneurship as activity based on organization processes

- Entrepreneurship as activity based on the exploitation of market changes

- Entrepreneurship as an activity based on uncertainty expectations

- Entrepreneurship as an activity based on innovative business ideas

- Entrepreneurship as an activity that destroyes exinting products, processes, organizational routines etc.

Entrepreneurial opportunities

General definition

An entrepreneurial opportunity arises when “new product (or services), production rows, new processes etc can be allocated on the market with a price higher than their production cost (SHANE S., VENKATARAMAN S., 2000)

Entrepreneurial opportunities

Discovery approach

The entrepreneur's task is to discovery existing needs and the way to satisfy them

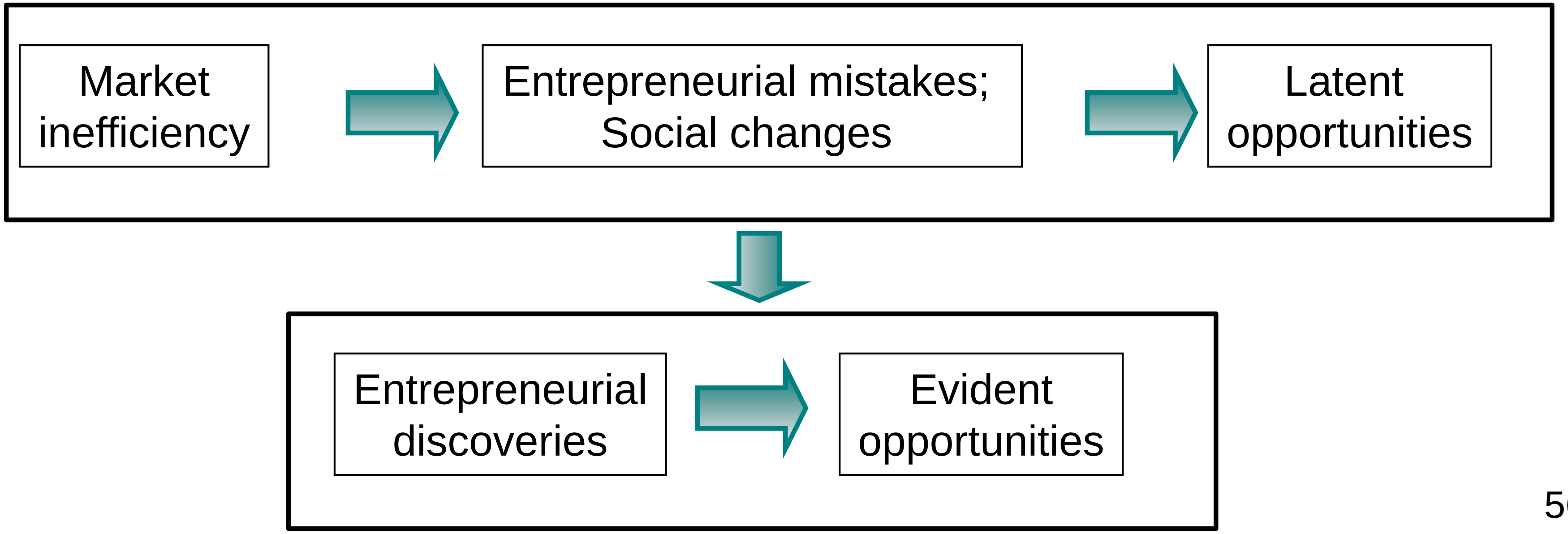
Creation approch

The entrepreneur's task is to create new needs and new solutions

Discovery approach

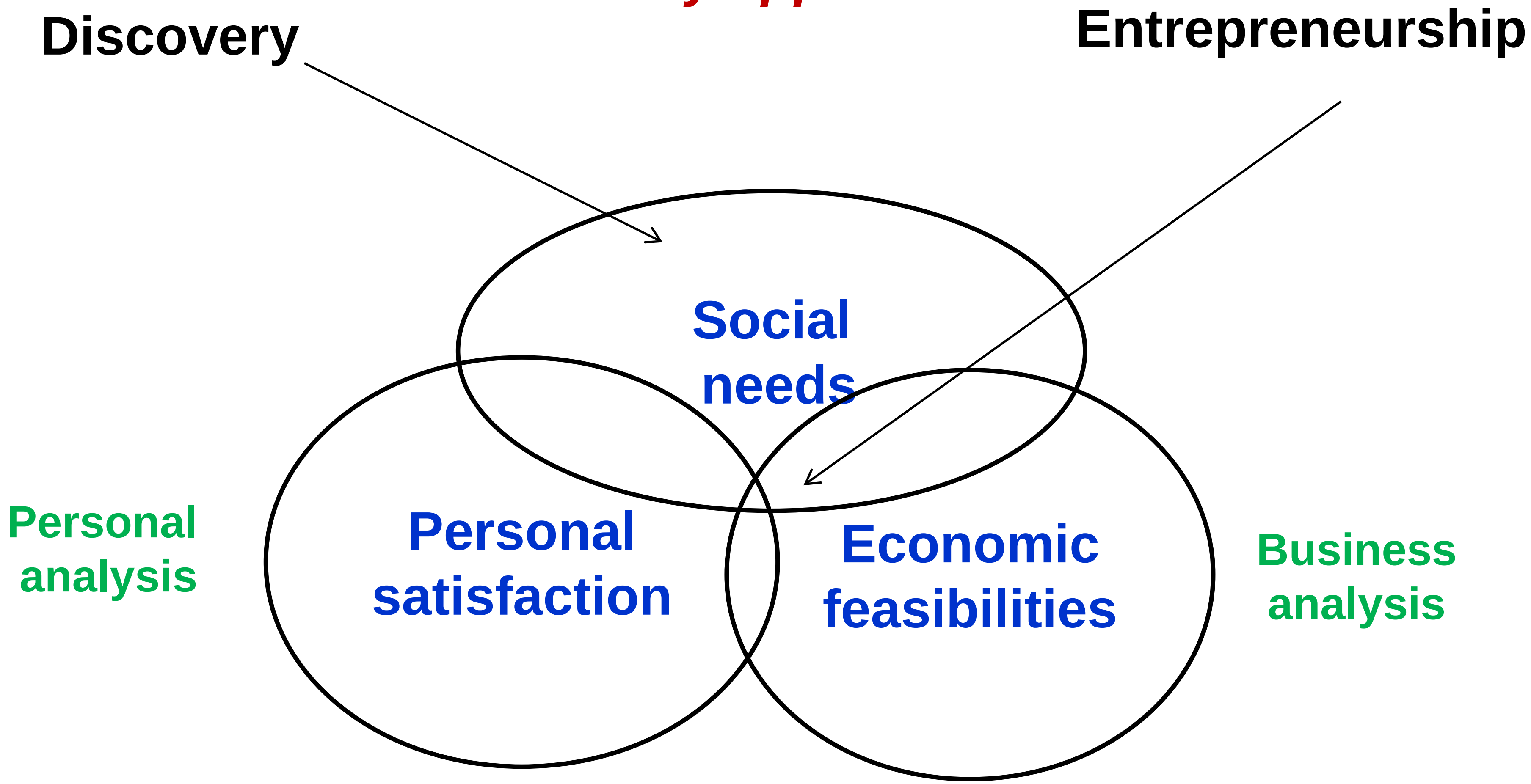
The entrepreneurial opportunity arises before the entrepreneurial action. Market frictions and social dynamics cause a lack of information about new entrepreneurial opportunities. They are latent. The entrepreneurial activity starts whit the transformation of a shadow opportunity (or latent opportunity) in a evident opportunity.

Information inefficiency



Entrepreneurial opportunities

Discovery approach

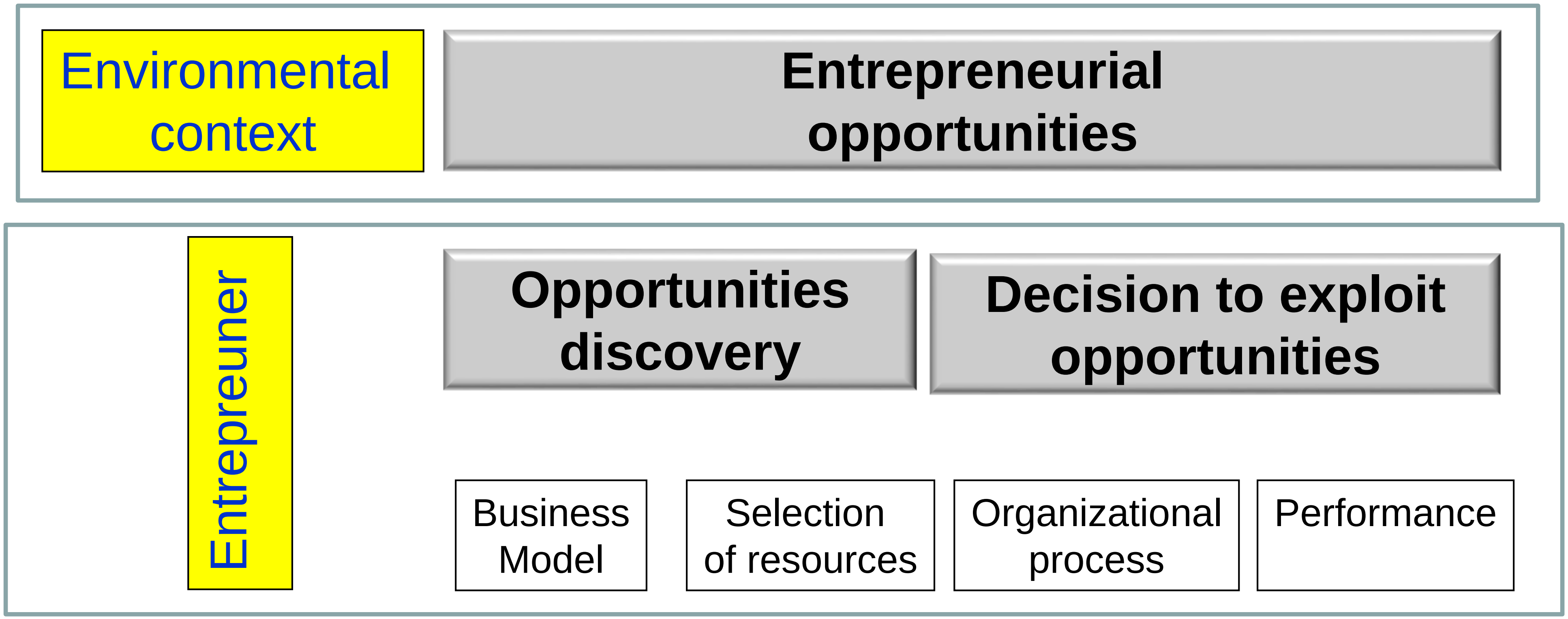


Source: H.H. Stevenson, S.M. Spence, 2009, identifying and exploiting entrepreneurial opportunity, Harvard Business School

Entrepreneurial opportunities

Discovery approach

Entrepreneurial opportunities and entrepreneurial process



Source: Shane (2004)

Discovery approach

In same cases the discovery process arises in a clear way. This happens for example when:

When a specific need appears in a clear way, but, in that moment, there isn’t any product (or service/process) which can satisfy it;

When one firm had already created a new product (or new service/process), but it hasn’t identified yet a market for it.

Discovery approach

Therefore, for each entrepreneurial opportunity there's a time limit before the opportunity expires: the time range is comprised between the moment of the discovery and the one of the new business development.

Some factors affecting the «economic life» of an entrepreneurial opportunity:

- if it is patentable;
- Exclusive contract;
- time-lag before information diffusion;
- Technical complexity;
- Time-lag before competitors catch the information;
- Time-based competitive advantage, as instance as in case of economies of experience.

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Discovery approach

Expected opportunities

The entrepreneur who has a pioneer behavior could catch an expected (forthcoming) opportunity.

This is the case of those business ideas speeding up the times. In this situation, it could happen the social and economic context is not ready for the innovation, yet.

Similar situations could include options and they have an economic value: the economic value is linked to the possibility to «wait and see», or, in other words, of postponing the market entry.

Entrepreneurial opportunities

Discovery approach

The time factor for entrepreneurial opportunities

Current sociological and economic environment

Current latent need

↓

Current Opportunity

↓

Time to the opportunity expires

Future latent need (potential)

↓

Expected opportunity (potential)

↓

Waiting time

Possible dynamics of the sociological and economic environment

Discovery approach

Random Discovery

Random observation of one or more events that are drivers of new business ideas

Searched Discovery

Planning of research activity aimed to looking for new business ideas

Discovery approach

Some Discovery drivers

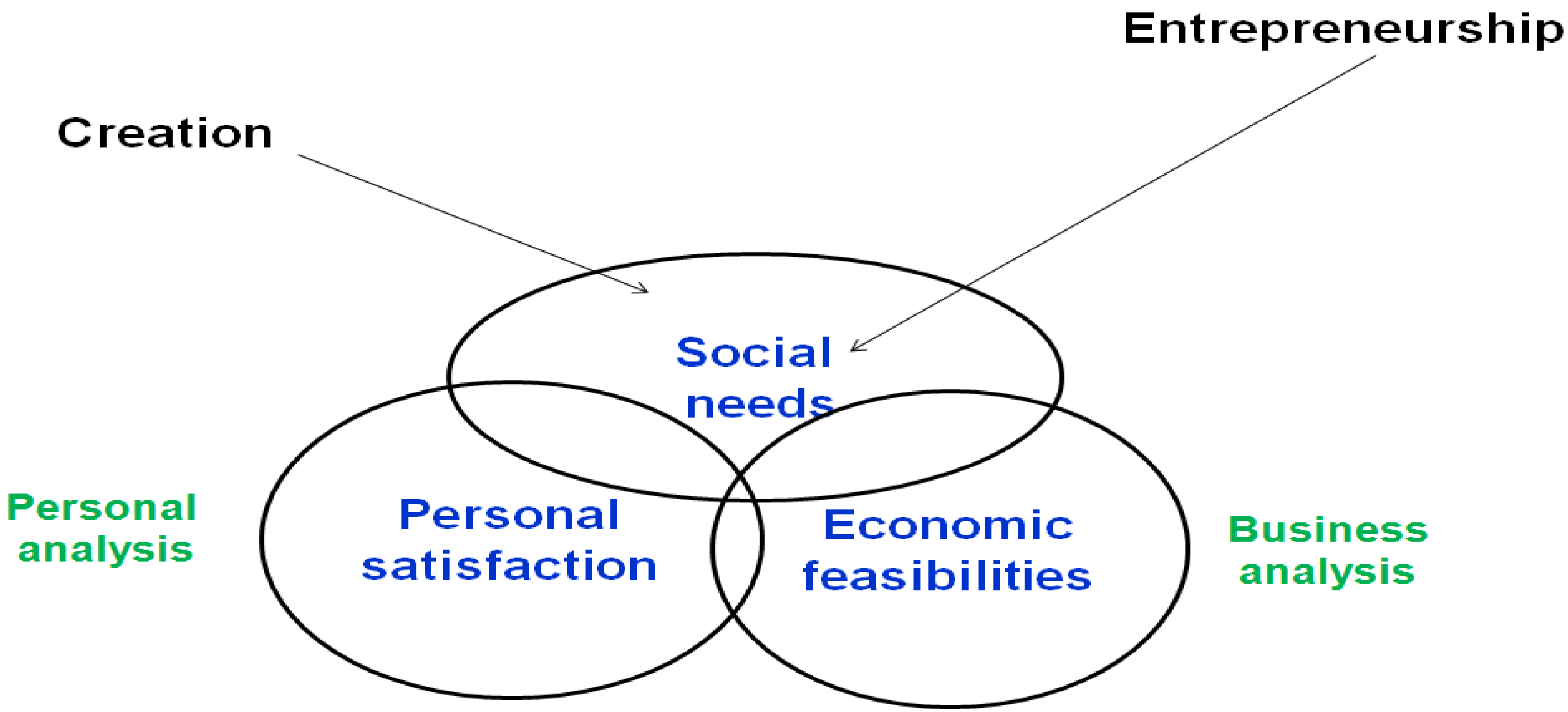
- Specific competencies of the entrepreneur

- Entrepreneur capabilities useful to figure out overall information about future scenarios

- Entrepreneur capability to take into account two sides of business value: Social side, Economic side.

Creation approach

According to creation approach each entrepreneurial opportunity arises as an entrepreneurial decision.
Entrepreneurs create needs and the solutions to solve them.



Entrepreneurial opportunities

"Discovery entrepreneur"
strategic planning, risk-return analysis, capital raising

"Creation entrepreneur"
Strategic flexibility

Key Points

Profit: entrepreneurial view and capitalists' view

Entrepreneur as organizer: Environmental conditions

Entrepreneur as decision maker: Environmental conditions

Uncertainty and risk and subjective capabilities

Organizational routines and value

Creative/destruction concept

Entrepreneurial risk according to Schumpeter

Entrepreneurial opportunities: Discovery process and creation process

Entrepreneurship and new ventures finance

Innovation: general overview

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Agenda

1. **Incremental innovation and radical innovation**
2. **Innovation and knowledge**
3. **Innovation adoption**

Incremental and radical innovation

Incremental innovation: “Repairing” the old

Improvements in existing goods and processes

Radical Innovation: Creating the new

Development of new goods and processes

Examples of key radical innovations

Telephone (1861)

Television (1929)

Computer (1946)

Compact disk (1979)

Mobile phone (1992)

Incremental innovation, radical innovation and internal resources

Incremental Innovation propensity	Radical Innovation propensity
Produces little changes	Produces big changes
Produces a gradual profit growth	Affects strongly the profit dynamic
Implies low risk	Implies high risk
Allows stability of organization structure	Causes instability of organization structure
Allows stability of business model	Causes instability of business model
Doesn't change the competitive rules	Changes the competitive rules
Doesn't need new resources and competencies	Needs investments in new resources and competencies

Knowledge Creation

Both radical and incremental innovations need the exploitation of new knowledge or a new use of existing knowledge.

Four ways for creating new knowledge as driver of innovation:

- **Learning by doing;**
- **Learning by using;**

Field experiences produce flows of new knowledge

- **R&D investments;**
- **Acquisition of external knowledge.**

New investments produce flows of new knowledge

Learning by doing

Learning by doing means to improve products, services and processes thanks to the constant acquisition of incremental experience.

Each firm’s worker learns from their own mistakes: the current mistakes produce new experiences that reduce the probability of future mistakes.

Constant production improvements allow firms to achieve marginal innovation in stable conditions.

Learning by doing

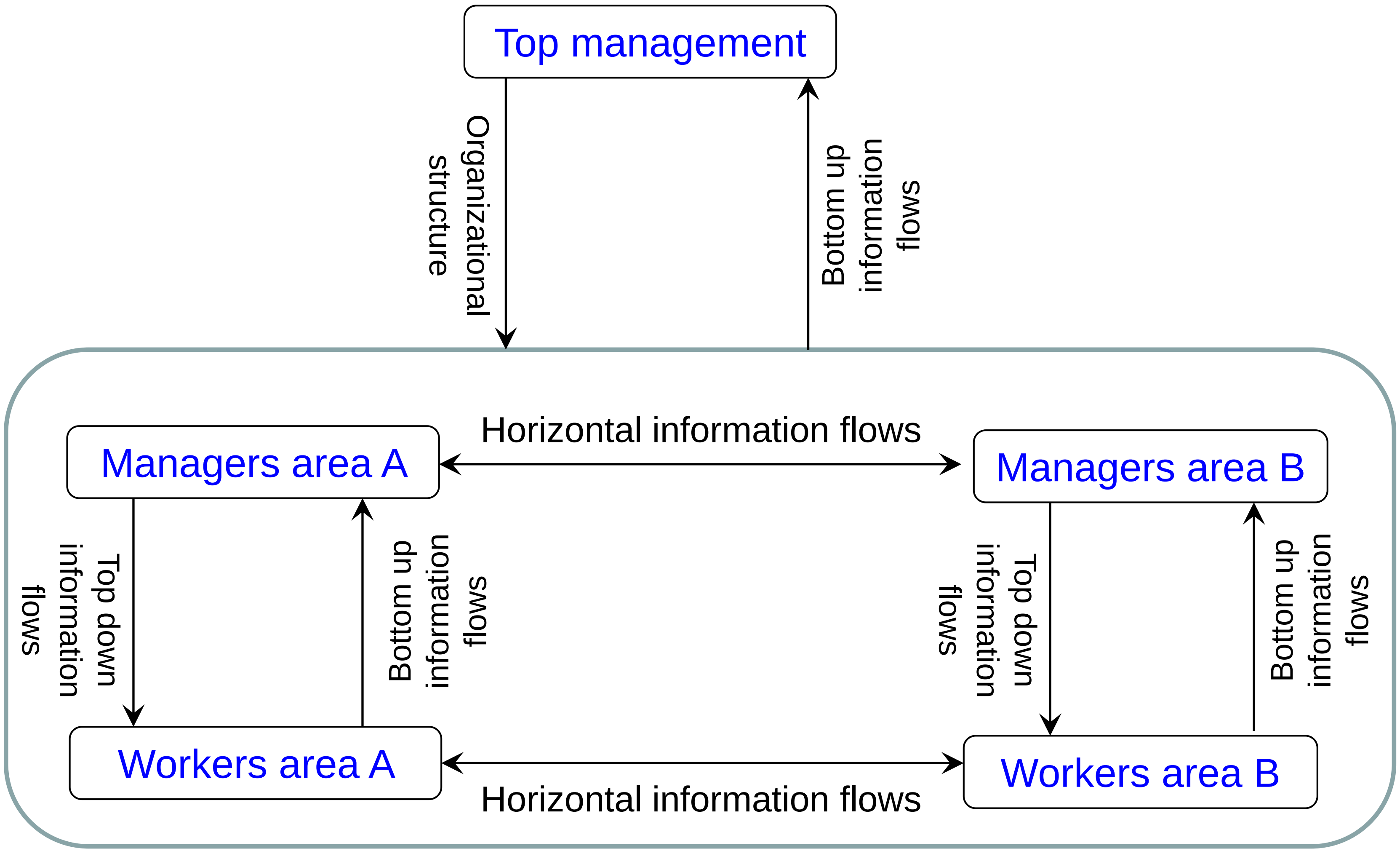
The focus is on internal experiences.

The firm improves what it is able to produce.

The learning by doing approach is consistent with incremental innovations.

Learning by doing and information flows

The application of the learning by doing logic needs choices in relation to the organizational structure and the information flows.



Strengths and weaknesses of learning by doing

Strengths	*Weaknesses*
Lower innovation costs	Rigidity of organizational structure in relation to radical innovations.
Stability of organizational structure	Rigidity of organizational structure in relation to strong external changes.
A higher efficiency	Constant improvement is just based on an internal perspective.
Strong technical interrelations between top management, managers and workers.	

Learning by using

"Learning by using" means to improve products, services and processes thanks to the capability to figure out the consumers needs.

Marketing oriented approach: new market needs drive improvements and innovations over time.

Learning by using

The focus is on user experience.

The firm improves its production in a way that fits with needs and requests of consumers.

The learning by using approach is mostly consistent with incremental innovations and only in some cases is it consistent with radical innovations.

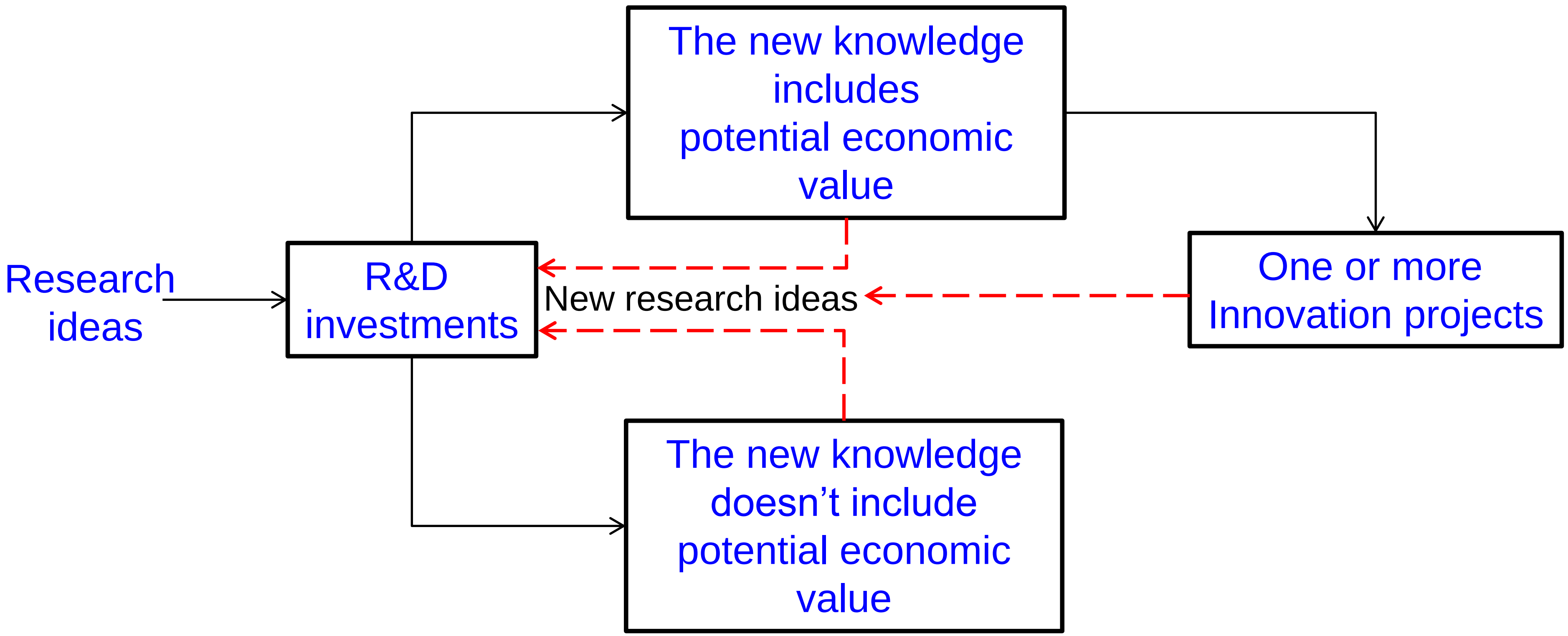
Strengths and weaknesses of learning by using

Strengths	Weaknesses
Dynamism of organizational structure. A higher propensity to face external changes. Higher strategic interrelations between top management, managers and workers. Client satisfaction and increase of the price for sale (price premium).	Higher innovation costs. A higher complexity of organizational structure. Risk of internal inefficiency. Risk to realize wrong innovations linked to the difficulty to figure out real market needs.

The R&D investments

Making R&D investments is the typical way for generating new knowledge that could be used as input for innovation projects.

R&D, knowledge and innovation as circular path



R&D investments as a necessity

In some sectors (e.g. pharmaceutical industry), R&D investments are typical assets, since the competitive rules are based on a constant research of new products.

This condition implies a stable level of high fixed costs, caused by one or more specific research structures.

Acquisition of external innovation

In some sectors, the need for knowledge investments is lower, and it arises only in specific phases.

This condition causes a lower propensity to realize R&D investments and a higher propensity to acquire knowledge from third parties.

Typical suppliers of knowledge:

- Public and private research centers
- Universities
- Competitors
- Others

Innovation adoption framework regards the decisional process of innovation users.

An innovation is successful when it meets the favor of potential users.

For example, in some cases successful innovations provide clear benefits in economic terms. In other cases, the success is linked to non economic factors.

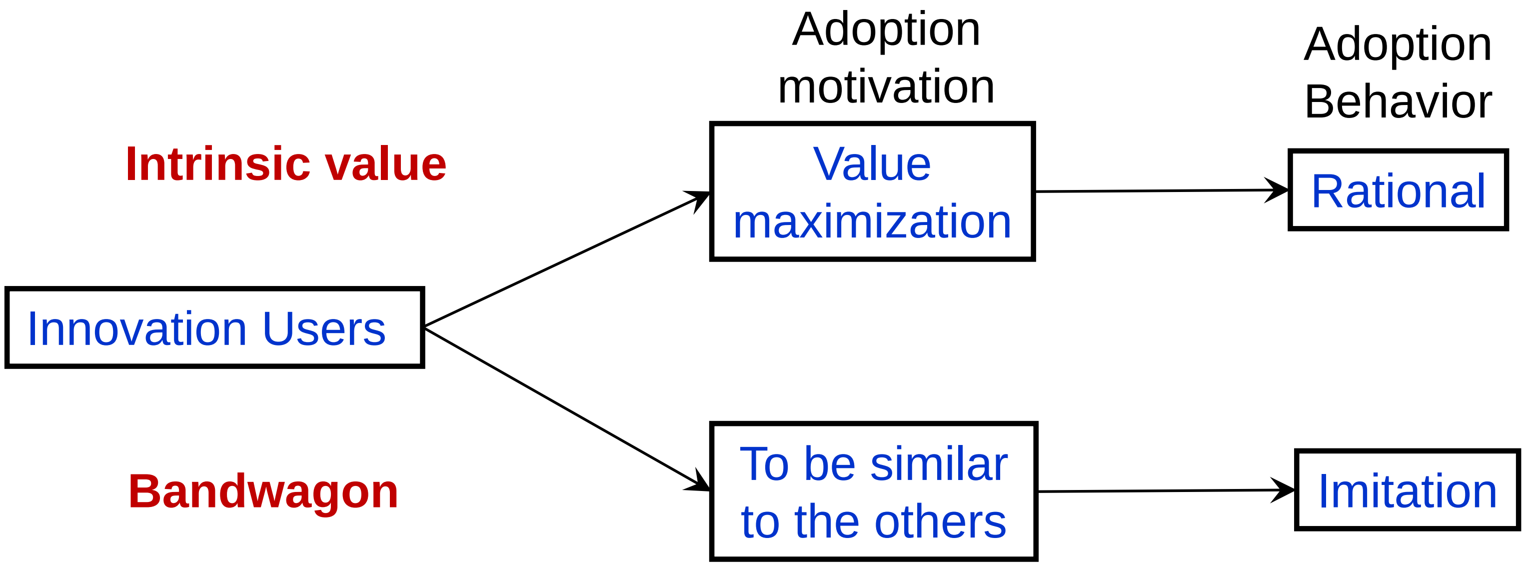
Two drivers of innovation adoption

1)Intrinsic value: the adoption degree is linked to the economic dimension of a specific innovation (e,g. new machinery that allows lower production costs)

1)“Bandwagon” behavior: the adoption degree of an individual (or a firm) depends on the behavior of other individuals (or firms)

Innovation adoption

Two drivers of innovation adoption



Intrinsic value

Typically, an innovation affects positively the intrinsic value of its users when it determines one or more of following benefits:

- **Lower cost**
- **Higher Revenues**
- **Lower technological risk**
- **Faster use**
- **New technological synergies with one or more stakeholders**

Intrinsic value

The intrinsic value logic is fit for those users who have technological competencies and skills to estimate the economic value of new goods.

Therefore this logic regards especially business to business relationships, where both the “firm customer” and the “firm supplier” have a deep knowledge about a certain product.

Instead, the intrinsic value logic can’t be applied when the customer doesn't own the competencies to estimate a new product. In these conditions the success probability of an innovation depends strongly on the marketing capacities of the innovators.

Bandwagon

The bandwagon logic is linked to the propensity of individuals (or organizations) to take decisions observing the behavior of other individuals.

For instance, a large spread of a new technology pushes us to think that's a good technology, even if we are not able to specify the benefits that it could provide.

Bandwagon

Often bandwagon processes start with an initial choice taken by one or more leaders in a certain context, such as big companies, public institutions, opinion leaders etc.

In other cases, the membership to a network is the main motivation to adopt a certain innovation.

Innovation adoption and innovation alignment

- Analysis of purchase motivations of potential customers
- Analysis of more customer types differentiated in relation to their adoption behavior
- Innovation alignment to the adoption criteria of potential customers
- Marketing alignment to the adoption criteria of potential customers

Key Points

Incremental innovation and radical innovation

Strengths weaknesses of the learning by doing

Organizational structure according to learning by doing

Strengths weaknesses of the learning by using

R&D investments and circular flows of knowledge

Innovation adaption according to intrinsic value perspective

Innovation adaption according to bandwagon perspective

Entrepreneurship and new ventures finance

The space of slack interaction

Prof. Antonio Renzi

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Agenda

1. Slack dilemma
2. The reciprocal interactions between several kinds of slack
3. The space of slack interaction

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Three definitions of slack

Slack "as pool of resorces in an organization that is in excess of the minimum necessary to produce a given level of organizational output" (Nohria, Gulati, 1997).

Slack "A cushion of actual or potential resources which allows an organization to adapt to internal pressures for change in policy, as well as to initiate changes in strategy with respect to external environment" (Bourgeois, 1981)

Slack "As resource intentionally kept by a firm beyond those needed by an organization to meet its known commitments" (Sharfman et al., 1998, Sharfman and Dean, 1997)

Slack dilemma

Inefficiency in short run

Agency costs

-Financial slack;

-Relational slack;

-Human resource slack;

-Knowledge slack;

-Operative slack;

-…

Potential strategic reserve in long run

Potential innovation driver

Dilemma: is slack good or bad?

The reciprocal interactions between several slack kinds

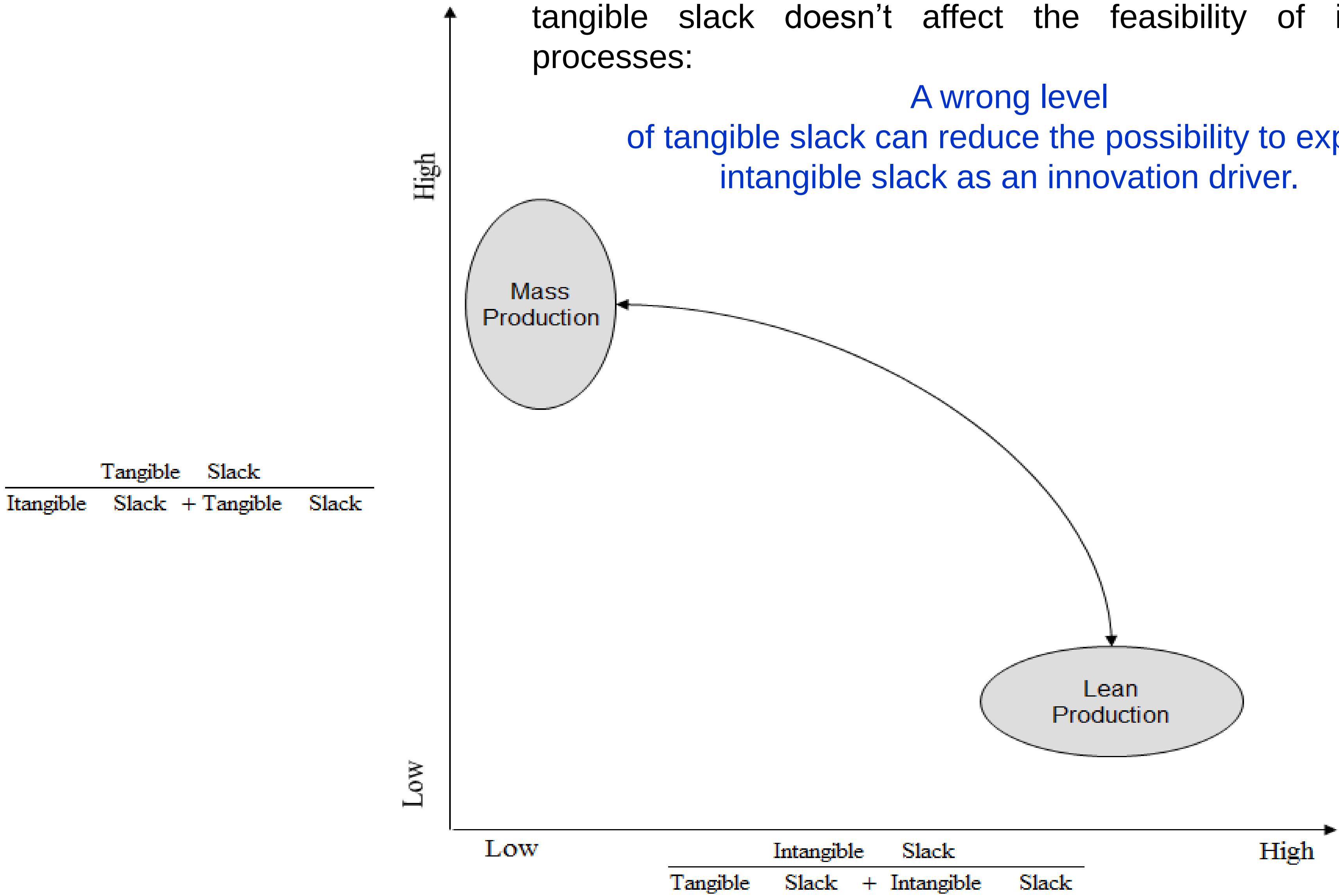
The phenomenon of slack can’t be evaluated in absolute terms as negative or positive, but it must be evaluated in relative terms.

Moreover, with particular reference to innovative firm processes, scholars have put little attention to investigate the reciprocal interactions between heterogeneous slack resources.

The increasing importance of intangible slack

The increasing importance of intangible slack doesn't mean that tangible slack doesn't affect the feasibility of innovation processes:

A wrong level
of tangible slack can reduce the possibility to exploit
intangible slack as an innovation driver.



The space of slack interaction

How do tangible and intangible slacks interact to each other?

How does the interaction between tangible and intangible slacks influence risk-return profile of innovative firms?

Heuristic model:
"THE SPACE OF SLACK INTERACTION"

The space of slack interaction

The model takes into consideration two kinds of slack:

OPERATIVE SLACK

It derives from the excesses in productive capacity. It is typically due to over sizing of plants, machinery and work force.

KNOWLEDGE SLACK

It derives from the patrimony of knowledge found internally in economic organization that can assume diverse paths.

The space of slack interaction

Assumptions

- Economic and industrial performances depend on how knowledge slack is combined with operative slack

-“Non neutral” alignment leads to different effects depending on the “nature” of the innovative approach taken.

The space of slack interaction

"The space of slack interaction": General logic

Slack composition

OPERATIVE SLACK

KNOWLEDGE SLACK

Exploitation in innovation process

Intrinsic risk-return profile of innovation

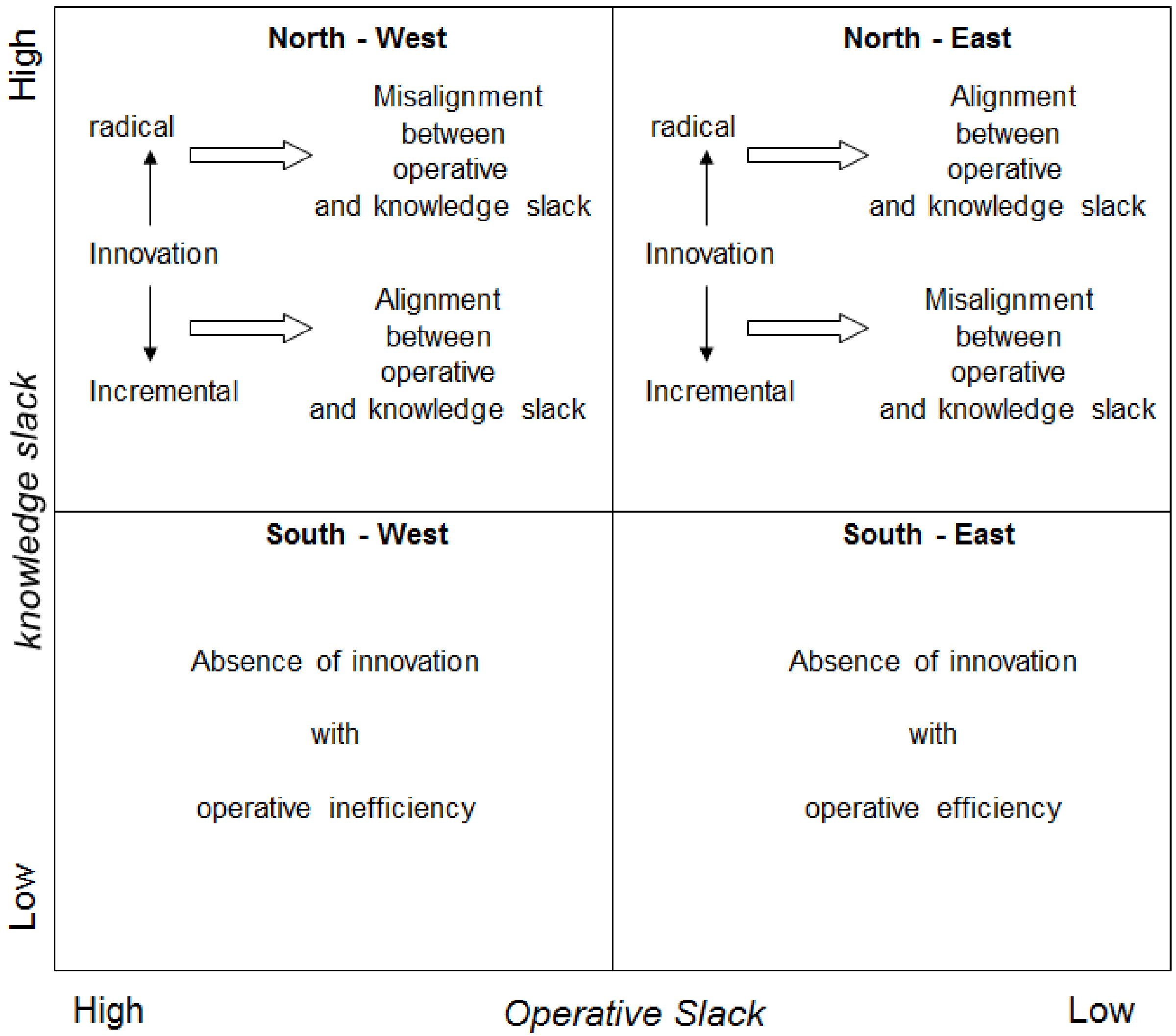
Alignment between slack composition and innovation kind

The internal structure improves risk-return relationship

Misalignment between slack composition and innovation kind

The internal structure worsens risk-return relationship

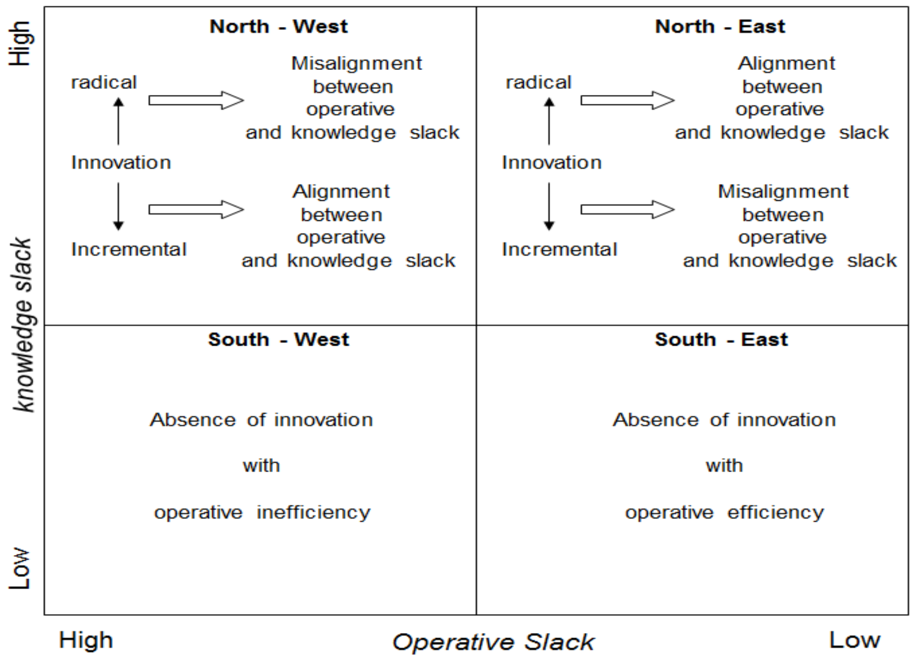
The space of slack interaction



The space of slack interaction

North west ➡

North-west region regards the hypothesis that a high knowledge slack is accompanied by an even more consistent operative slack.



For example, it could be the case of a company that, on one side, invests a relevant quota in R&D activities, and, on the other hand, operates with an excess of base capacity linked to slack of plants.

The combination of north-west quadrant can generate misalignment and, vice versa, alignment between tangible and intangible resources.

North West Misalignment

Radical innovations

In the case of disruptive/creative innovation, the excess of operative resources loses economic value, the moment that the transformation of knowledge slack in a radical innovation process exercising a destructive force on the level technological assets, organizational routines and/or market references.

Sub-optimal effect of slacks' portfolio on risk-return relationship

The need to disinvest existing asset implies a lower return to parity of risk

North West Alignment

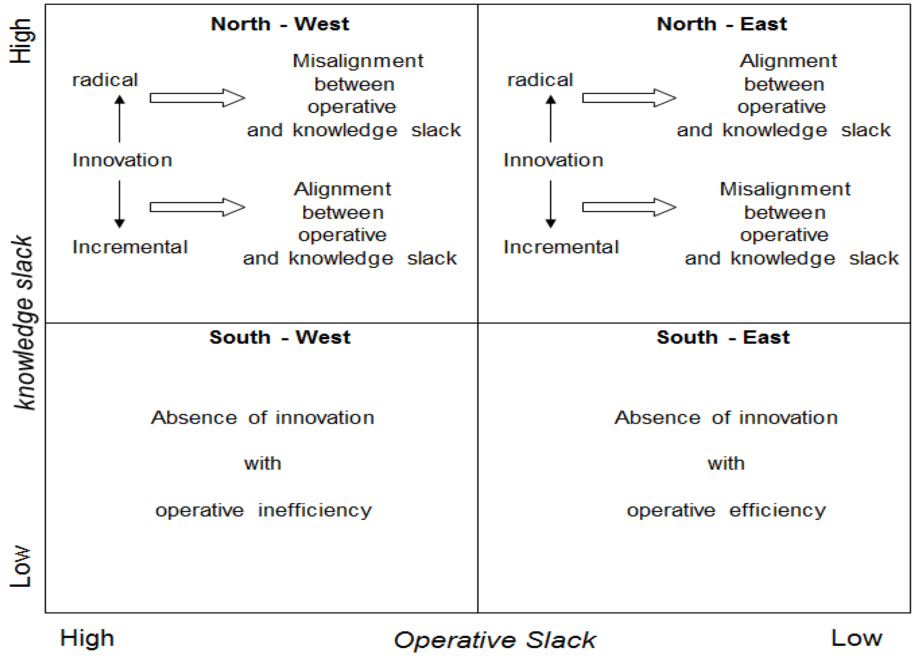
Incremetal innovations

In the hypothesis of conservative/reinforcing innovations, north-west region shows a situation of alignment between operative and knowledge slack. In this specific case, on one hand the innovative process is realized in substantial steadiness of the productive/commercial structure, and on the other hand, can allow the recuperation of economic efficiency, where there are product and/or process improvements capable of annulling operative redundancies..

Optimal effect of slacks' portfolio on risk-return relationship

The innovation process entails exploitation of existing resources, meaning a higher return to parity of risk.

The organizational slack analysis to find a compromise between financial and entrepreneurial view of innovation



North east

North-east region refers to the combination between an elevated endowment of knowledge slack and a low level of operative slack.

In general, such a combination regards organizations that efficiently explore new knowledge and at the same time they are capable of maintaining a high level of technical and operative efficiency.

A paradigmatic case of positioning on north-east region emerges as an effect on the efficiency linked to lean production models that use a type of management that has a high level of intangible slack and a strong propensity to cut back on tangible slack.

The organizational slack analysis to find a compromise between financial and entrepreneurial view of innovation

North East Misalignment

Incremetal innovations

In the case of conservative/reinforcing innovations the scarcity of operative slack is not in line with opportunity for economic and productive growth realizable in operative structures.

Sub-optimal risk-return relationship

The low level of slack operating entails an incremental cost due to the need to increase production capacity. This condition could imply the firm's incapacity to exploit opportunities of gradual growth. For example this has happened to the fashion industry in Italy.

The space of slack interaction

North East Alignment

Radical innovations

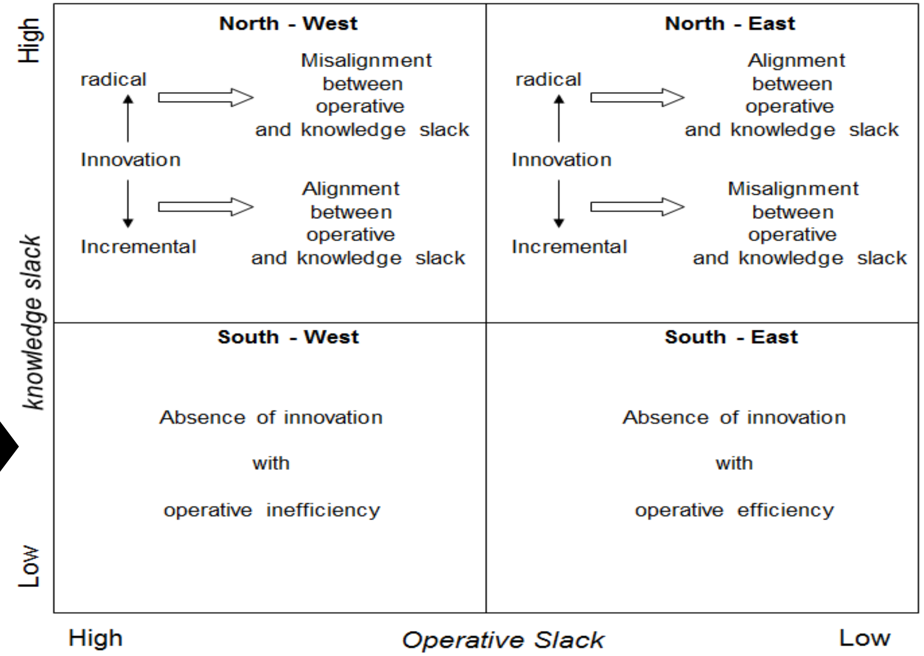
A low level of operative slack is coherent with creative innovations, the moment they are linked to structural transformations corresponding to a contained loss of economic value of industrial assets.

Optimal effect of slacks' portfolio on risk-return relationship

It's not necessary to invest in new operative assets or disinvest in existing activities.

The space of slack interaction

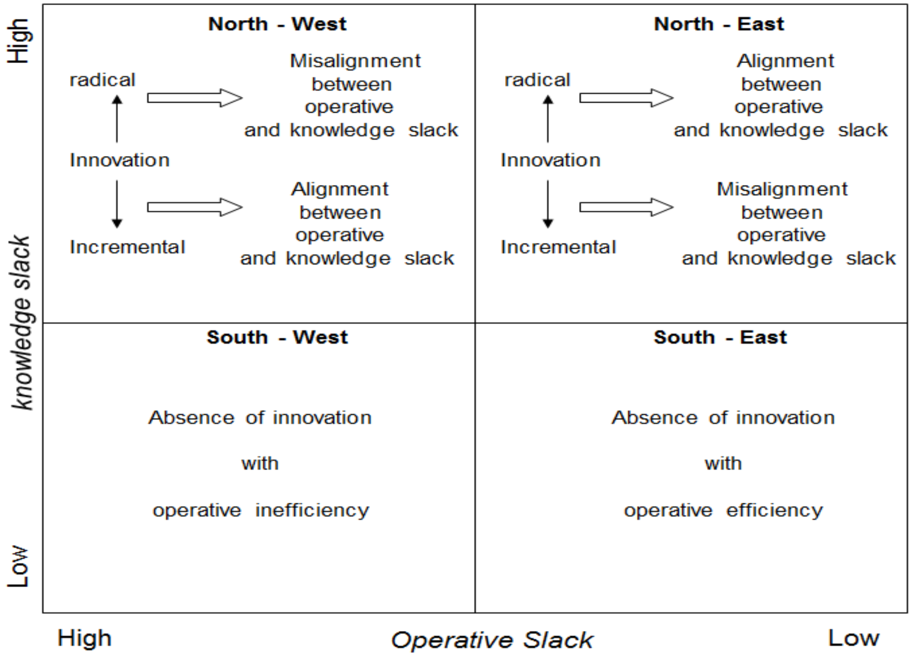
South West



Inefficiency caused by oversizing of tangible resources

Undersizing risk of the intangible resources.

The space of slack interaction



South East

Efficiency caused by a proper level of tangible resources

Undersizing risk of the intangible resources.

Key Points

Slack dilemma

Agency costs, financial slack and R&D (Nohria, Gulati,)

Financial slack and R&D without agency problems

Slack composition and incremental innovation

Slack composition and radical innovation

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Entrepreneurship and venture evaluation

Designing a new business (1): the business model

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Agenda

1. Entrepreneurial opportunities and business planning
2. An introduction to business model
3. The business model according to “canvas” approach

Entrepreneurial opportunities and business planning

Discovery and Selection

Opportunities selection

General evaluation of chosen opportunity

Design And Evaluation

Embryonic business idea

Development of the business idea

Business Model

Business Plan

Feedback

Implementation and revisions

Development of the business idea

Evaluation of possible ways to protect the specific business idea: for instance, eventually creating entry barriers.

Categories of potential customers

Evaluation and identification of potential customers.

Categories of potential suppliers.

Evaluation and identification of potential suppliers.

Identification of critical resources

Characteristic traits of the business idea

Uniqueness

Differentiation degree

Internal Environment

Product system

Organizational Structure

Balance and coherence

Market Segment

Organization's competences

External Environment

Entrepreneurs' capabilities are greater than opportunities discovery. The entrepreneur converts a business idea into an actual project, structured in phases as:

- design and evaluation of the new business;
- organization and set up of resources needed for the project implementation.

The pre-requisites needed to convert an idea into an actual business project

- Availability of tangible; human, and financial reosources (actual or potential ones)

- Strategic and managerial capabilities of the entrepreneur.

An introduction to business model

The project's first step is the elaboration of the "business model".

There are several and heterogeneous definitions of what is a "business model"
However, there are some general recurring concepts, which are the following:

- The business model is a logical scheme that connects the dots among ideas; technologies, and economic results;

- The business model expresses the value proposition;

- The business model is a sort of structural template.

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The origin of the business model

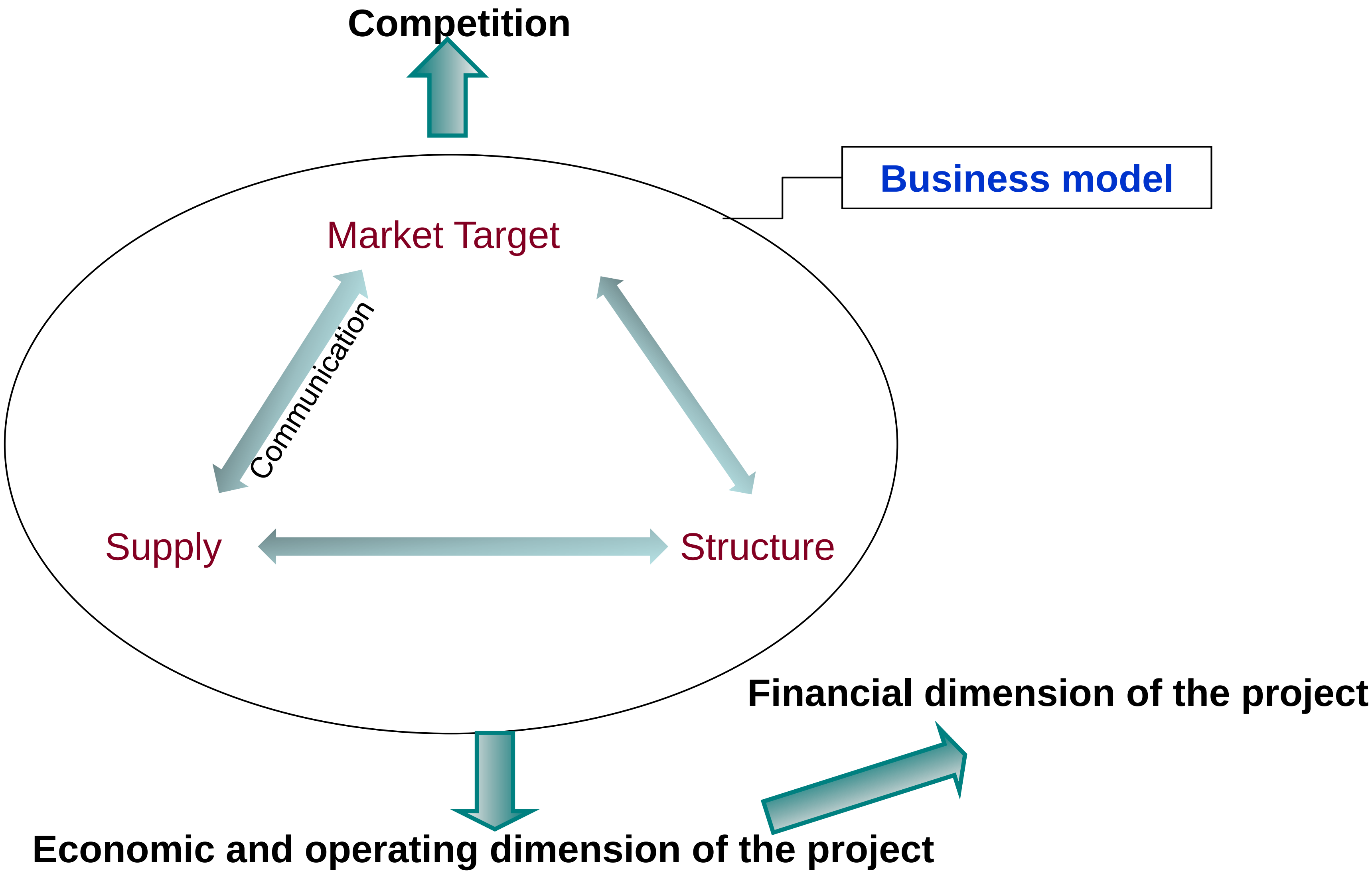
The “business model” concept began during the ’90s and it was used with reference to innovative start up firms, whose main assets were mostly intangible.

Internet start up firm		Business model
Based on network potentialities Characterized by the massive presence of intangible assets Their innovative capability were mostly based on: Customer relationship; sales process; trade process	→	The business model was the new language built to express a new business paradigm Its purpose was to find a greater integration among different projects elements, than previous adopted tools for planning

The multi-dimensional nature of the business model

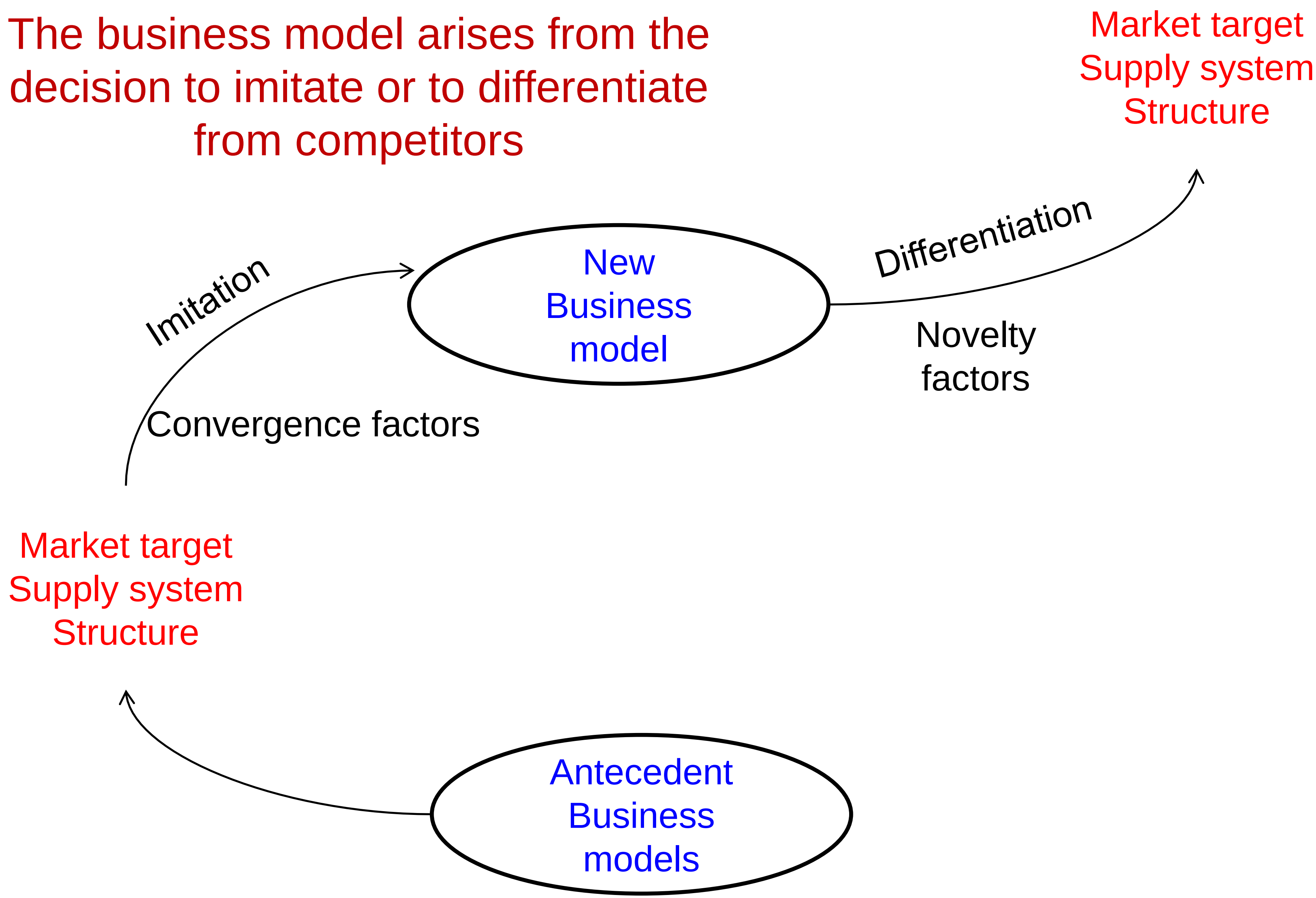
- Value/Customer oriented (external dimension)
- Activity/Role oriented (internal dimension)
- Structural/strategic dimension
- Economic Dimension

Basic business model type



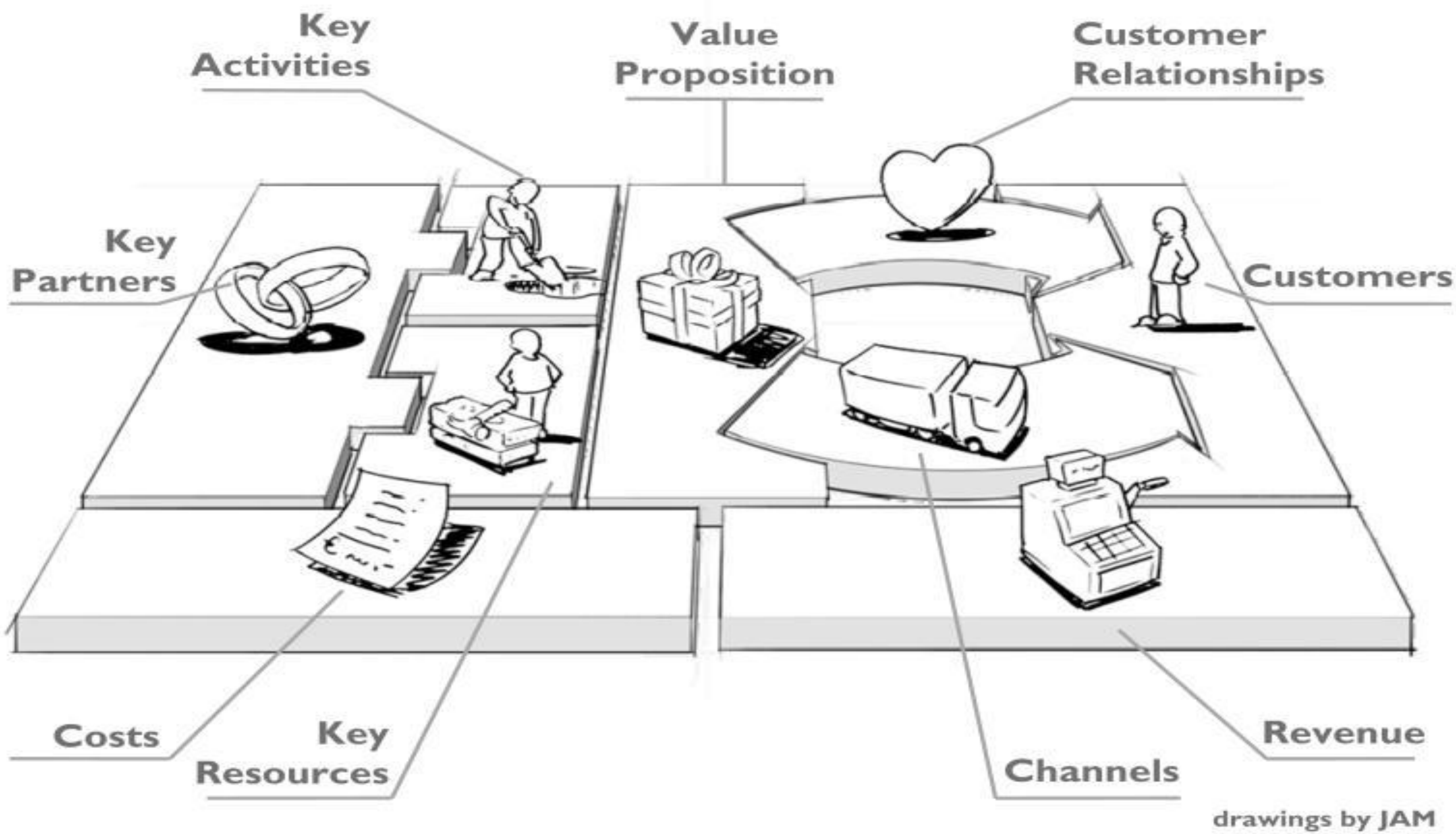
An introduction to business model

The business model arises from the decision to imitate or to differentiate from competitors



The business model according to Canvas approach

All of the business elements are depicted in a single representation



Source: Osterwalder, Pigneur (2010)

Breakdown of canvas

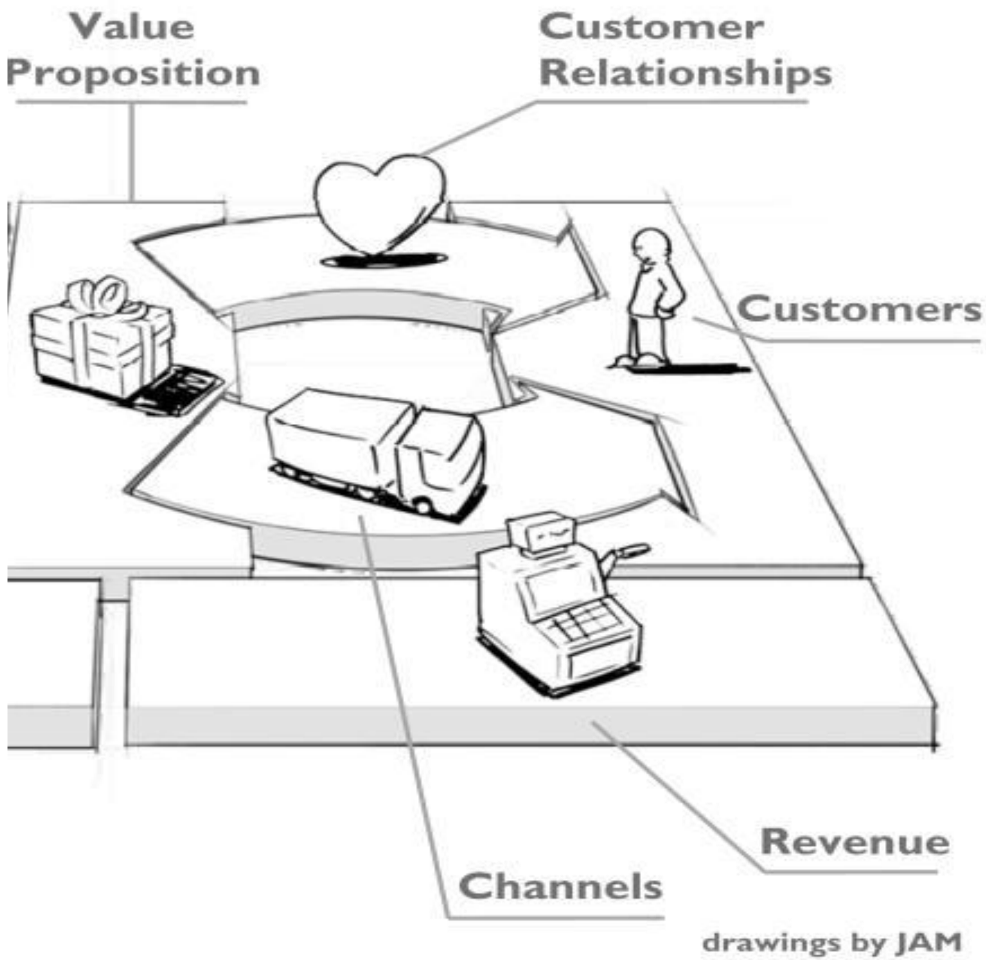
The canvas facilitates both the unification and the breakdown process.

Breakdown process: it allows to extract the four dimensions and the nine elements of the business.

The business model according to Canvas approach

Right side of Canvas

Value/Customer oriented
(external perspective)



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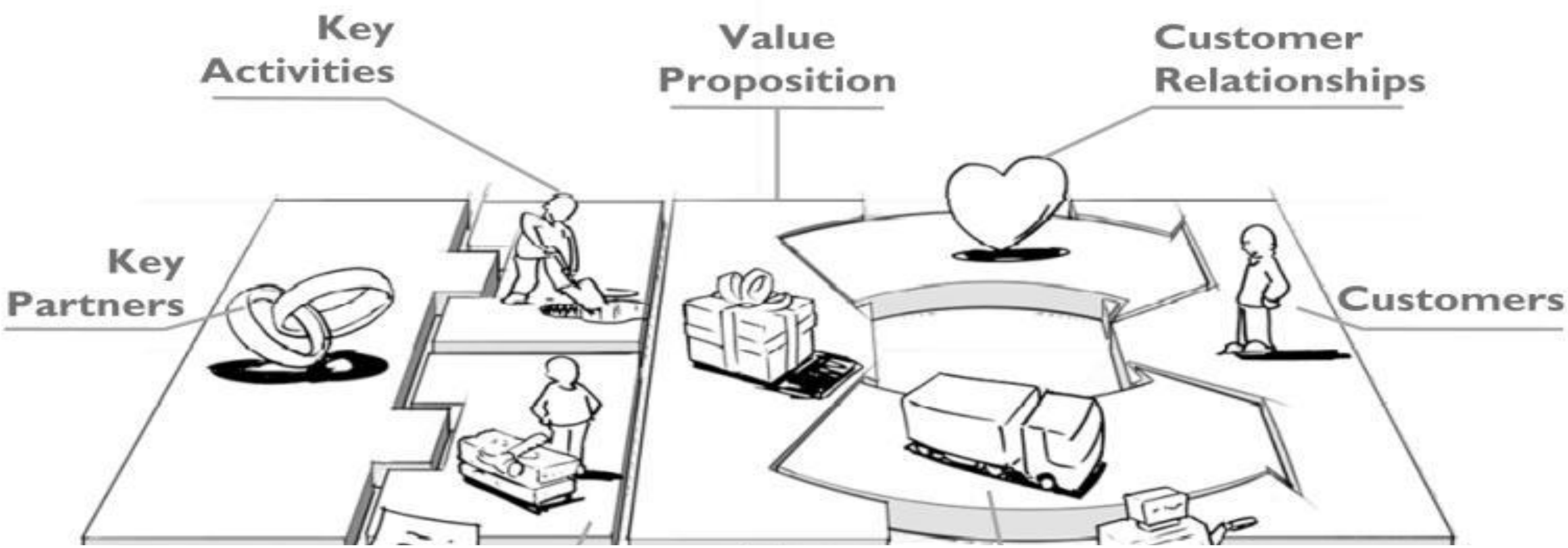
The business model according to Canvas approach

Left side of canvas

Activity/Role oriented (internal perspective)

The business model according to Canvas approach

Up side of canvas

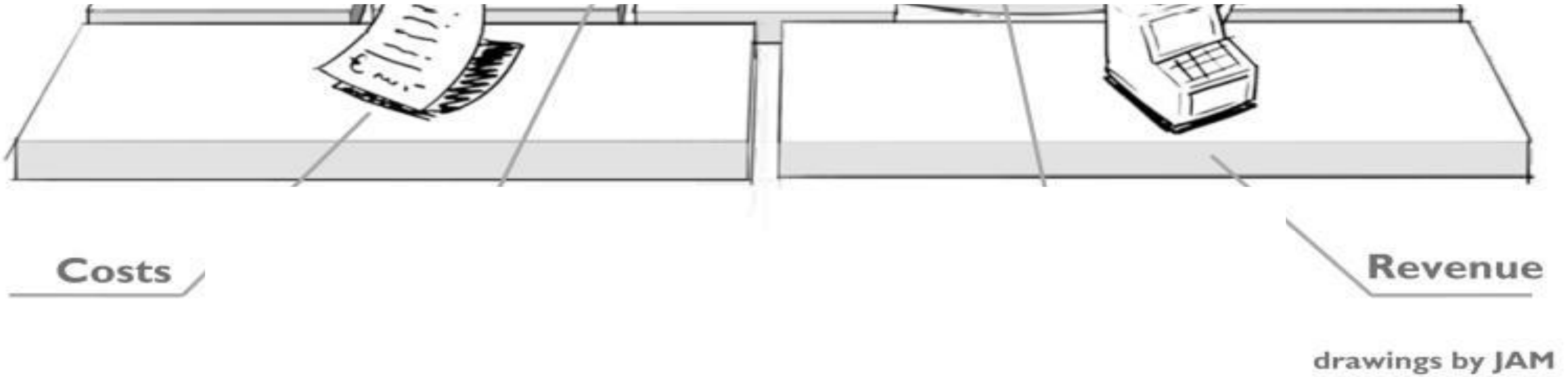


Structural and strategic dimension

The business model according to Canvas approach

Down side of canvas

Economic dimension



The business model according to Canvas approach

Value proposition

What kind of value do we offer to our customers?
What kind of problems are we helping to fix?
Which are the bundles of product and services we are offering to our customers?
What is the need we are satisfying?

Performance
Customization
Design
Brand/ Status symbol
Price
Cost saving
Risk reduction
Accessibility
Comfort/usefulness

How to describe a value proposition

1) Describing the capacity of your product to solve customers' problems.

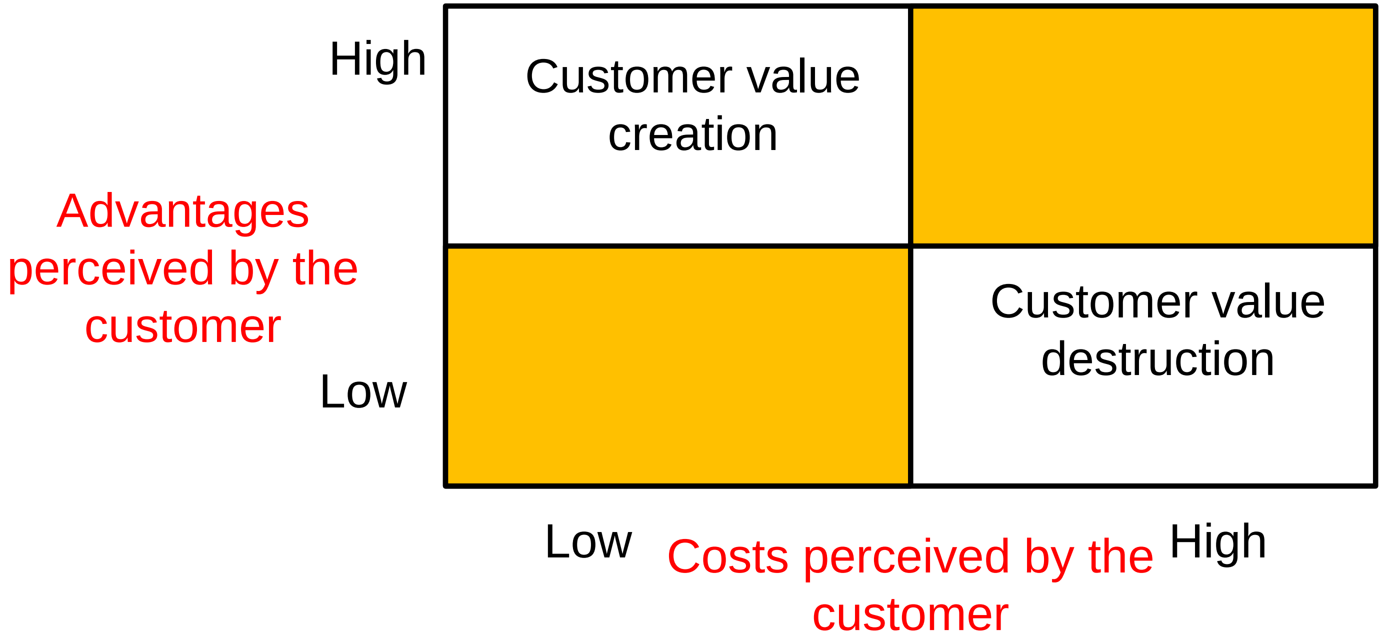
2) Describing customers' benefits

3) Describing your differentiation degree from competitors

4) Describing differentiation drivers

Value proposition

The value proposition explains how the firm's generating customer value



The value creation can be further investigated analyzing :

- Purchase decision (Canvas);
- Customer behavior;
- Quantitative evaluation of customer value creation;
- Quantitative evaluation of the relationship capital.

The business model according to Canvas approach

The value proposition according to a differentiation logic (strategic or operating)

Operating differentiation

- Resource saving to produce the same competitors' product → Price below the average of the market

Strategic Differentiation

- Innovation concerning the product bundle → The quality is perceived as higher than competitors' one
- Creation of a new market → Satisfaction of a new need

Value proposition

Value proposition: the switching costs problem

Often, the adoption of a new product by customers requires further investments, as those one made for compatibility among products.

For instance :

- A new software could require further investments to update already existing software;
- A new plant could require additional investments for human resources training
- There could be penalties due to previous suppliers in case of switching.

Moreover, the innovative product could increase the supply risk, whether if it's a real risk or just a difference in risk perception.

The business model according to Canvas approach

Value proposition: network opportunities

The network effect could produce positive externalities, increasing customer’s perceived advantages.

The network can have both an emotional and a functional nature

The business model according to Canvas approach

Customers

For whom do we want to create value?
Which are our main customers?

Mass-market
Niche
Segment
Multi-sided platforms

The business model according to Canvas approach

Customer relationship

Which kind of relationship do we need to build and keep with each of our target?
What kind of customer relationship did we build in the past?
How they are integrated with our business model?
How much they cost?

Personal assistance
Dedicated personal assistance
Self-service
Automatic systems
Communities
Co-creation

The business model according to Canvas approach

Trade Channel

What is the channel desidered by customers?
What channel are we using?
How much they are integrated?
How our channels are integrated?
Which one is best performing?
Which one is the most efficient?
Are we keeping them up to date, considering our customer habits?

1.Awareness
How can we increase our product/service awareness?
2.Evaluation
How can we help our customer to detect the value we offer?
3.Purchase
How the customers can purchase our products/services?
4.Delivery
In what way is the value delivered to our customers?
5.Post-sales
How do we offer post-sales assistence?

The business model according to Canvas approach

Revenues

For what value customers want to really pay?
For what they actually pay?
In which way they pay?
How they prefer to pay?
How much each revenue contributes to the overall revenues?

Revenues type
Goods sale
Pay as you go
Subscription
Rent/ Leasing
Brokerage
Advertising/promotion

Fixed price
Price list
Depending on product characteristics
Depending on target
Depending on quantities

Variable price
Bargaining
Market real time

The business model according to Canvas approach

Core activities

What are the main activities for the creating value?

- model of production
- vertical integration
- activities in favor of the customer
- administrative model

The business model according to Canvas approach

Core partners

Which are our main partners?
Which are our main suppliers?
What are the core resources we are acquiring from them?
Which are the core activities they carry out?

Partnership motivation:
- Optimization and savings
- Risk and uncertainty reduction
- Acquiring core resources or activities

The business model according to Canvas approach

Core resources

Which are the resources needed to:
- Create value?
- Trade channels?
- Customer relationships?
- Revenues?

Types of resources
Tangibles
Intangibles (brands, patents, copyrights, data)
Human
Financial

Costs

The view of the competitive advantage can be:
-*Cost oriented (lean costs structure, low cost supplied value, massive automation, massive outsourcing)*?
- *Value oriented*

Fixed costs (wages, rents, utilities)
Variable costs
Economies of scale
Economies of scope

Key Points

The business idea elements

The reasons of business model

Value proposition concept

External relationships and revenues (Right side of Canvas)

External relationships, internal structure and costs(Left side of Canvas)

Entrepreneurship and new ventures finance

Designing a new business (2): The five dimensions of the project feasibility

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Agenda

1. The feasibility components
2. Entrepreneurial feasibility
3. External feasibility
4. Technological feasibility
5. Operative feasibility
6. Economic and financial feasibility

The feasibility components

- **Entrepreneurial feasibility:** Adequacy of the entrepreneur (or the team of entrepreneurs) in relation to the new business that he (they) is (are) proposing.

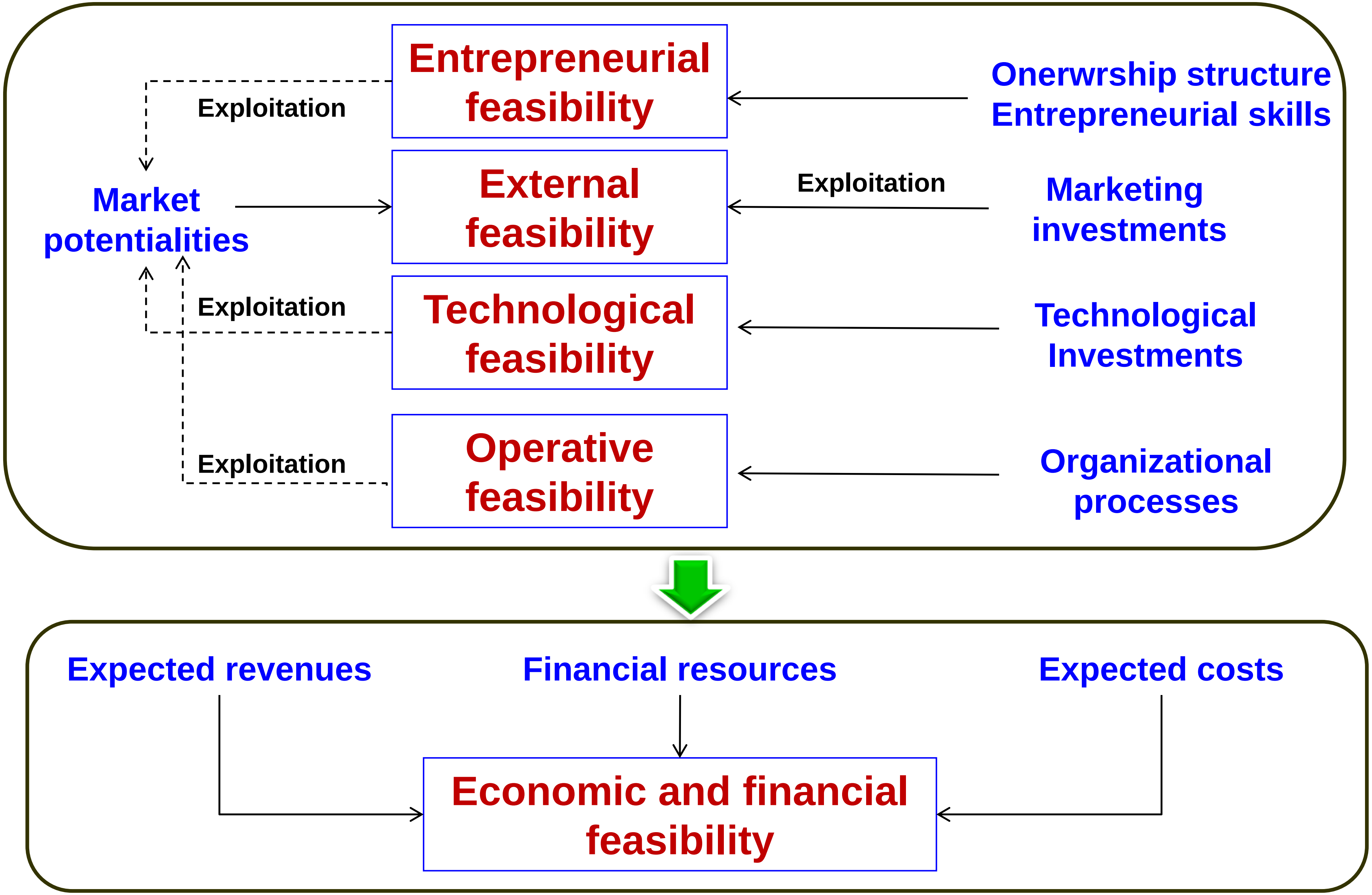
- **External feasibility:** Market potentialities of the new business.

- **Technological feasibility:** Adequacy of available technologies.

- **Operative feasibility:** Quality of internal processes.

- **Economic and financial feasibility:** Capacity for obtaining a sufficient level of financial resources; Potential capacity for generating economic and financial results over time; Risk level

The feasibility components



Entrepreneurial feasibility

Entrepreneurial capacities

1. Respectability
2. Problem solving capacity: Finding solutions
3. Operational capabilities and technical knowledge
4. Personal behavior and relationship capacity
5. Balance skills
6. Financial capacity: capacity to invest on the project
7. Propensity to risk

Business characteristics

1. Business idea
2. Product/service characteristics
3. Production process
4. Technological profile
5. Organizational structure
6. Internal resources
7. Financial need
8. Project Risk

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Entrepreneurial feasibility

Typical examples of inconsistency between entrepreneurial capacities and business characteristics

- Knowledge lack of entrepreneurial team in relation to the technological profile of the business.
- Leadership lack.
- Absence of managerial skills
- Skill concentration in one or few areas
- Few external relationships
- Incapacity to explain the projects contents
- Lack of initial capital
- Riskiness of the project higher than the propensity to risk (initial unawareness).
- Low propensity to accept external controls and/or corporate governance rules.

Entrepreneurial feasibility

Inconsistency between entrepreneurial capacities and business characteristics

In some cases it’s possible to remove inconsistency elements thanks the collaboration with external actors:

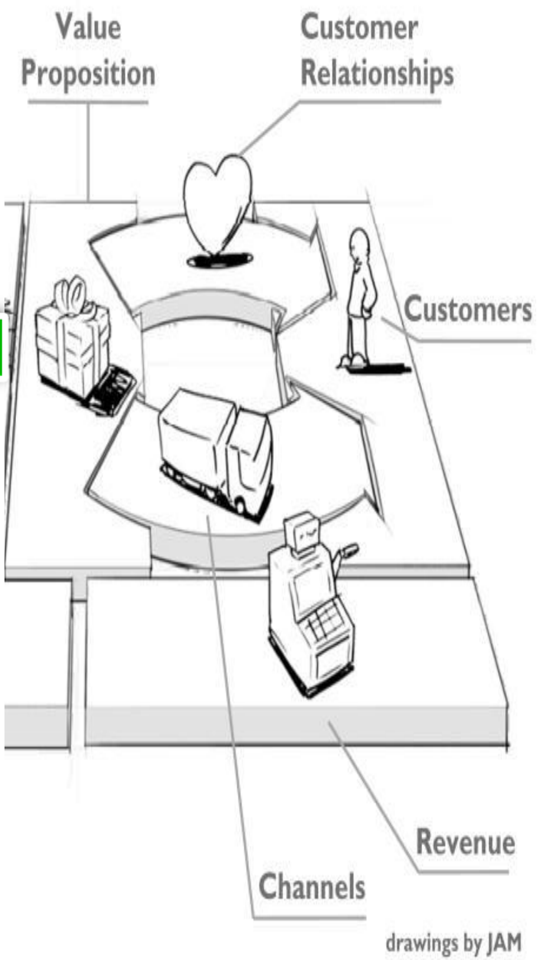
- Actors who have interest to acquire business shares;
- Actors who are able to give consulting services

The cost of those solutions can push the entrepreneur to give up the project

External feasibility

External feasibility:

- Demand analysis
- Marketing strategies
- Expected revenues



External feasibility

Primary demand and secondary demand

$$D'' = D' \cdot q_m$$

$$D''_{max} = D'_{max} \cdot q_m$$

D’ = current primary demand ; D’’ = expected secondary demand;
q_m= best hypothesis of expected market share.

Primary demand and secondary demand

Main exogenous variables	Main endogenous variables
Macro environment	Competitive strategies
Micro environment: Structural characteristics of the sector	Marketing
Lifecycle of the sector	Price elasticity of demand

External feasibility

Macro environment

- Economic system
- Financial system
- Demographic structure
- Macro technological dynamics
- Institutional actors

Microenvironment (sector)

- Suppliers
- Clients
- Competitors
- Real services
- Financial services

Primary demand

Secondary demand

The characteristics of the microenvironment amplify or reduce the effects of the macro environment on the primary demand

Project characteristics

- Product/Service
- Organizational structure
- Capital
- Marketing strategies

The characteristics of the project amplify or reduce the effects of the primary demand on the secondary demand

External feasibility

Identifying the sector

Three main approaches:

•Supply side approach: The sector consists of all companies that sell the same goods (for instance: automotive)

•Demand side approach: The sector consists of different goods that satisfy the same need and/or the same type of potential clients (for instance: the luxury sector can regard several products such as cars, watches etc.)

• Combining supply side and demand side approach

External feasibility

Sector barriers

Sunk costs

Financial need

Economies of scale

Difficult access to distribution channels

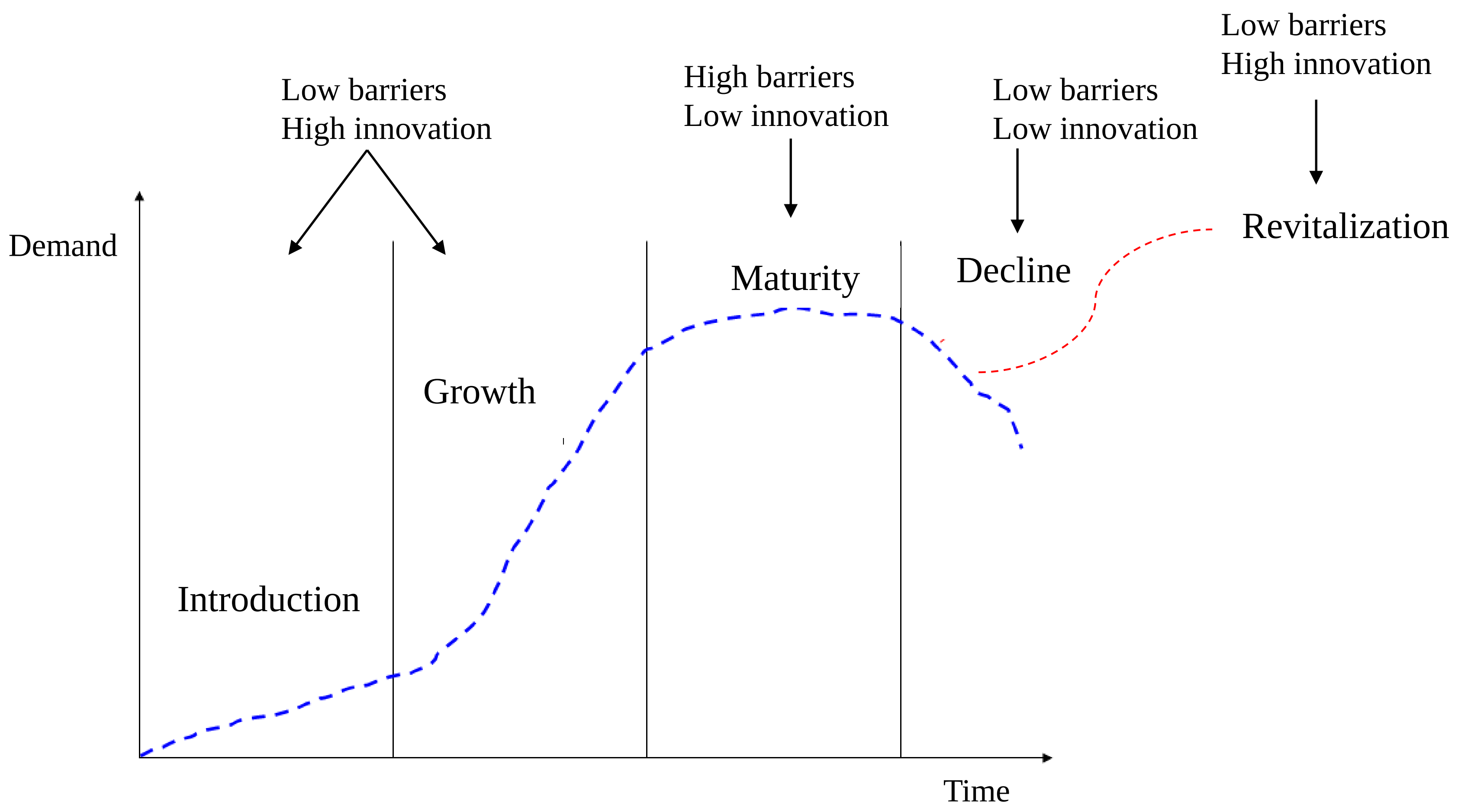
Institutional barriers

Resources and competencies necessary to compete

The sector barriers allow the strengthening or maintaining the primary demand; they reduce the space for new businesses

External feasibility

Sector barriers, innovation and product lifecycle

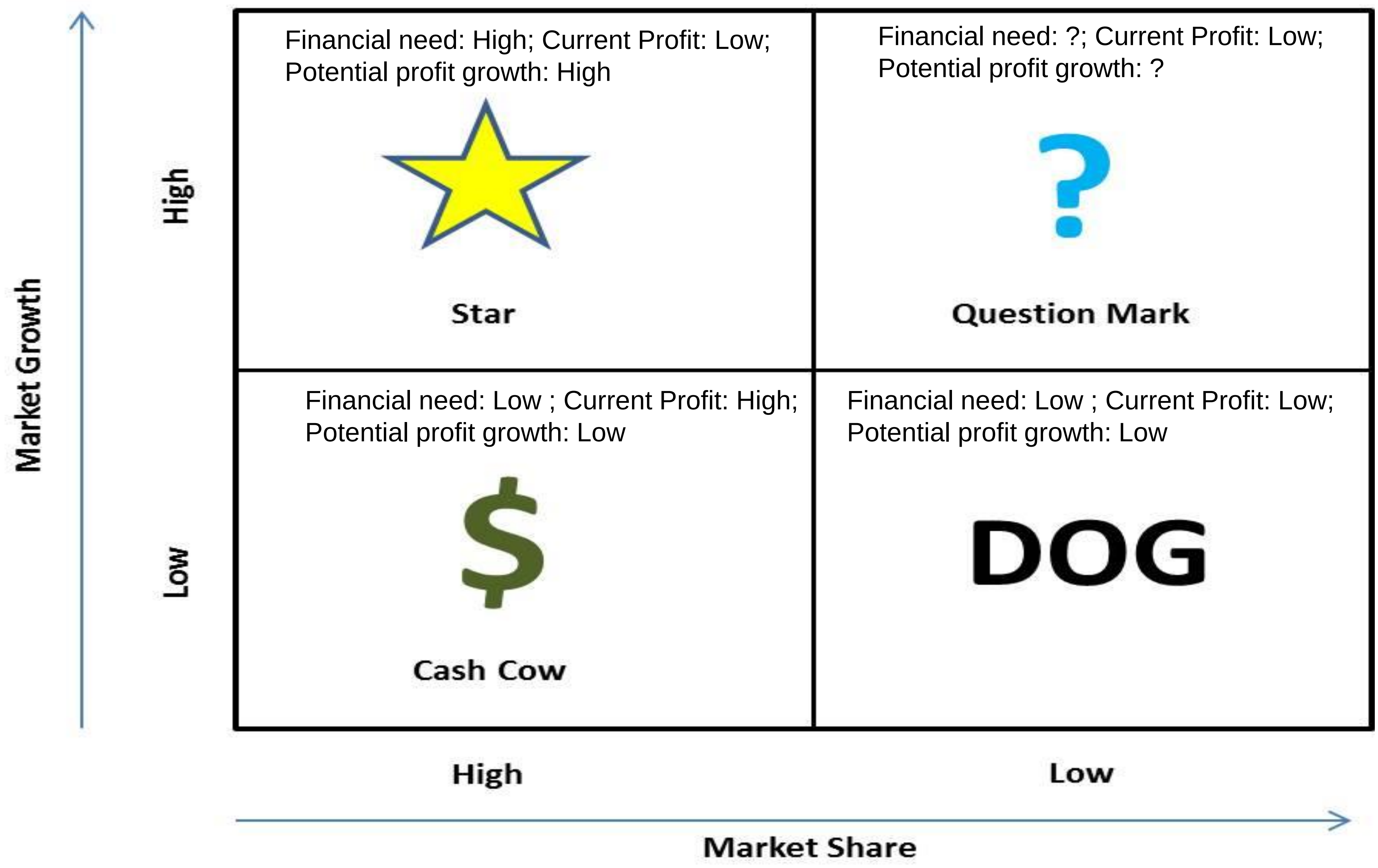


External feasibility

Competitors analysis

- Characteristics of competitors’ goods
- Size of competitors (number of employees; sales; investments)
- Market share of each competitor
- Strategic approach

External feasibility: BCG Matrix of competitors



External feasibility: BCG Matrix of competitors

Leader firm and new buisiness strategies

Leader	New business strategies
Cash cow	Strong innovation and strategic differentiation
	Niche strategy
Star	Low innovation and imitation strategy
	Cost differentiation

External feasibility

Attractiveness of the sector

	Low attractiveness	Limited attractiveness	High attractiveness
Market accessibility	High barriers	Low barriers	Absence of barriers
Product lifecycle	≤ 2 years	> 2 years ≤ 10 years	> 10 years
Market growth per year	≤5%	> 5%; ≤ 10%	> 10 %
Competition intensity	Monopoly or oligopoly	Unstructured competition : Without a firm leader; Without defined rules of the competition game	No Competition

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External feasibility

How competitors look at our business

A) Like a danger that implies reactions (creation of new barriers, for instance decreasing price)

B) Like insignificant in relation to their market position

C) Like an opportunity to realize a cooperative competition and/or synergies (for instance collaboration forms could be about new technologies, distribution processes, sharing costs of R&D etc.).

In the entrepreneur perspective

The hypothesis A causes more strategic constrains and lower success probabilities.

The hypothesis B helps the project realizing in terms of competition absence.

The hypothesis C helps the project realization in terms of more resources and synergies. However, that hypothesis implies opportunity costs in terms of knowledge sharing and a lower decisional autonomy.

Demand forecasting methods

Methods Based on Judgments: the expected demand comes from subjective opinions.

Methods Based on Quantitative Data: the expected demand depends on a statistical analysis.

Main Methods Based on Judgments

Delphi Method

The Delphi Method is based on questions to experts that have a deep knowledge about the sector where the new project will be placed. Interviews with experts mainly concern the future industry trends.

Panel Method

The Panel Method is based on the interaction of individuals with respect to the demand forecast. This interaction allows to compare several opinions and seek a consensus about future demand trends.

Intentions and Expectations Surveys

In this case the analyst makes interviews to a significant cluster of potential customers for understanding their intentions to buy.

Methods Based on Quantitative Data

- Time series analysis
- Correlation analysis
- Regression analysis

Technological feasibility

- Analysis and clustering of technological factors

- Analysis about the real possibilities to acquire in a proper time one or more technologies

- Analysis of the physical and economic duration of technologies

Operative feasibility

- Analysis of production cycle phases
- Division of tasks
- Layout
- Internal control processes

Economic and financial feasibility

The economic and financial feasibility is the final result of the project feasibility. It arises as a combination between the other feasibility factors.

Economic and financial feasibility

Expected revenues
Expected costs

Economic analysis

Financial structure

Plan of investments and financing

Expected cash inflows
Expected cash outflows

Cash flow analysis

Business volatility
Internal volatility

Risk analysis

Economic Value

Economic and financial feasibility

Three perspectives

Entrepreneurial perspective:

The economic and financial feasibility as required factor to obtain a sufficient capital in relation to the financial need covering.

The profitability as necessary result in relation to the survival and development of the business.

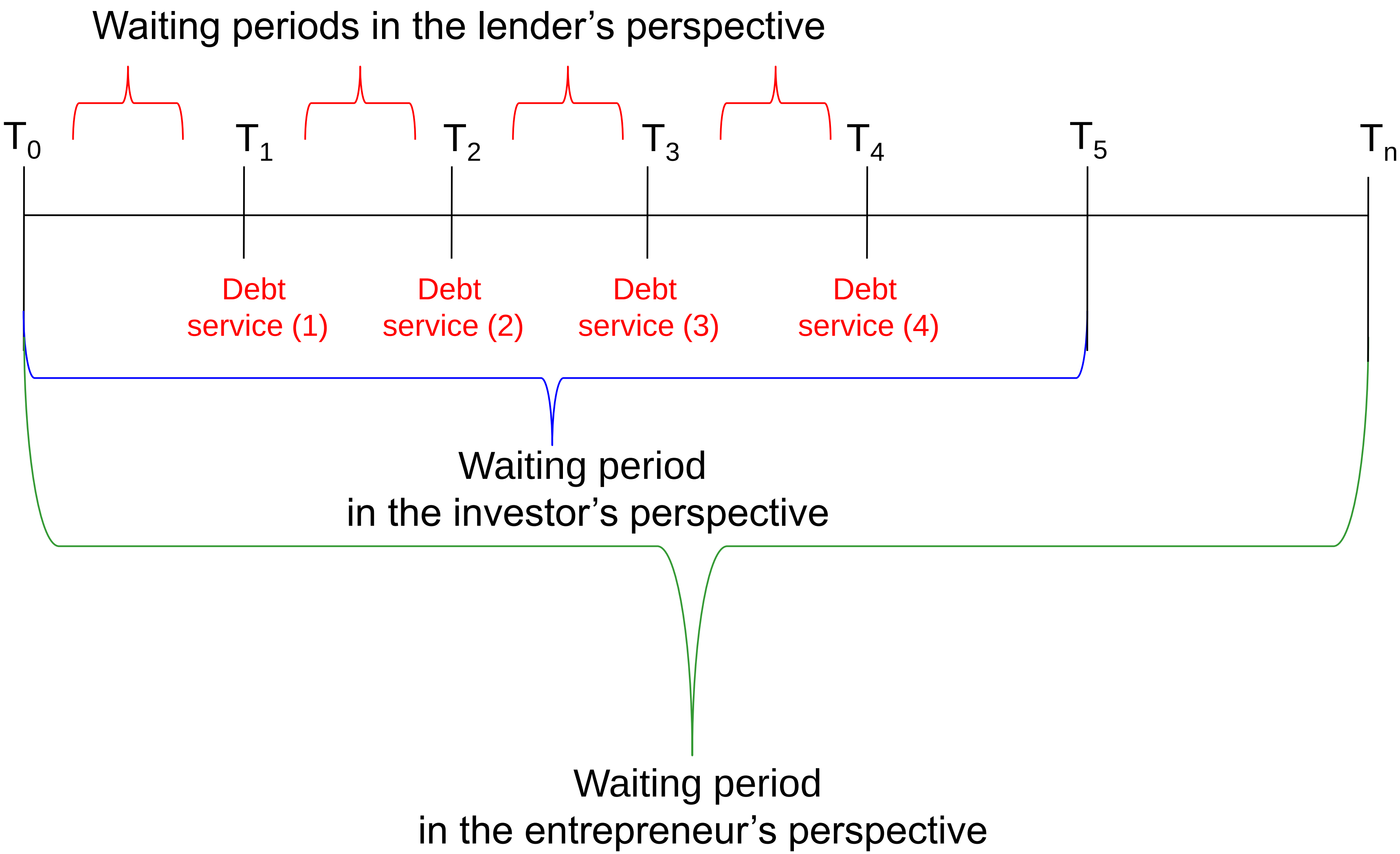
Investors perspective :

The economic and financial feasibility as the project capacity to reward the initial investment within a certain period.

Lenders perspective :

The economic and financial feasibility as the project capacity to generate cash flows to repay (period by period) financial debts.

Economic and financial feasibility



Key Points

The five feasibility dimensions and their interactions

Consistency between the entrepreneur and business features

Kinds of analysis to figure out the external feasibility

Economic and financial feasibility

Entrepreneurship and new ventures finance

Designing a new business (3): Revenues and costs

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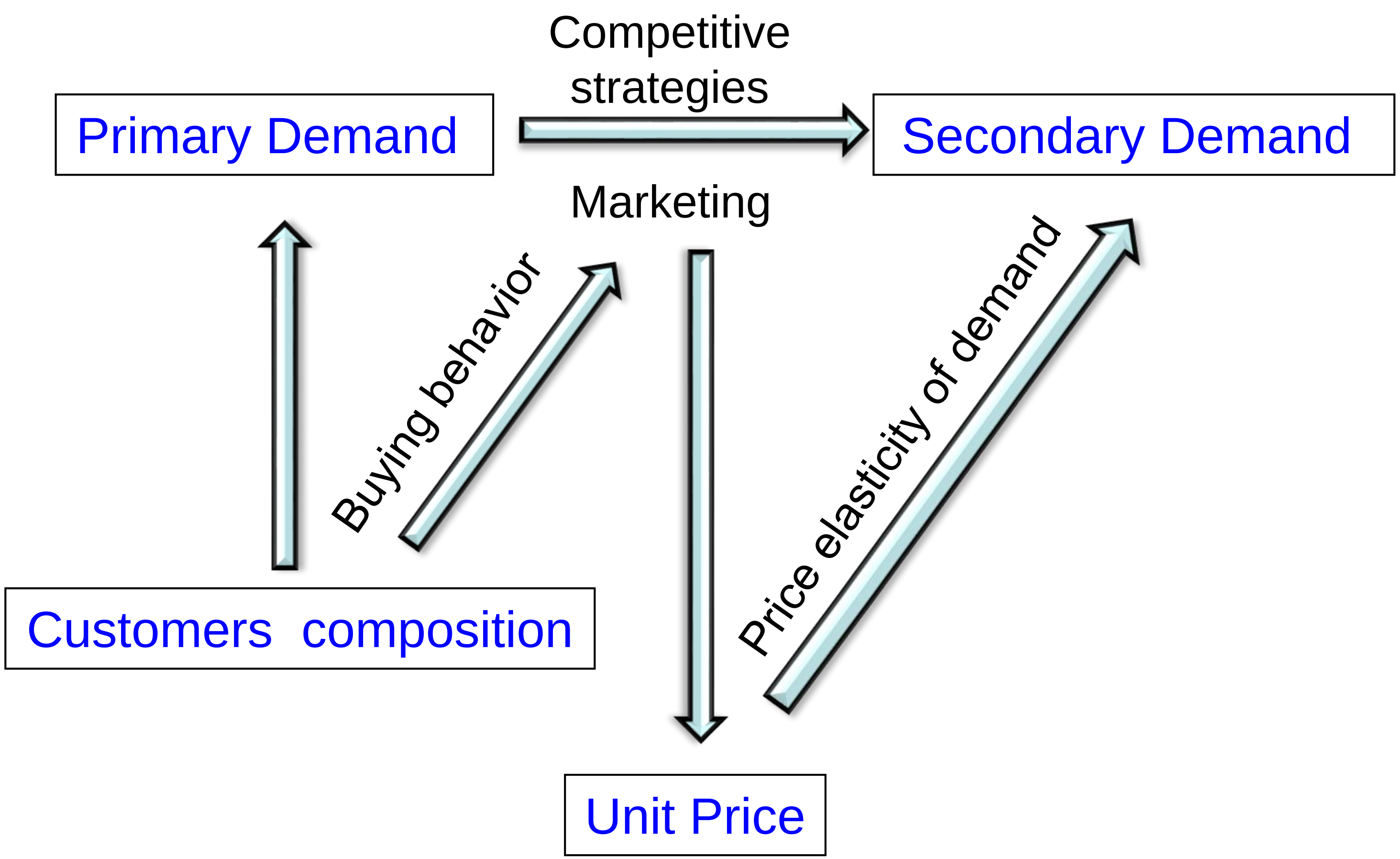
Agenda

1. **Revenues analysis**
2. **Costs analysis**
3. **Break even analysis**

Revenues analysis

Revenue Model



Scenarios analysis

The scenarios analysis is based on the "what if logic":
Relationships of cause and effect

Causes	Probabilities	Effects (targets)
Phenomenon (1)	p (1)	Outcome (1)
Phenomenon (2)	p (2)	Outcome (2)
Phenomenon (3)	p (3)	Outcome (3)
…	…	…
Phenomenon (n)	p (n)	Outcome (n)

Four types of scenario

- Exploration scenarios
- Forecast scenarios

- Descriptive scenarios
- Normative scenarios

Revenues analysis

Exploration scenarios vs. forecast scenarios

•Exploration scenarios are based on past and current phenomena. They assume, on the one hand, the recurrence of phenomena, on the other, stable relationships between the independent variables and dependent variables. It's possible to associate to each cause one or more effects: causes $\rightarrow$ effects.

• Forecast scenarios are based on the hypothesis of strong spread between past phenomena and future phenomena. This spread could be depend on new phenomena and/or new relationships between the independent variables and dependent variables: effects$\rightarrow$ causes

Revenues analysis

Exploration scenarios vs. forecast scenarios

CAUSE → EFFECT
For instance, the analysis of past has demonstrated that the primary demand of a certain product changes of - 20% than oil price changes:

Scenarios	Δ Oil price	Δ% Demand / Δ% Oil price	Δ Demand
1	-25%	-20%	5%
2	-15%	-20%	3%
3	-5%	-20%	1%
4	5%	-20%	-1%
...	...	...	...
n	35%	-20%	-7%

EFFECT→ CAUSE
For instance, each target about expected market share requires a specific change in price

Scenarios	Δ Expected market share (targets)	Δ Price
1	2%	-10%
2	10%	-20%
3	18%	-30%
4	20%	-40%
...	...	...
n	40%	-60%

Revenues analysis

Descriptive scenarios vs. normative scenarios

Descriptive scenarios have no contsrains: there are not limits in relation to positive or negative correlations. The analyst simply describes causal relationships.

In the case of normative scenarios the causal relationships are limited within constraints system: For instance, a growth in demand can be assumed as scenario taking into account constraints that come from internal resources.

Revenues analysis

	Exploration	Forecast
Descriptive	Given the causes, what will be the effects?	Given the effect, what will be the causes?
Normative	Given the resources, which target can be reached ?	Given the targets , what resources target can be mobilised?

Source: Martelli A. (2014), Model of scenario, Palgrave

Revenues analysis

Price elasticity of demand (ε)

$$\varepsilon = \left(\frac{\Delta Q}{Q_{t0}}\right)\left(\frac{p_{t0}}{\Delta p}\right) \qquad \Delta p \rightarrow \Delta Q = \varepsilon\left(\frac{\Delta p}{p_{t0}}\right)Q_{t0}$$

p = price per unit
Q = sales

Revenues analysis

Price elasticity of demand (ε)

Phases of elasticity analysis:

- Estimation of elasticity using a sample of comparable companies
- Estimation of the neutral change in price
- Estimation the change in price that maximizes the level of revenues

Estimation of the elasticity using a sample of comparable companies

The elasticity price of demand of a specific business as the average elasticity of a certain cluster of comparable companies

Years	1	2	3	
Firms	ε_1	ε_2	ε_3	Average
A	70%	65%	72%	69,00%
B	80%	78%	70%	76,00%
C	75%	78%	68%	73,67%
D	70%	72%	60%	67,33%
Average	73,75%	73,25%	67,50%	71,50%

Given a cluster, the elasticity price of demand of a specific business as the average elasticity of the company characterized by the lower market share.

Years		1	2	3	
Firms	Matket share	ε_1	ε_2	ε_3	Average
A	20%	70%	65%	72%	69,00%
B	10%	80%	78%	70%	76,00%
C	20%	75%	78%	68%	73,67%
D	50%	70%	72%	60%	67,33%

Revenues analysis

Price elasticity of demand (ε)

pt0	ε	Qt0	REV
10	-0.6	15	150

$\Delta p/pt0$	0.10	0.4	0.333	0.66	0.67
pt1	11	14	13.33	16.67	16.7
Qt1	14.1	11.4	12	9	8.97
REVT1	155.1	159.6	160	150	149.8

The elasticity analysis can be used to figure out the maximum increase of the sale price beyond which the revenues go down.

In addition it's possible to determine the change in price that maximize the expected revenues for each level of elasticity.

Revenues analysis

Price elasticity of demand (ε)

$$\varepsilon = \left(\frac{\Delta Q}{Q_{t0}}\right)\left(\frac{p_{t0}}{\Delta p}\right) \qquad \Delta p \rightarrow \Delta Q = \varepsilon\left(\frac{\Delta p}{p_{t0}}\right)Q_{t0}$$

$$\Delta REV = (Q_{t0})(\Delta p) + (p_{t1})(\Delta Q) \qquad \Delta REV = (Q_{t0})(\Delta p) + (p_{t1})\underbrace{\varepsilon\left(\frac{\Delta p}{p_{t0}}\right)(Q_{t0})}_{\Delta Q}$$

REV = Revenues

$$\boxed{\Delta REV = 0 \rightarrow (Q_{t0})(\Delta p) + \varepsilon\left(\frac{\Delta p}{p_{t0}}\right)(Q_{t0})(p_{t1}) = 0 \ \rightarrow \ \varepsilon = -\frac{Q_{t0}\cdot\Delta p}{Q_{t0}\cdot p_{t1}}\cdot\frac{p_{t0}}{\Delta p} = -\frac{p_{t0}}{p_{t1}}}$$

$$\boxed{p_{t1(max)} = -\frac{p_{t0}}{\varepsilon} \qquad \Delta p_{(max)} = -\frac{p_{t0}}{\varepsilon} - p_{t0}}$$

Δp_{max} shows a neutral variation in price in relation to revenues' dynamic

Revenues analysis

Price elasticity of demand (ε)

ε	-0.4	-0.4
p	10	25
Q	100	40
REV	1000	1000

$$\Delta p = -\frac{p_{t0}}{\varepsilon} - p_{t0} = -\frac{10}{-0.40} - 10 = 15$$

$$\Delta REV = 0$$

ε	-0.4	-0.4
p	10	26
Q	100	36
REV	1000	936

$$\Delta p = 16 > -\frac{p_{t0}}{\varepsilon} - p_{t0} = 15$$

$$\Delta REV = -64$$

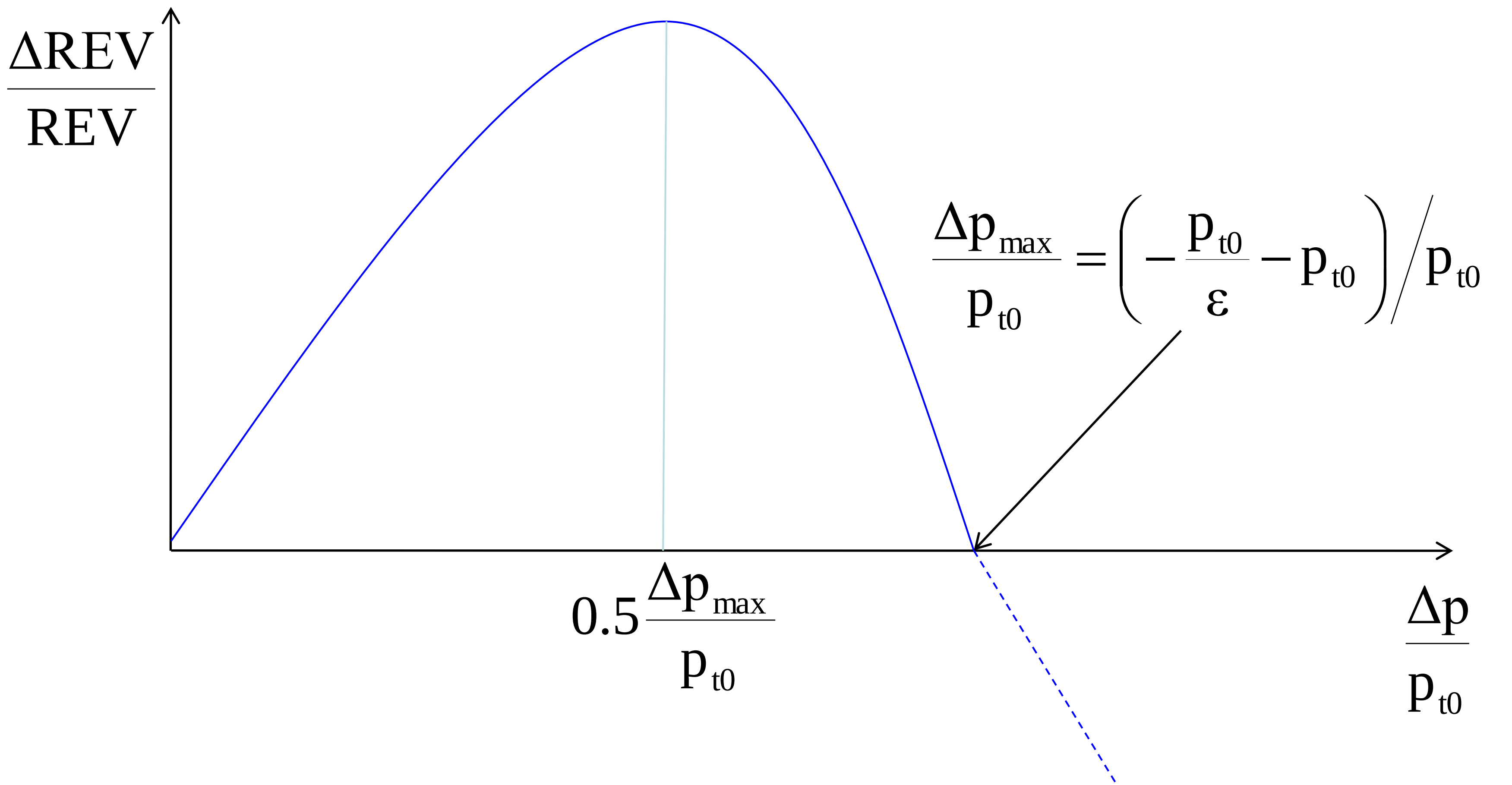
ε	-0.4	-0.4
p	10	24
Q	100	44
REV	1000	1056

$$\Delta p = 14 < -\frac{p_{t0}}{\varepsilon} - p_{t0} = 15$$

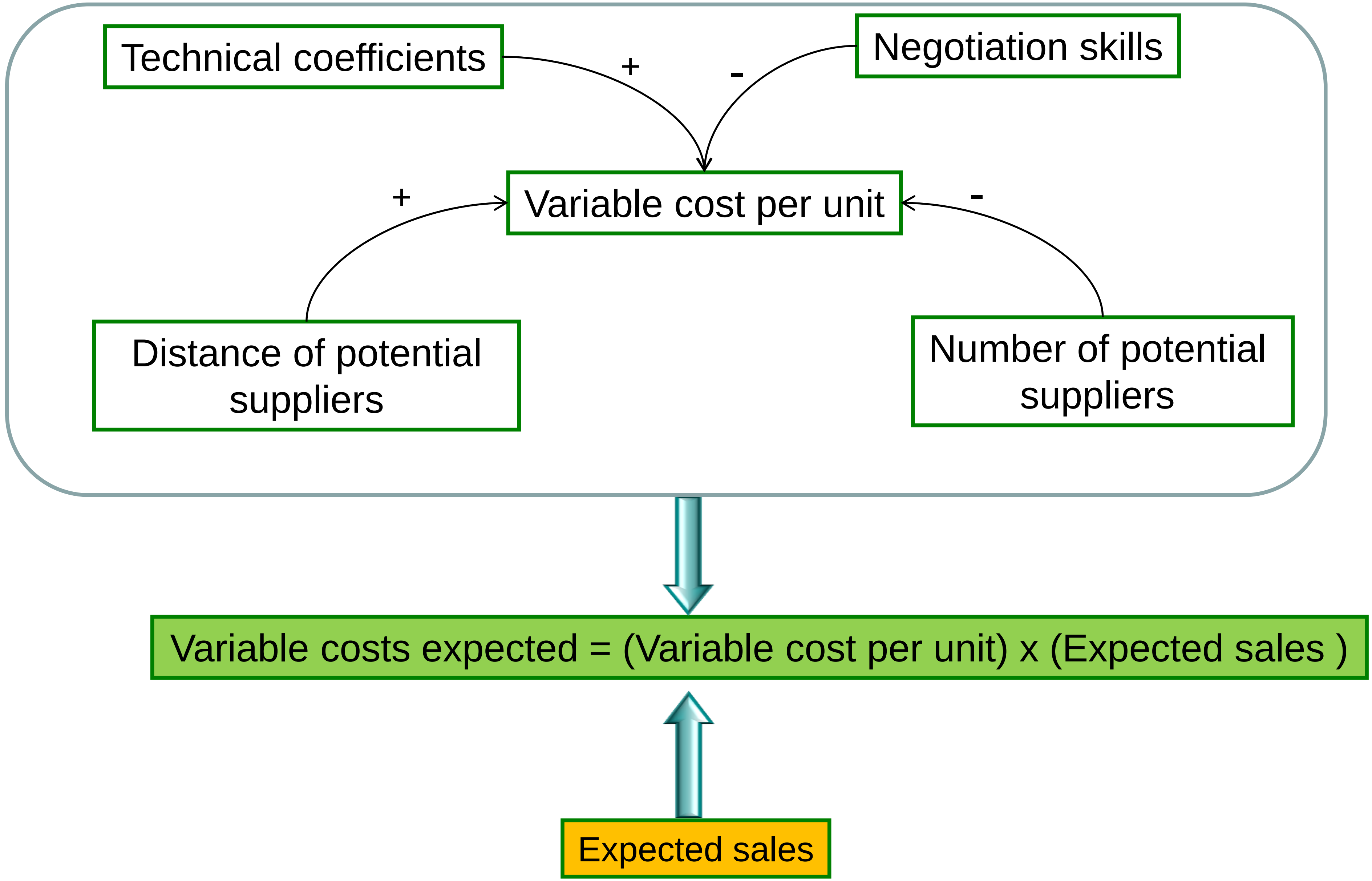
$$\Delta REV = 56$$

Revenues analysis

Price elasticity of demand (ε)



Variable costs



Contribution margin

Revenues = Price per unit (p) x Expected sales (q)

-

Variable costs expected = Variable cost per unit (c) x Expected sales

=

Contribution margin (CM)

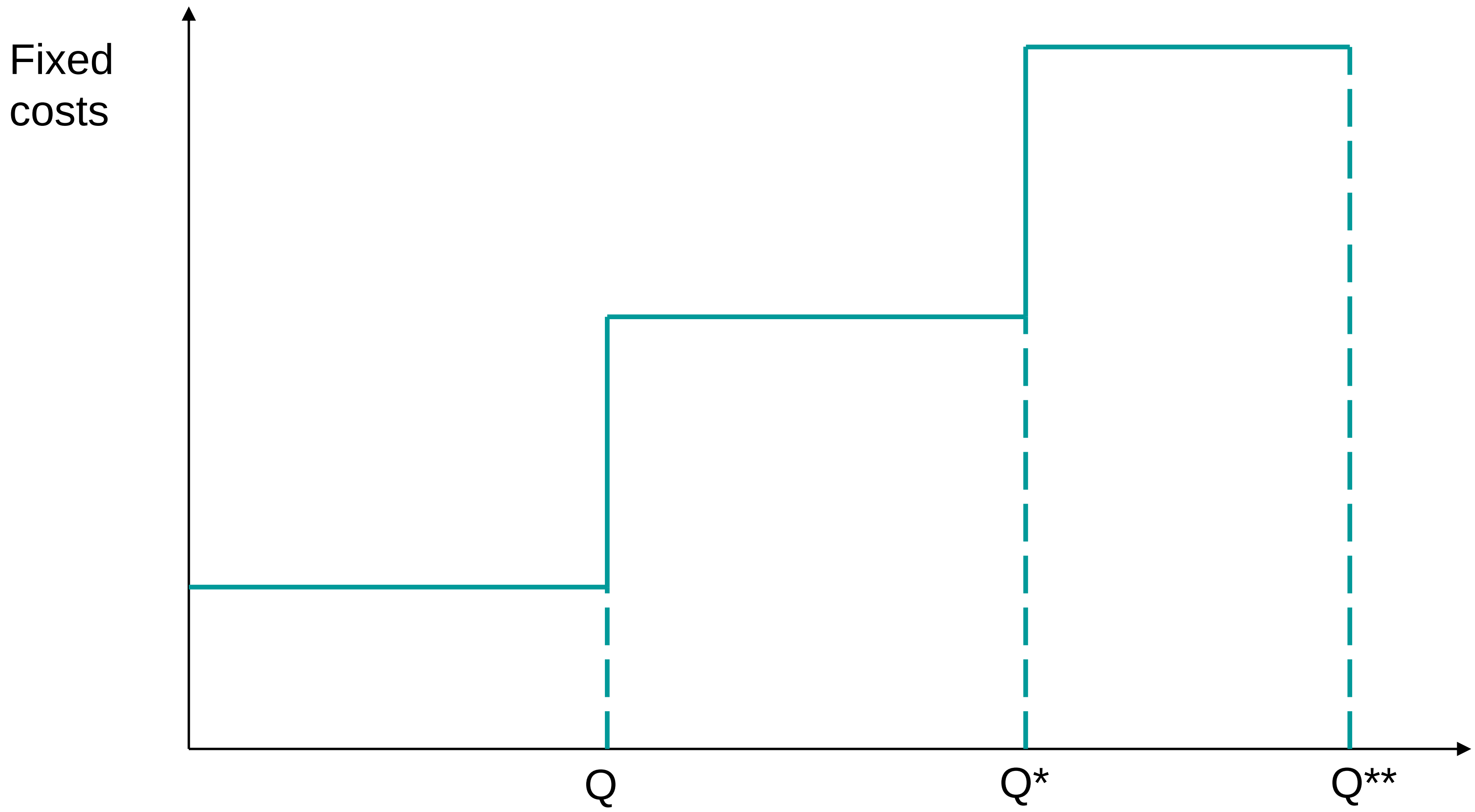
$$CM = q(p - c)$$

Revenues, variable costs e contribution margin: a simulation

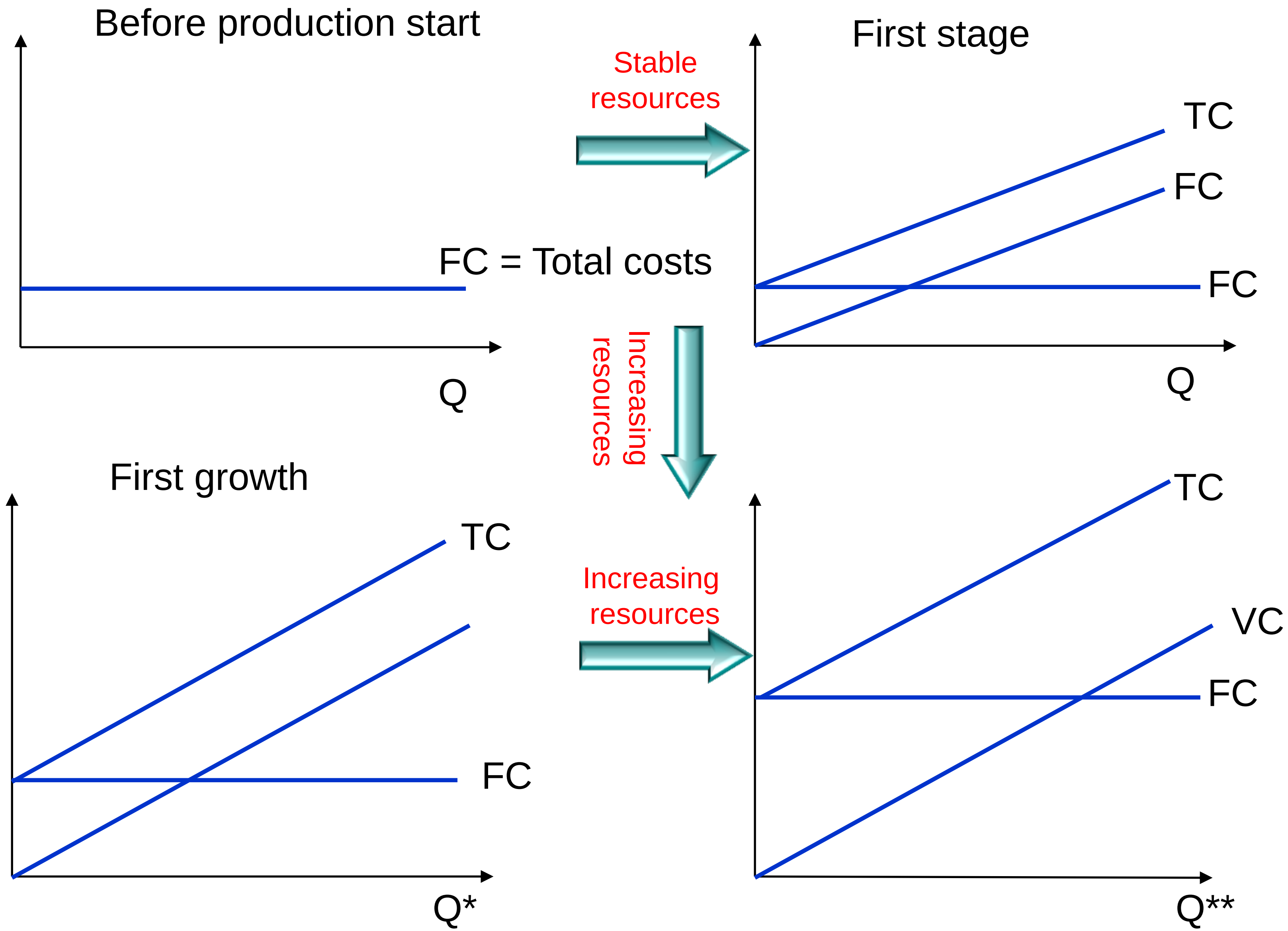
Max production capacity	120	
Price	10	
Unit cost	8	
Probabilities	Q	Probabilities (Q)
0.1	120	12
0.2	100	20
0.2	80	16
0.4	60	24
0.1	40	4
$\Sigma = 1$		$\Sigma = 76$
Expected Sales	76	
Expected Revenues	760	
Expected Variable Cost	608	
Expected contribution margin	152	

This analysis must be repeated for each forecast year

Stepped fixed costs



Start-up, development and dynamics of total costs



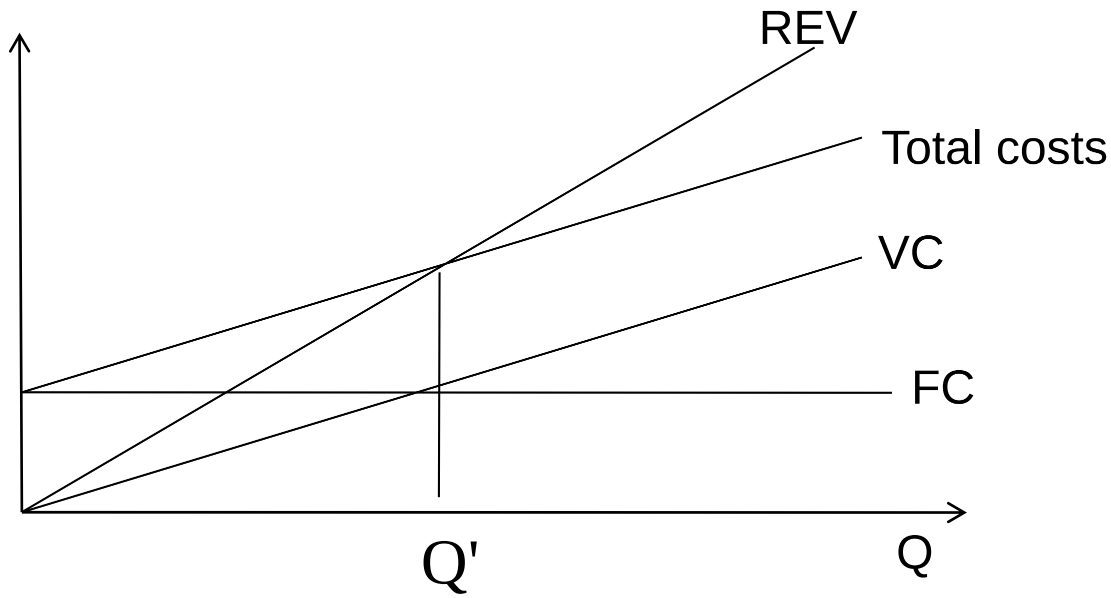
Break even analysis

$$Ebit = REV - VC - FC = Q(p - c) - FC$$

$$Q' = \frac{FC}{p - c} \rightarrow Ebit = 0$$

$$Q > Q' \rightarrow \text{profitability}$$

$$Q < Q' \rightarrow \text{losses}$$

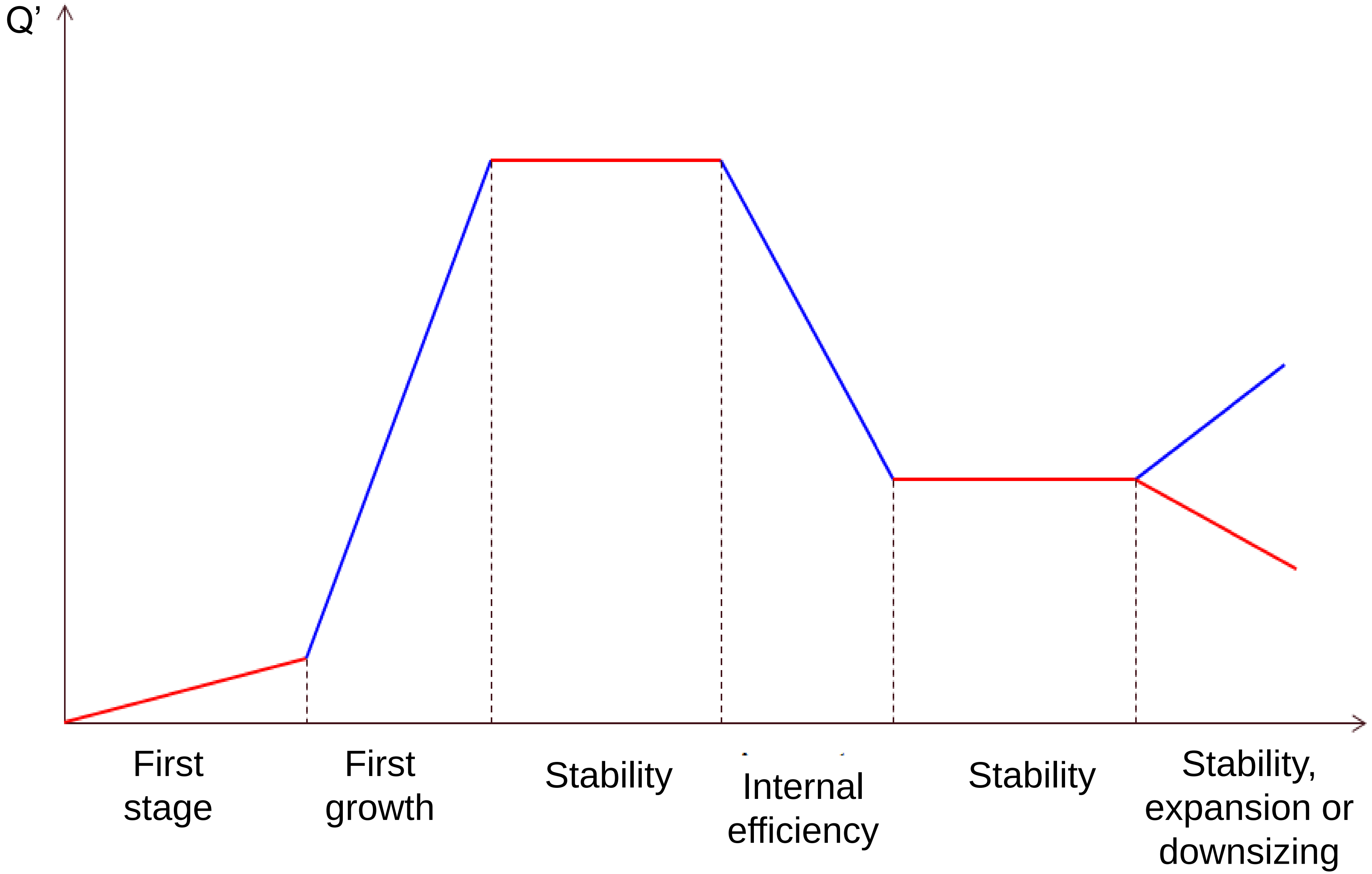


Break even analysis

Growth of internal resources $\rightarrow$ $+\,\Delta Q'$ $\leftarrow$ **Worsening competitive position**

Exploitation of internal resources $\rightarrow$ $-\,\Delta Q'$ $\leftarrow$ **Improving the competitive position**

Break even analysis (Q') and entrepreneurial stages



Break even analysis (Q') and entrepreneurial stages

	t_0	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}
FC	50	130	150	900	1200	1300	1300	1300	1200	1100	1100	1100
p - c	2	2	2	10	10	10	10	10	10	10	15	20
Q'	25	65	75	90	120	130	130	130	120	110	73	55
Q	0	0	10	40	60	100	130	130	130	130	130	130
Ebit	-50	-130	-130	-500	-600	-300	0	0	100	200	850	1500

First stage

First growth

Break even

Efficiency

Competitiveness

Key Points

General kinds of scenarios

Price elasticity of demand and the revenues optimization

The drivers of variable cost

The relationship between fixed costs and internal resources

The break even analysis during the several entrepreneurial stages

Entrepreneurship and new ventures finance

Designing a new business (4): Financial analysis

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Agenda

1. **Financial dynamic: general framework**
2. **Financial need of new businesses**
3. **Net working capital**
4. **Cash flow analysis**

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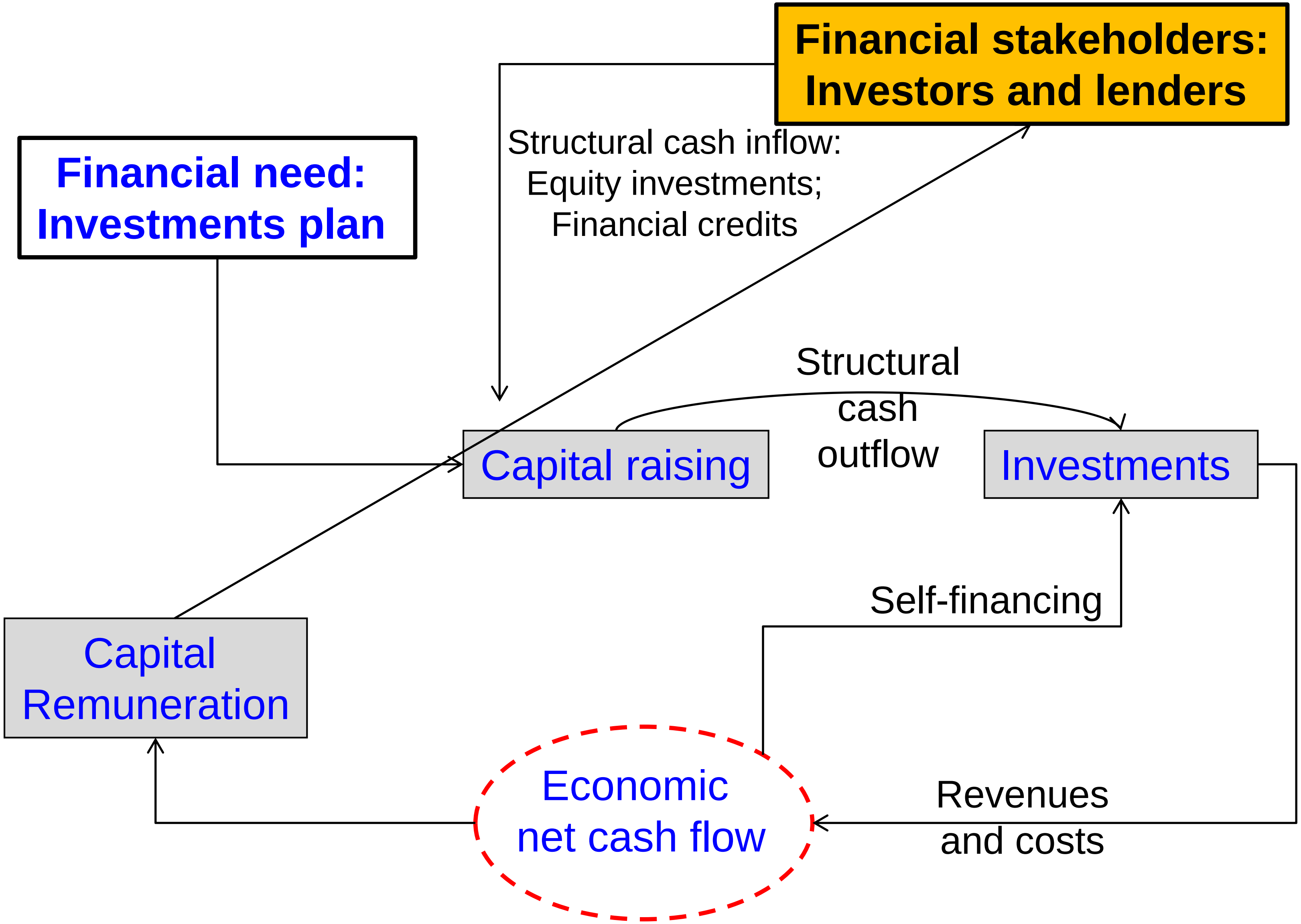
Financial dynamic: general framework

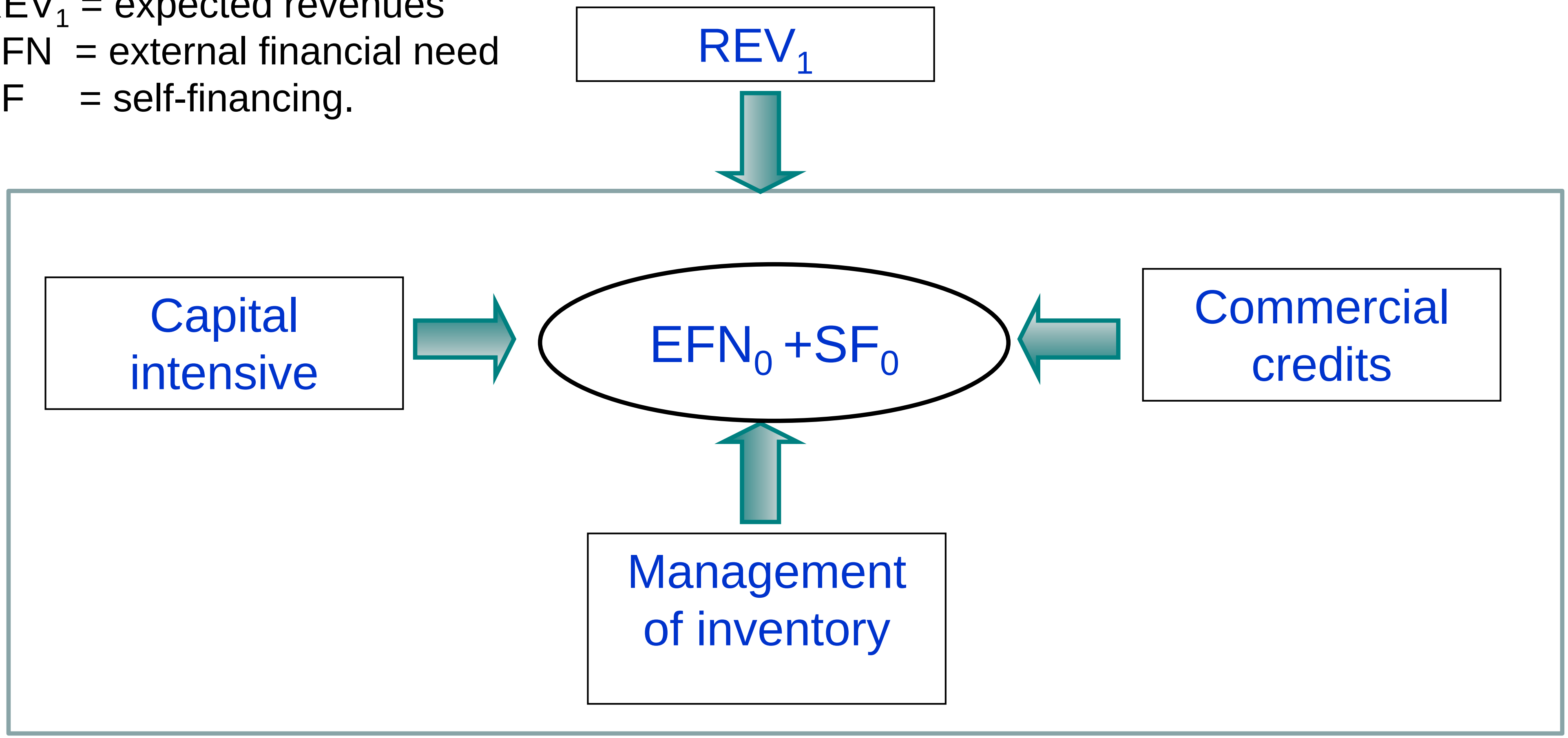


Financial need of a new business

Financial need for expected revenues

$$\text{Financial need(FN)}_0 = f(REV_1) \qquad \text{FN}_0 = \text{EFE}_0 + \text{SF}_0$$

REV_1 = expected revenues
EFN = external financial need
SF = self-financing.



Financial need of new businesses

The estimation of durable financial need: Analytic approach

T_0	T_1	T_2	T_3
Fixed Investments	**Fixed Investments**	**Fixed Investments**	**Fixed Investments**
Patents	Marketing investments		Increasing R&D and Prototype development
Software and computer system	Stores and/or sales channels		Increasing software and computer system
R&D and Prototype development		Increasing stores and/or sales channels	Increasing machinery and Equipment
Machinery and Equipment			Increasing stores and/or sales channels
Other capital assets	Other capital assets	Other capital assets	Other capital assets
Current Assets	**Current Assets**	**Current Assets**	**Current Assets**
Pre-paid expenses (for instance insurance)	Starting inventory	Increasing inventory	Increasing inventory
Starting cash need	Accounts receivable	Increasing accounts receivable	Increasing accounts receivable
Other current assets	Icreasing of cash need	Icreasing of cash need	Icreasing of cash need
	Other current assets	Other current assets	Other current assets
Before starting the production activities	Initial production activity	Commercial growth	Commercial and industrial growth
Expected Rev(1) = 0	Expected Rev(2) > 0	Expected Rev(3) > Expected Rev(2)	Expected Rev(4) > Expected Rev(3)

The estimation of durable financial need: Synthetic approach

$$ACA_s = \sum_{i=1}^{n} \left(\frac{FI_i}{REV_i} \right) \Big/ n$$

$$FN_{j(T0)} = ACA_s \cdot (REV_{j(T1)}) = FI_{j(T0)}$$

ACA_s = Average capital intensive of cluster s
FN_j = Financial need of business j
$REV_{j(T1)}$ = Expected j revenues
$Fi_{j(T0)}$ = Fixed investments

Financial need of new businesses

Synthetic approach: multi-period analysis

$$FN_{j(T0,TN)} = ACA_s \cdot \lfloor (REV_{j(T1)} - REV_{j(T0)}) \rfloor + \ldots + \lfloor (REV_{j(TN)} - REV_{j(TN\text{-}1)}) \rfloor =$$
$$= (FI_{j(T1)} - FI_{j(T0)}) + \ldots + (FI_{j(TN)} - FI_{j(TN\text{-}1)})$$

Periods	1	2	3	4	5
AFI_s	3	3	3	3	3
Expected Rev	0	20	40	100	100
ΔExpected Rev		20	20	60	0
Financial need (j)	60	60	180	0	
Total fixed Inv.	60	120	300	300	

Hypothesis: Each expected Euro of revenue requires a durable investment equal to three Euros

Financial need of new businesses

Analytic approach /Synthetic approach

The synthetic approach is useful especially in the first stage of analysis, when the specific business goods are not identified. From this point of view, the synthetic approach helps the estimation of the general capital amount necessary to finance the industrial structure of the project.

Moreover the synthetic approach could be useful to analyze the causes about differences between the capital intensive of a certain industry and capital intensive of a certain business.

Financial need of new businesses

Financial need and risk

FINANCIAL NEED \ RISK	High	Low
High	Project Start Elevated operative and financial risk High durable financial need	Project Growth Negative cash flow High temporary financial need
Low	Idea creation High uncertainty Low durable financial need	Consolidation Positive cash flow

Networking capital (NWC)

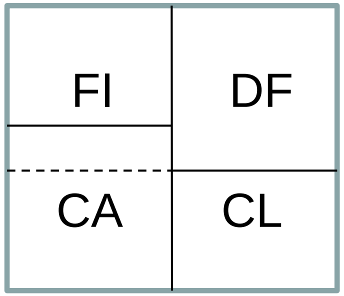
Balance sheet equation: $\mathrm{FI} + \mathrm{CA} = \mathrm{DF} + \mathrm{CL}$

	1	2	3	4	5
Fixed Investment (FI)					
Patents					
Software and computer system					
R&D and Prototype development					
Machinery and Equipment					
Current Assets (CA)					
Cash					
Accounts receivable					
Inventory					
Durable financial resources (DF)					
Equity					
Long term debt					
Current Liabilities (CL)					
Accounts payable					

NWC = CA – CL = DL - FI

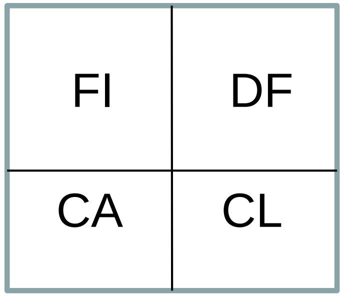
Short term		Short term		Long term		Long term
Current Assets		**Current Liabilities**		**Durable Financial R**		**Fixed Investment**
Cash				Equity		Patents
Accounts receivable	-	Accounts payable	=	Durable founds	-	Software and computer system
						R&D and Prototype development
Inventory				Durable financial dets		Machinery and Equipment

Networking capital (NWC)



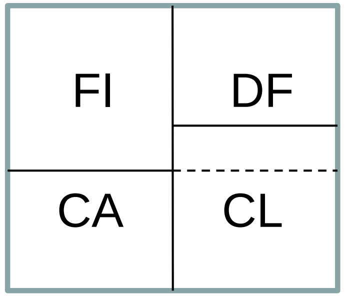
NWC > 0

Disequilibrium:
Excess of liquidity



NWC = 0

Equilibrium:
Excess of liquidity



NWC < 0

Disequilibrium:
Lack of liquidity

Net working capital

Excess of liquidity: Causes

• Combination between economic strength and a lack of opportunity growth (cash cow).

• Self-financing.

• Business crises causes (for a short time) liquidity that comes from disinvestments

Net working capital

Lack of liquidity: Causes

- Economic inefficiency
- Difficulty to get a return on commercial credit.
- Difficulty to obtain durable financing.

The right level of NWC

The optimum level of NWC requires: 1) A low waste of financial resources; 2) A protection margin (m) than the volatility of current asset and current liabilities.

$$a)\ m < NWC > 0$$

Inefficiency: waste of financial resources; covered risk

$$b)\ m = NWC > 0$$

Limited efficiency; risk covered

$$c)\ m > NWC = 0$$

Max efficiency; No cover risk

Cash flow analysis

Net Income
(-) Δ Net operative Working Capital
(+) Depreciation
A) Economic cash flow

(+) Δ Equity - Net Income
(+) Financial debts
(-) New Fixed Investments
(+) Disinvestments
B) Structural cash flow

Total Cash flow = A +B

Cash flow analysis

- Δ Net operative Working Capital

=

ΔAccounts payable – (Δ Accounts receivable + Δ Inventory)

ΔAccounts payable = costs without cash out flow

Δ Accounts receivable = revenues without cash inflow

Cash flow analysis

A) Economic cash flow **Goal: maximization**

B) Structural cash flow **Goal: ?**

A positive value of the structural cash flow indicates a surplus of financing

A negative value of structural cash flow could depend on self-financing processes

A null value of the structural cash flow arises when there is a perfect balance between the acquisition of new equity (and/or new financial debts) and the dynamic of fixed investments

Cash flow analysis

Free cash flow

The free cash flow is a net cash flow usable to reward lenders and shareholders

Free Cash Flow To Firm

It comes just from investment decisions.

Assets	Equity
	Debt

Free Cash Flow To Equity

It comes from both investment decisions and financing choices

The Free Cash Flow
is correlated in negative way with the business dynamic:
Investments growth decreases dividends

Investment growth
<u>Δ Net Fixed Investments + Depreciation > 0</u>

Cash flow analysis

Free Cash Flow To Firm

Net Income

\+ Debt service

\+ Non-Cash Items (Depreciation)

– ΔNet Operative Working Capital

– New Fixed Investments

\+ Fixed Disinvestments

= FCFF

Cash flow analysis

Free Cash Flow To Equity

Net Income

\+ Non-Cash Items (Depreciation)

– ΔNet Operative Working Capital

– New Fixed Investments

\+ Fixed Disinvestments

= FCFE = FCFF - Debt service

Cash flow analysis

Expected Free Cash Flow analysis and growth assumption

- No-Growth Assumption - Free Cash Flow stable
- Constant Growth Assumption – Constant growth of Free Cash Flow
- Negative Growth Assumption
- Variable Growth Assumption – Variable growth of Free Cash Flow

In general the growth assumptions about expected free cash flow are inverse than the growth assumptions about investment dynamic:

Temporal mismatching between earning dynamic and investment dynamic

Key Points

Financial dynamic framework

Capital intensive and financial need analysis

Net working capital and static equilibrium

Cash flow: economic and structural drivers

Free cash flow concept

Entrepreneurship and new ventures finance

Venture financing

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Overview

Venture financing: introduction

Venture investors

Firm life cycle and firm financing

Venture capital structure

The investing process

An introduction to IPO

Venture capital return

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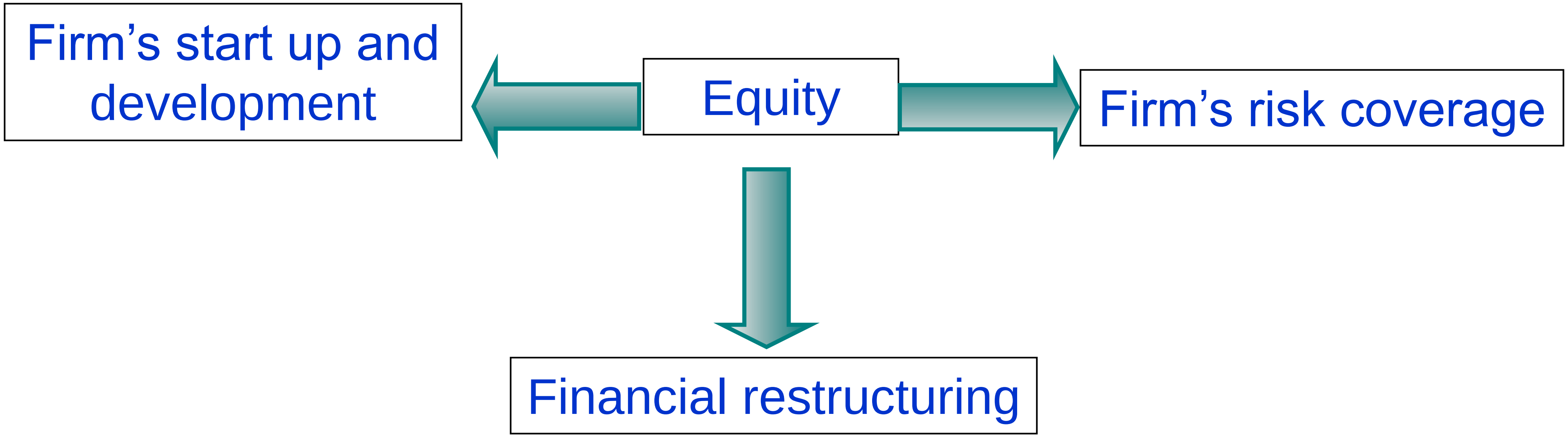
The equity role



The equity role

- The equity employed for financing the start up phase and the development of firms. For this reason, it arises on the one hand as development capital on the other as patient capital.

- The availability of financial intermediaries, which supply development capital, is an alternative to the more traditional relationships between commercial banks and firms.

- There is a positive relationship between the diffusion of development capital and the knowledge development.

The inadequacy of bank lending

Bank lending		**Firm financial need :**
Current account overdrafts	→ Coverage	Cash need;
Short-term loans	→	Working capital need
Mortgage Loans	→	Conservative investments
(Bank lending)	→ Inadequacy	**Startup investments R&D Investments**

Equity financing
Self-financing
→ Coverage → **Startup investments R&D Investments**

Credit constraints → Inadequacy

- Maintaining of a minimum level of liquidity
- Capital adequacy to the credit risk.

The inadequacy of bank lending

- Bank lending framework is not consistent with strategic investments of new innovative businesses.
- The mortgages are too rigid than the dynamic of innovative investments.
- Normally the financing of startups is too risky in relation to the credit constraints.

The bank loan of a start up implies negative effects in relation to:

1. The amount of capital that can be acquired;
2. The probability of obtaining a proper financing;
3. The entrepreneurial creativity;
4. The business innovation;
5. The business size.

However, in the entrepreneur perspective, the bank loan implies the following advantages:

1. Better protection of the business idea.
2. Better protection of firm ownership
3. More decisional power in relation to both the governance structure and organizational choices.
4. A lower capital cost

Venture financing and volatility

•Systems that are mostly oriented to venture financing are more exposed to the economic conjuncture: they amplify the effects both in case of a growth phase and in case of a negative conjuncture.

• The diffusion of the venture financing increases the volatility of the financial system, due to high default probability associated with new ventures and to a lack of control on operators/investors

Venture financing diffusion: the case of Italy

• The fund raising of equity resources is harder in Italy, than in Usa or in other European Countries.

• Proprietary rights of Italian firms have a high rate of concentration: family firms are the most common ones.

• Most of Italian firms are of a small size: the 95% of them has less than 10 employees.

• The financial system is mainly bank-based.

• Italian firms' financial structure is very often characterized by a high rate of financial leverage. The short-term debt weigh heavily on the financial structure, as well.

Venture financing: introduction

Venture financing diffusion: the case of Italy

External equity resources for European start up firms:
20% USA: 15% Asia; 12% France; 9.4% Scandinavia; 9% Germany.
The contribution of Italy is only secondary and it is classified under the category "others" (Source: EVCA, 2011).

In spite of above data, in the last years, there was a positive trend in Italy for what concerns private equity and venture capital investments.
This phenomenon was having different positive effects, both in economic and social terms.

Venture Investors

Informal investors

- Business Angels
- Business incubators

Institutional Investors

- Venture Capitalists
- Private Equity Funds

Other investors

- Corporate Venture Capital
- Merchant Banks
- Public Investors

Venture Investors

Informal investors

The business angels are those backer using their own equity to finance a venture. Often, they are individuals (as retired entrepreneurs, managers, professionals) who own large amounts of financial resources, and who have specific competencies in the sector where they are going to invest.

Business incubators provide a support to those start-ups operating in a specific technology sector or region. More precisely, with the term incubator, we refer to those institutions that interact with potential entrepreneurs, supplying them some specific services, and, sometimes, also providing financial resources. Their aim is to promote the entrepreneurship, providing all those resources that are necessary both in the start up and the developing phases.

Venture Investors

Institutional investors (prive equity and venture capital)

They operate in an organized manner, thanks to a durable economic coordination: they raise the funds from different backers and, then, they invest them to increase the economic value of a firm. Later, they sell their stake to maximize the profit.
To reach the economic value creation, the private equity backer pushes toward to a fast growth of the firm and to high returns, to the end of realizing a capital gain with the later divestiture of its stake.

Institutional investors (private equity and venture capital)

In general, the private equity backer activity consists in an acquisition of a stake in a target firm. In this way, the backer becomes a partner of the firm. Hence, the backer contributes to firm growth not only with financial resources, but also with his bundle of managerial capabilities and competencies, pro-actively promoting firm’s development.
Firm’s objectives are determined in advance, in accordance with shareholders.

The venture capital activity is a specific kind of private equity investment, or, in other terms a specific business segment. According to the European approach to venture capital, this last type of backer is dedicated to early stages of start up firms’ life cycle.

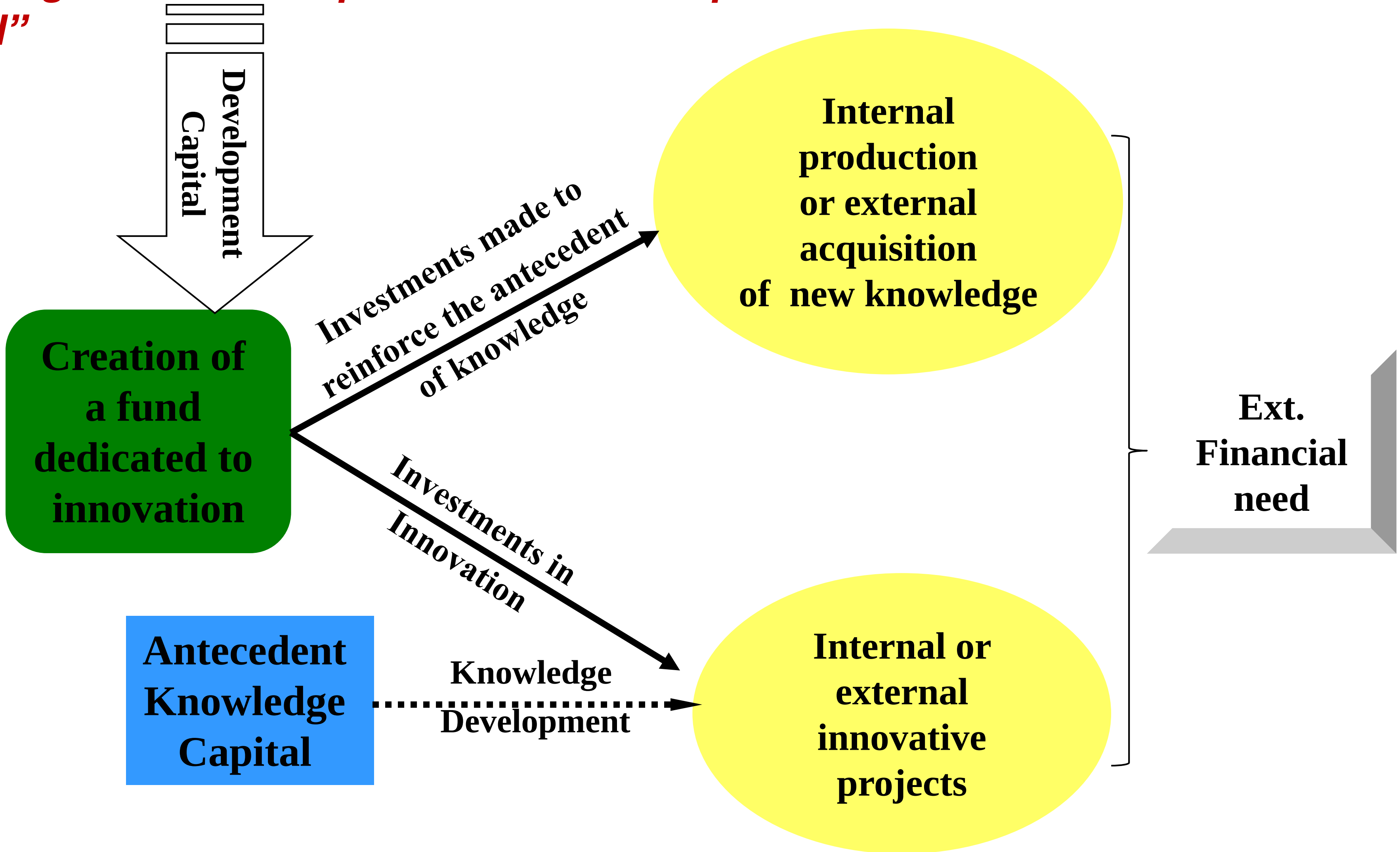
Venture Investors

Corporate venture capitalists

The Corporate Venture Capitalist is when a corporation acts like a venture backer investing part of its funds in external ventures. Its aim is both to realize a profit and to develop critical synergies with internal corporate activities, at a business level.

Venture Investors

The logic of the corporate venture capital and the “extended financial need”



Venture Investors

Business Angel Goals: investment return maximization and/or philanthropic goals

Venture Capitalist Goal : investment return maximization in specific period

Corporate Venture Capitalist Goal: development of strategic and technological synergies

Merchant Bank

The venture financing is just one kind of the overall activities that a merchant bank carries on. They supply a bundle of financial resources and consultancy services, to facilitate firms to resort to a further fund raising on public markets, in a later moment.

Government agencies

Sometimes, also Government agencies can step in capital markets to support specific kinds of business, with the aim of stimulating the growth of the overall economic system and of the employment rate.

The three types of public policies to sustain venture financing

1. **Direct action policies, aimed to financing a specific kind of businesses and projects.**
2. **Indirect action policies, aimed to promote the venture capital activity.**
3. **Indirect action policies, aimed to promote the development of favorable environment, at a geographic level, and based on the reinforcement of the availability of financial and other real services for start up firms.**

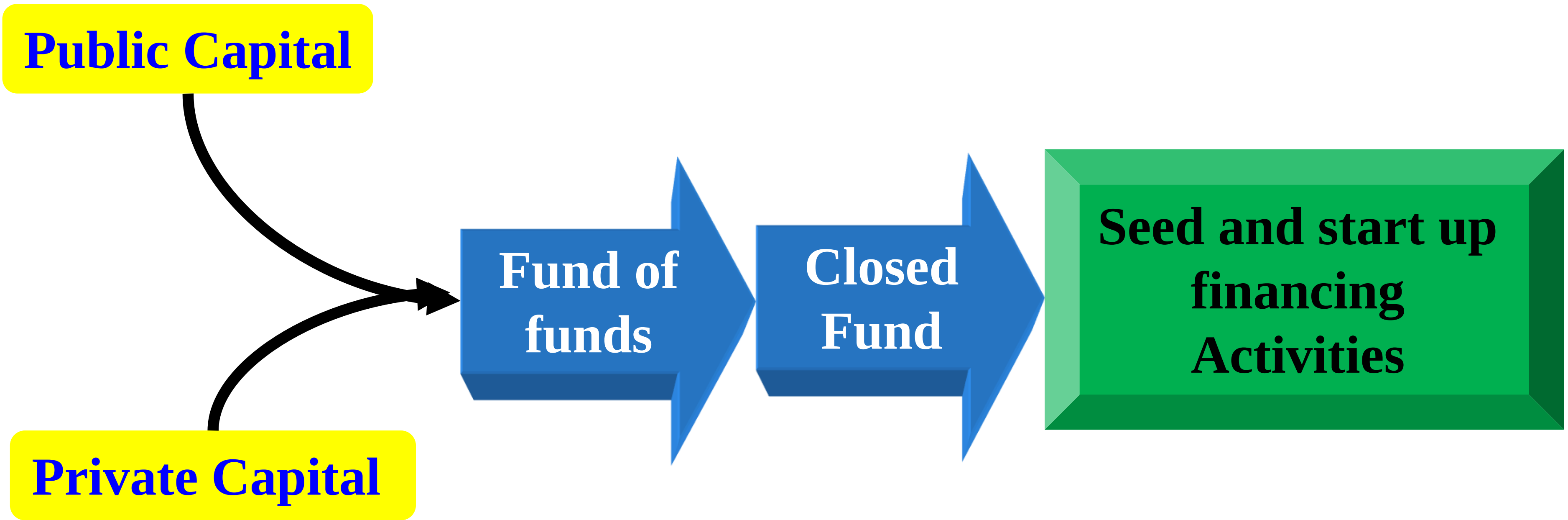
Venture Investors

A comparison between direct and indirect policies

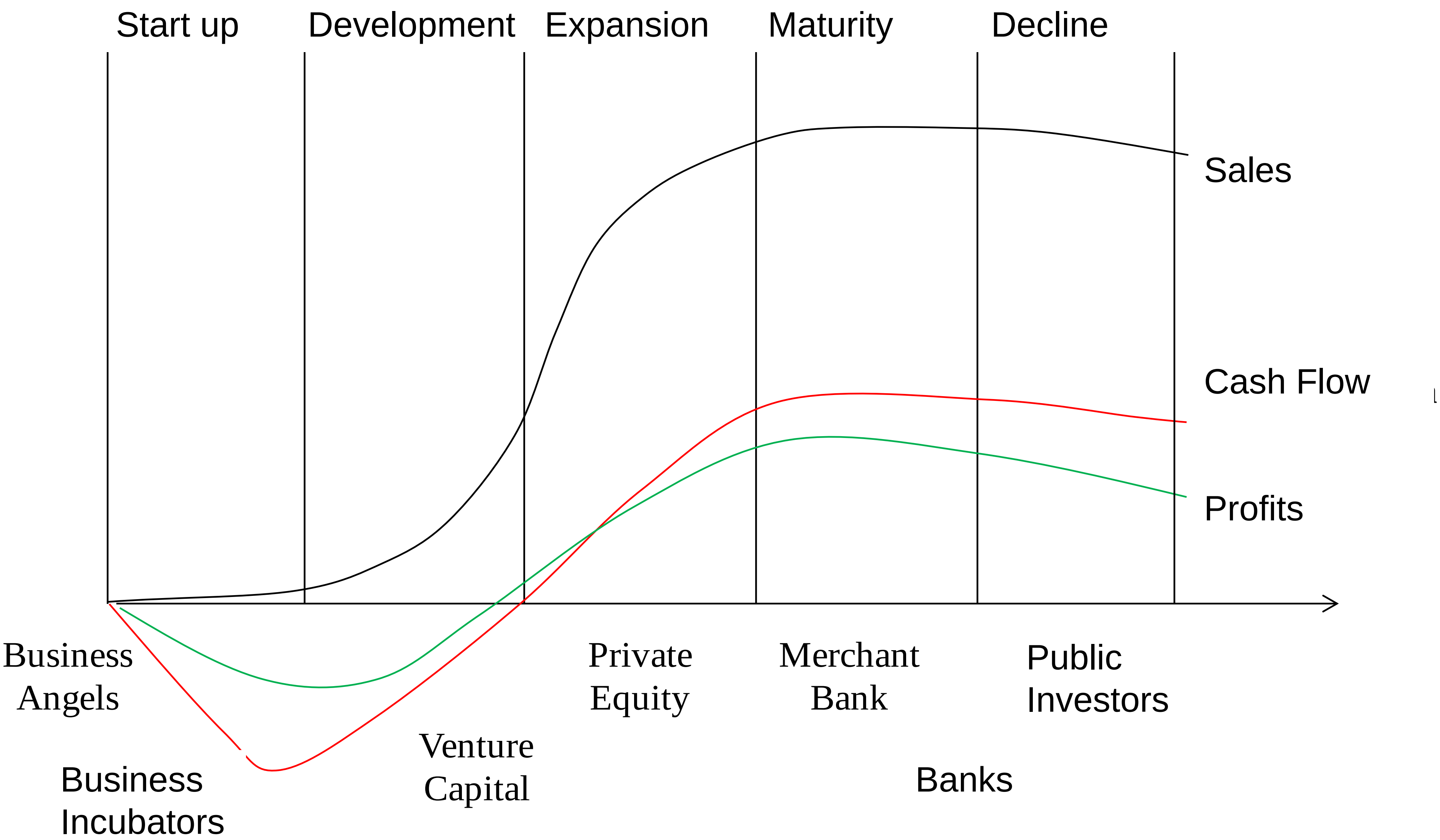
Direct policies	Indirect policies
• They allow a direct control by the State	• They do not allow a direct control by the State
• They determine a situation for what the entire cost of financing and its risk are carried by the State • They amplify a static condition of the financial system • They are not indicated to promote the knowledge sedimentation and integration	• They allow the risk sharing between private and public capital • They promote the sedimentation and the integration of the knowledge over time • They reduce a static condition of the financial system

Venture Investors

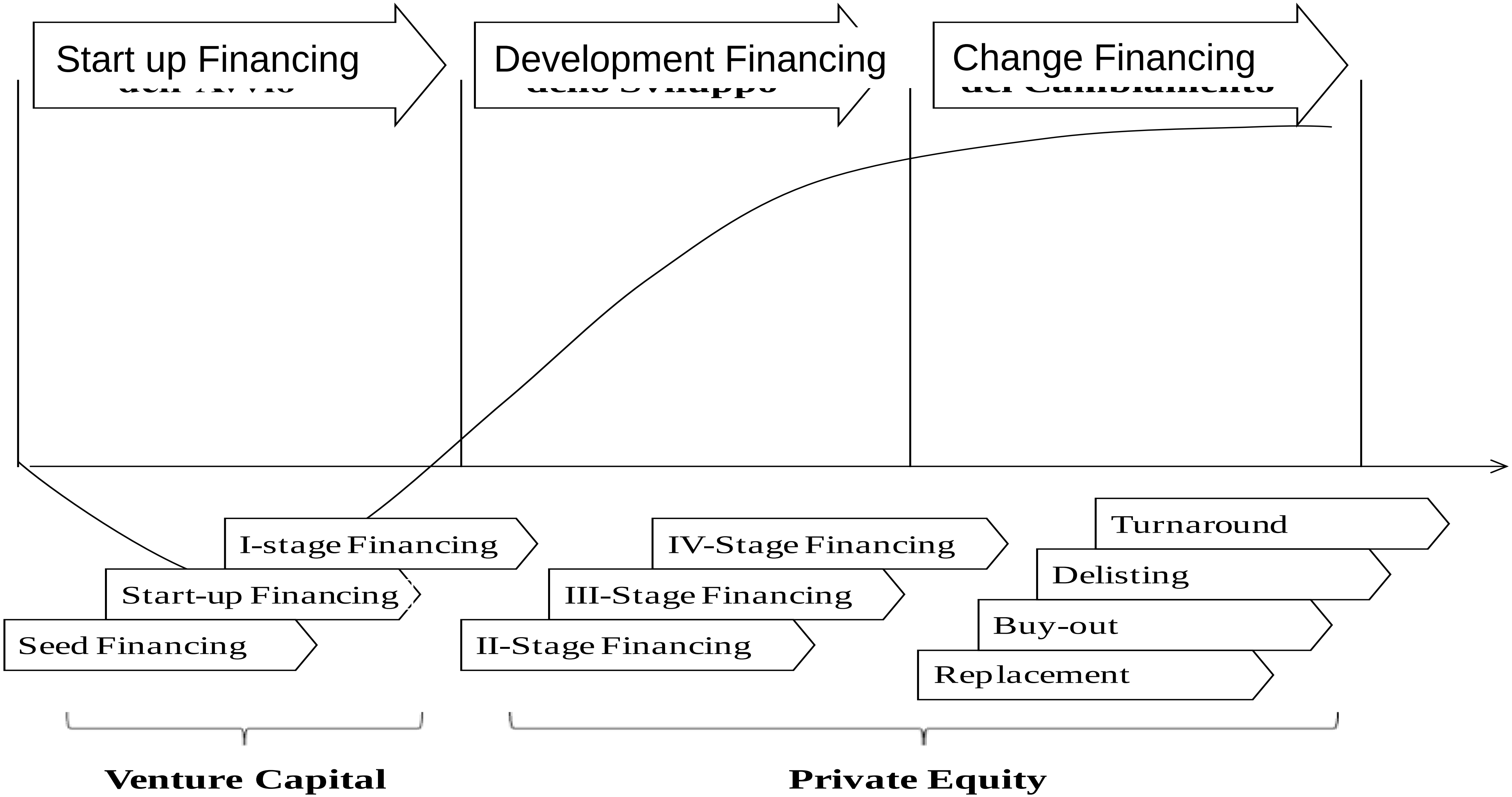
Funds of funds



Firm life cycle and firm financing



Firm life cycle and firm financing

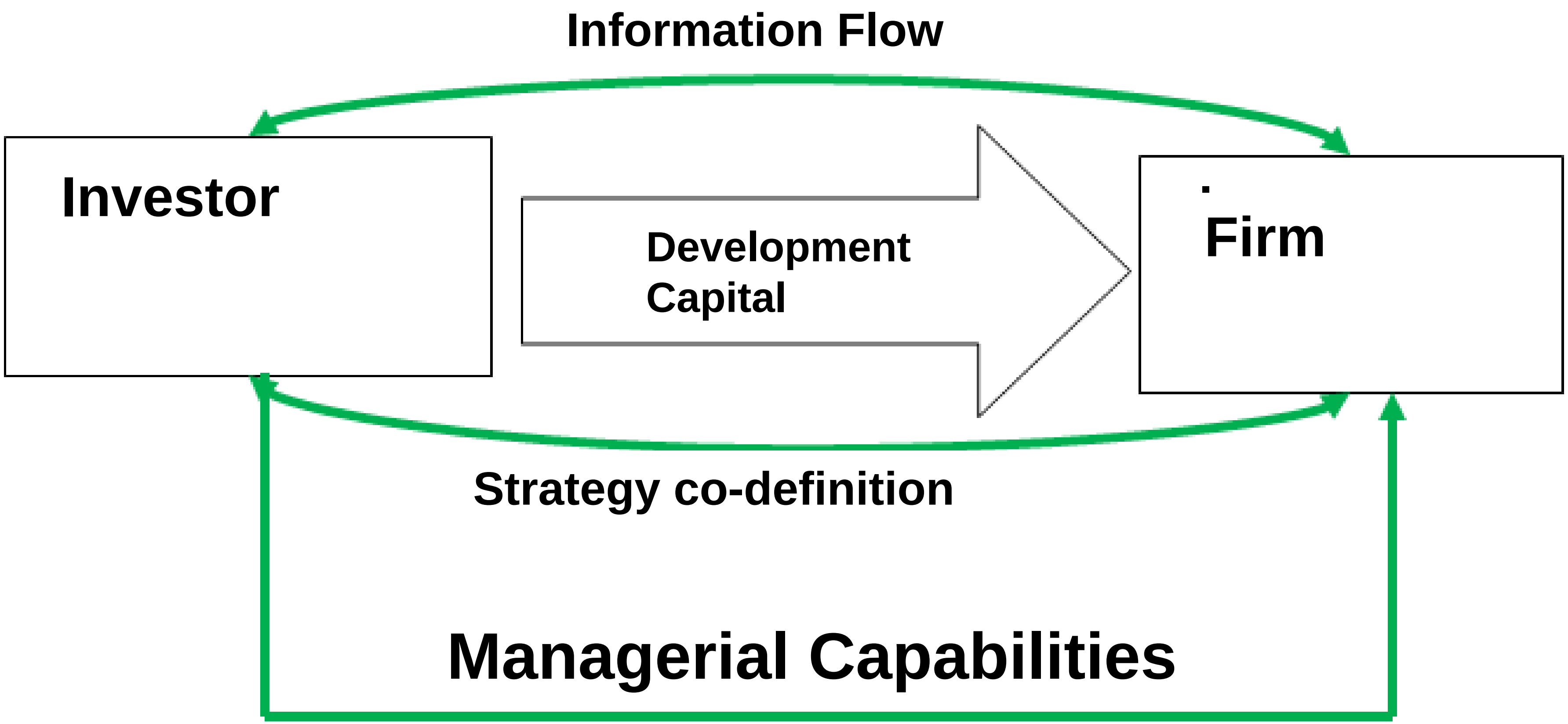


Early stage financing

The early stage financing is characterized by a lack of financial resources and of managerial ones.

In general, during the seed financing phase – a sub-phase of the overall process – the firm has no business plan at all; or it has one, but it must be improved. The investor (usually, a business angel) supports the firm also during the planning phase.

Early stage financing



Early stage financing

Seed Financing

It supports financial resources for the business idea, before the launch phase. Investors (business angels; business incubators; venture capitalists) contribute both with financial resources and with their managerial competencies, with the aim of converting the business idea into a feasible business model.

Start up financing

Type of financing (typically, venture capital) that allows for the start up phase of the business, as depicted in the business model.

Early stage financing

I-stage financing

This phase concerns the financing with external equity resources of the later stage, following the start up phase. The risk of this phase is linked to a lack of information on the product/service's sales potential.

Further investments can be required and in addition to promote the sale development with financial or commercial debt.

Early stage financing

Seed financing

Financing the planning phase

Start up financing

Financing the start up phase and the launch of the production

First stage financing

Financing sales development and/or firm's lack of debt resources

Expansion financing

II -stage financing

It supplies equity resources aimed to increase firm’s efficiency, through the exploitation of the productive capability, realizing economies of scale/scope.

With this kind of financing, the objective is shifted from the maximization of sales to the maximization of returns.

Expansion financing

III-stage financing

It provides financial sources to promote the firm development through M&A operations.

It could lead to:

- *core business reinforcement;*
- *related diversification;*
- *non related diversification.*

Expansion financing

IV-stage financing

This kind of financing is directed to support the firm's listing on the public market.

The Fourth-stage Financing is also named *Bridge Financing*, and its objective is to organize the IPO, as quickly as possible.

The management of the IPO (Initial Public Offering) is assigned to the private equity investor.

Change Financing

Replacement capital

It refers to the exit of minority shareholders, and it could imply some changes at an organizational and managerial level.

In this case, the remaining part of shareholders could be unwilling to purchase the minority stake or could not have the financial resources. Those two situations justify an intervention of a private equity fund.

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Change Financing

Buy – out

The investor offers both a financial and a managerial support to promote a radical change in the ownership structure. The main types of buy-out operations are the followings:

• management buy out (MBO – internal managers assume the control of the firm);

• management buy in (MBI – external managers assume the control of the firm);

•buy in management buy out (BIMBO – both internal and external managers assume the control of the firm);

•employee or worker buy out (EBO or WBO – the new ownership structures includes part of the employees).

Change Financing

Delisting

The delisting is when a company, which assets are traded on a public market, opts for a private ownership and becomes unlisted.

Turnaround financing

This kind of investments recurs in case of firm crisis, when there is a need for change, whether in the ownership structure and in the managerial board.

Venture capital structure

•Close-end funds: with the model of the investment company, this last one manages the close-end fund. This kind of model is common in Italy and in many other European Countries.

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• Limited partnership: this type is based on the presence both of partners with limited responsibility (limited partnership – LP), and partners with unlimited responsibility (general partner – GP).
This is common in US and some European Countries (UK; Sweden)

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Structure of a limited partenership

General partner (venture capitalist)
- opportunities selection
- deal structuring
- control and advisory
- disinvesting

1%-2% Capital of the fund ↓

Annual Management Fee 2-3% ↑

20%-30% Capital gains ↑

Venture capital fund

98%-99% Capital of the fund ↑

70%-80% Capital gains ↓

Limited partner
- Endowments
- Life insurance companies
- Big corporations
- Other investors

Forestieri (2011)

The investing process

- Selection of the target firm/business
- Evaluation of the entrepreneurial idea
- Evaluation of the target firm/business
- Definition of the financial structure of the investment
- Definition of the purchase price
- Investment monitoring
- Disinvestment

Selection of the target business

- Usually, in Countries as Us or Uk, where there is a greater availability of equity funds, the selection of the business is somewhat easier than elsewhere, since entrepreneurs are used to propose their business to potential investors.

- For other Countries, where is less common for entrepreneurs to go in search for investors, there is a different mechanism of business selection.

- The process of selecting a business target can be based on a single or multiple sectors, according to investor's characteristics.

The evaluation of the entrepreneurial idea

- It is direct toward the verification of entrepreneurial team reliability; competencies, and reputation.

.

The evaluation of the target business

- Strategic Evaluation
- Technologic Evaluation
- Financial and Economic analysis
- Default probability analysis
- Risk-return analysis
- Enterprise value estimate

Definition of the purchase price

- Theoretical value
- Price negotiation
- Timing and steps of the financing process

Monitoring Phase

•Analysis of the gap between firm ongoing performance and the bussiness plan, as initially forseen.

• In case of any correction is needed, implementation of change at strategic, organizational, or financial level.

Disinvesting

- IPO (Initial Public Offering);
- The stake could be also sold to another investor;
- Buy-out.

An introduction to IPO

• The IPO (Initial Public Offering) is when firm's assets are publicly traded.

• With the IPO, the firm is going to be listed on one or more public markets.

• The process is extremely affected by information asymmetries.

• The IPO process can take from 6 to 12 months.

IPO main objectives

- Managing of the financial structure.

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- Exit way for shareholders.

- Development, innovation or internationalization strategies.

- As a way to enhance the firm status: for instance, investing in its reputation.

Main risks of an IPO

- Short-termism

.

- The firm can be taken over

- Greater exposition to systematic risk

- Since the decision process becomes extremely formal, there’s a probability of loosing part of entrepreneurial creativity.

- High costs for the internal control system.

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IPO's actors

• Bid: offering actors as the issuer (OPS- public offer for subscription); the exiting shareholders, which are going to sell their assets.

• Ask: public investors or individuals.

• Public institutions: control authorities; stock exhange authority

• Bank syndicate: its role is to place the bid, inviting investors to underwrite a stake. Its technical function can follow two different ways: with or without the underwriting of stakes.

IPO's actors

- Global coordination: this role is conferred to a merchant bank, which manage the overall process, organizing and coordinating both advisors and the bank syndicate.

- Other advisors: financial, legals, for shareholders, etc..

IPO pricing

Initial general evaluation	Initial evaluation
Its aim is to collect and to verify information on the issuer, as property; financial; economics; operating; strategic; fiscal; and environmental information.	Due diligence
Independet analysts' analyses and disclosure of results	Presentation and equity research
Meetings with selected investors, aimed to obtain an initial feed-back	Pre-marketing
Meetings with the financial community to make the initial public offering and to collect underwriting by institutional investors.	Roadshow And pub. offering

Pricing

Venture capital return

The takeover of a target firm is a typical way to realize an operation of new venture financing with external equity funds. The investor purchase a stake of the target firm, usually an unlisted one, for a short predetermined period. Once the firm value has increased, the investor sells the stake, realizing a capital gain yield.

The return for institutional investors: two main alternatives

• IRR (internal rate of return).

• Cash Multiple: this method is based on multiples that measures the return of the investment on total capital

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Above methods are generally combined.

However, they can lead to different results, since they are based on heterogeneous logics. In case of a gap of results between the two, the IRR method is weighed more than the Cash Multiple.

Venture capital return

Internal rate of return (IRR)

$$\sum_{t=1}^{n} \frac{\mathrm{CF}_t}{(1+\mathrm{IRR})^t} = \mathrm{I}_0$$

$$\mathrm{I}_0 = \text{Initial Investment}$$

Value creation

$$\mathrm{IRR} - \text{opportunity cost of capital (i)}$$

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Venture capital return

Cash Multiple (CM)

$$CM = \frac{NCF}{I}$$

NCF = Net Economic Cash flow
I = Investment

The CM is a simple method, and, for this reason, is very common among professionals. However, it has some strong limits: it doesn't take in account the financial expression of time.

IRR and CM

In case of a single initial investment

$$\begin{cases} CM = (1+IRR)^{n} \\ IRR = CM^{1/n} - 1 \end{cases}$$

	t_0		t_3
NCF			220
Initial Investment	100		
CM=NCF/I	2.2		
IRR= $CM^{1/3}$-1	0.300591		
CM = $(1+ IRR)^3$	2.2		

$$\frac{CF_{t3}}{(1+IRR)^{t}} = \frac{220}{2.20} = 100 = I_0$$

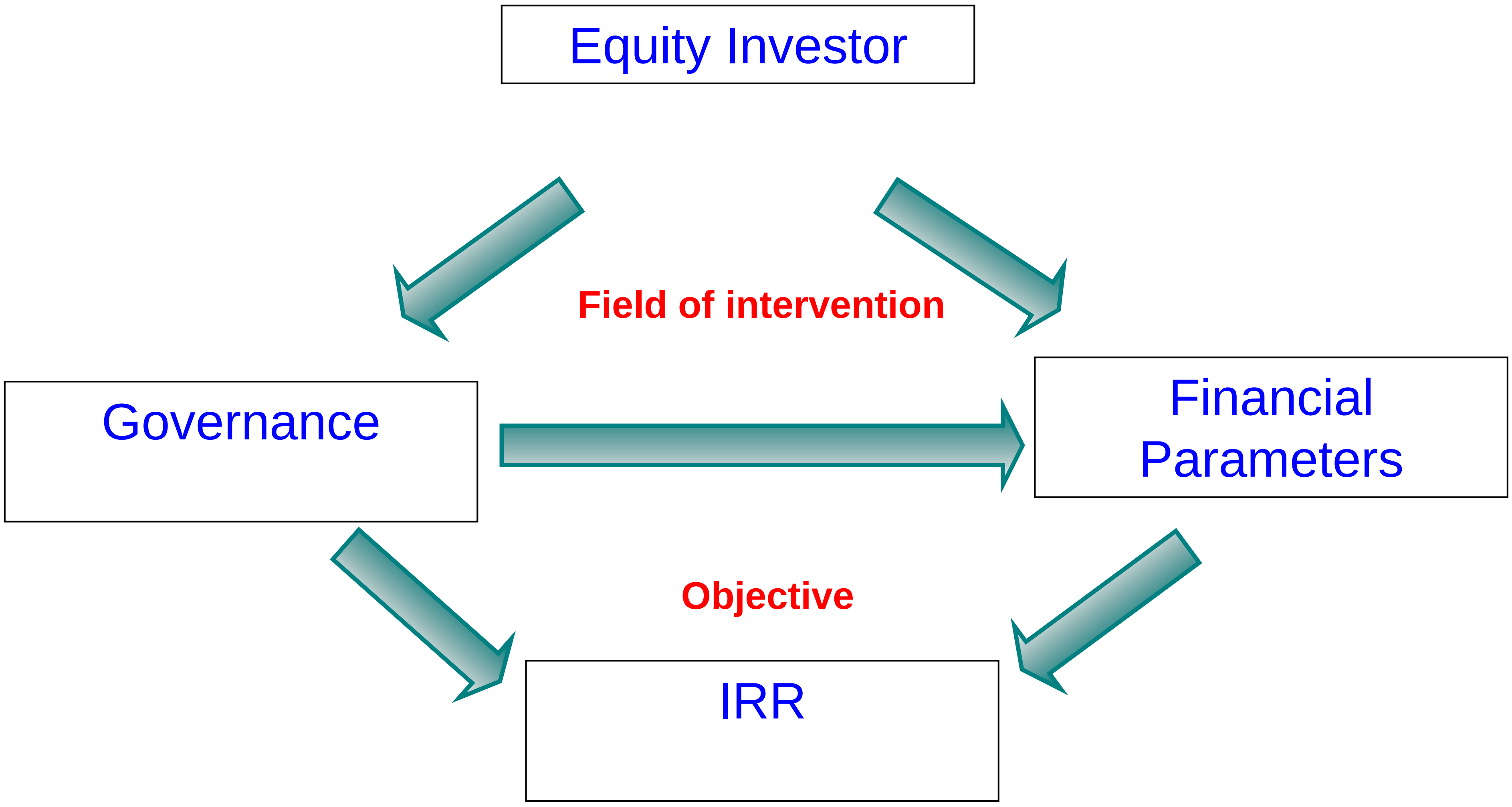
Venture capital return

IRR over time

CM \ Year	1	2	3	4	5	…	20
	IRR_1	IRR_2	IRR_3	IRR_4	IRR_5	…	IRR_{20}
10	9	2.162	1.154	0.778	0.585	…	0.122
9	8	2.000	1.080	0.732	0.552	…	0.116
8	7	1.828	1.000	0.682	0.516	…	0.110
7	6	1.646	0.913	0.627	0.476	…	0.102
6	5	1.449	0.817	0.565	0.431	…	0.094
…	…	…	…	…	…	…	…
1	0.000	0.000	0.000	0.000	0.000	…	0.000

Venture capital return

Internal rate of return (IRR)

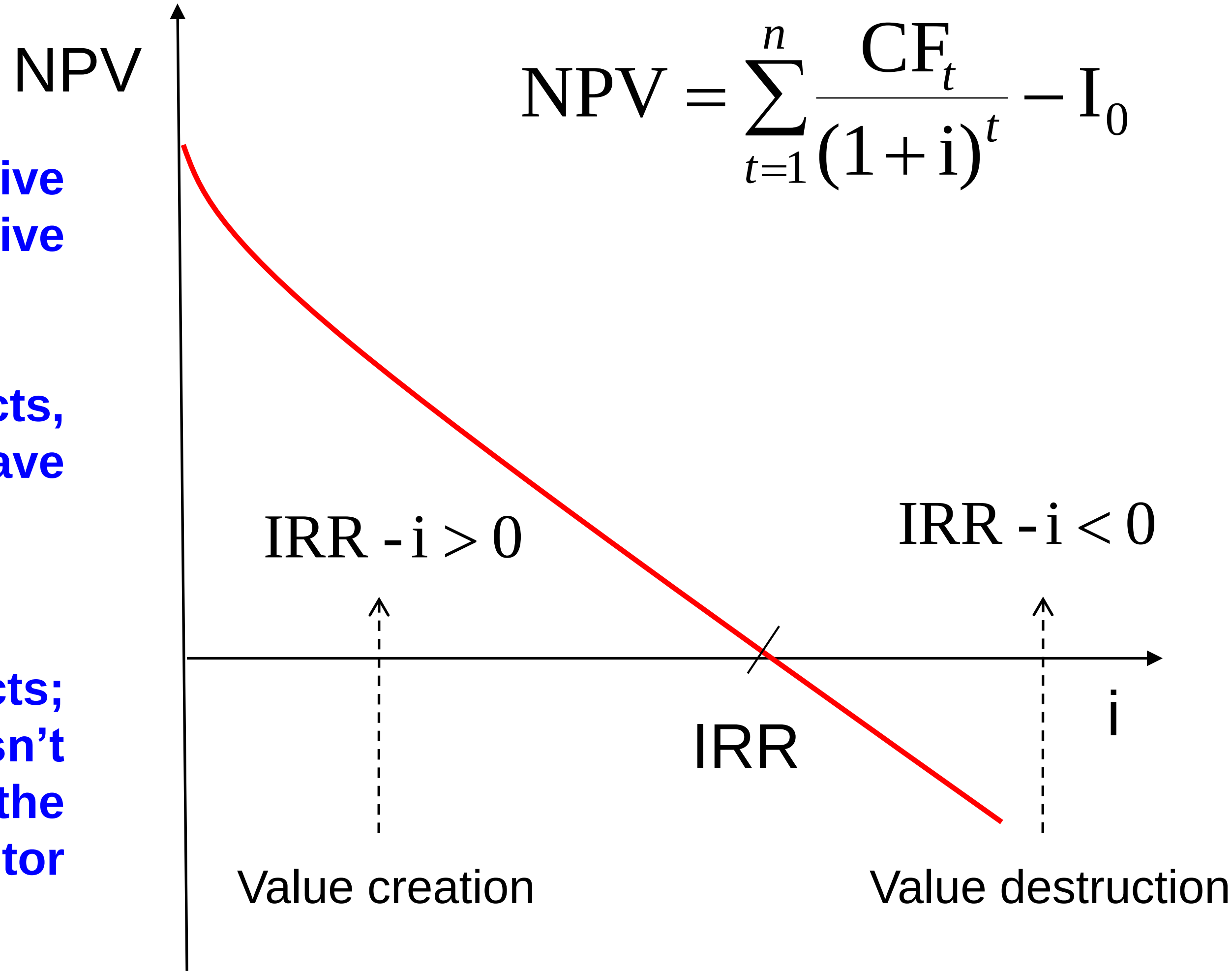


Internal rate of return (IRR) and Net Present Value (NPV): the problem of incongruity

If there are no alternative projects; the NPV and IRR give consistent output.

In case of alternative projects, the NPV and IRR could have different results.

In case of alternative projects; the maximization of IRR doesn't necessary imply the meximization of the investor value.



$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+i)^t} - I_0$$

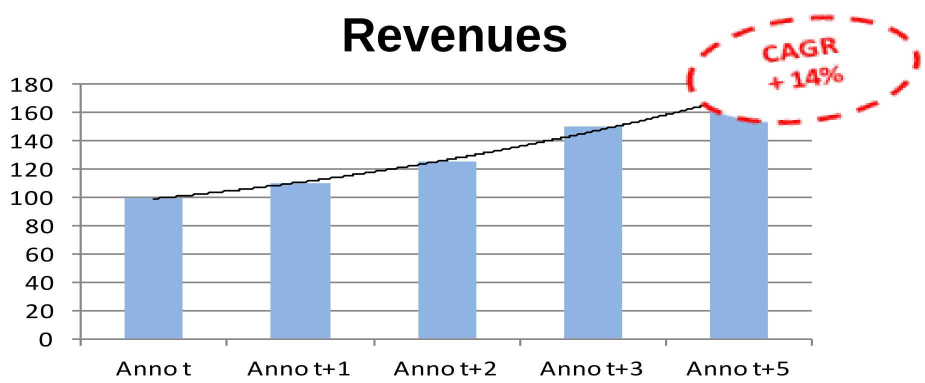
Internal rate of return (IRR) and Net Present Value (NPV): the problem of incongruity

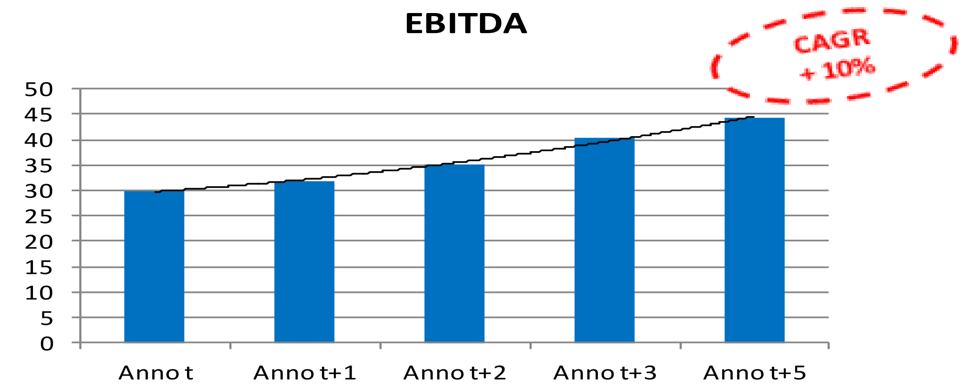
Project A					
Periods	0	1	2	3	4
NCF	-150	10	10	10	220
Discount rate= 0.09					
Actualization		9.17	8.42	7.72	155.85
NPV	31.166				
TIR	0.1471				

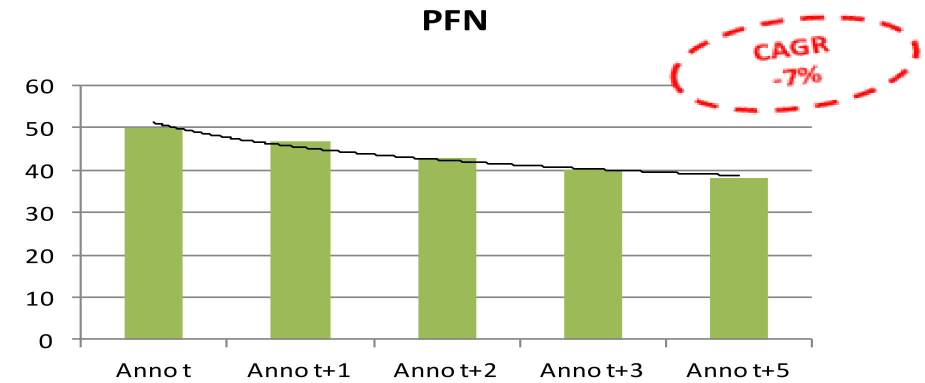
Periods	0	1	2	3	4
NCF	-119	19	50	65	50
Discount rate= 0.09					
Actualization		17.43	42.08	50.19	35.42
NPV	26.128				
TIR	0.1738				

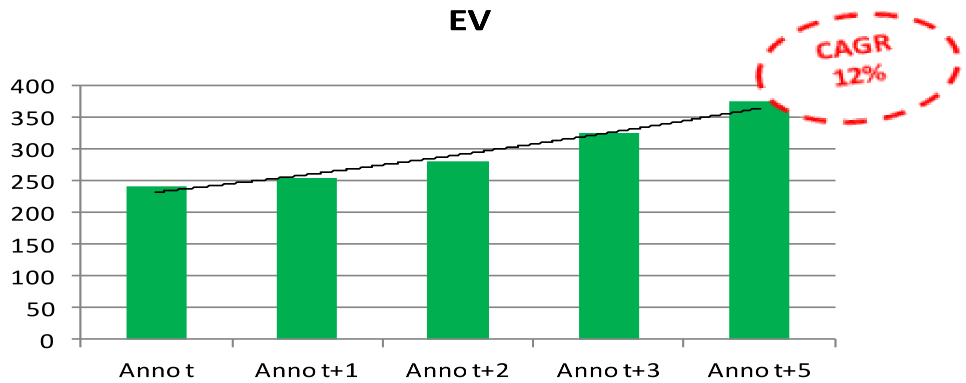
Venture capital return

Balanced growth of value









CAGR = Compound Annual Growth Rate

As instance: $$\mathrm{CAGR(Rev)}_{2009/12} = \left(\frac{\mathrm{Rev}_{2012}}{\mathrm{Rev}_{2009}}\right)^{1/3} - 1$$

Entrepreneurship and ventures finance

Venture evaluation (1): Basic models

Prof. Antonio Renzi

FACOLTÀ DI ECONOMIA

SAPIENZA UNIVERSITÀ DI ROMA

Agenda

Value and prices

New business and intangibles

The DCF approach

The APV (Adjusted Present Value) method

Market multiples and comparable transactions

Venture capital method

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Economic value and potential value

Economic value

The present value of economic and financial flows, linked to a firm's capability that is either already in being or achievable with a high degree of likelihood.

Potential value

It refers to the present value of those expected flows linked to latent firm's capabilities.

The growth target could be very different from the original firm size, as well as there are many different strategic paths that can be pursued, even strategies characterized by an intense degree of novelty.

The forecast is based on historical data

The forecast is not based on historical data

Intrinsic value and prices

Intrinsic value:
This kind of estimate is based on the evaluation of flows and risks linked to future expected performances and their probability.

Price: Exogenous variable, defined by the market.

In other words, the price is an objective factor, emerging from market transactions. On the converse, the value emerges from a subjective estimation that reflects an opinion about the manifestation probability of an event, under certain hypotheses.

Two different perspectives

• The entrepreneur makes his evaluation basing on firm's fundamentals, and he has the ability to catch what are the potentialities in the medium and the long run. This greater awareness is ascribable to his insider role, since he has a wealth of information both on how the sector works and on the key factors of the business model.

• The financial investor has a more narrowed perspective. His time horizon is the medium run, and his financial resources cannot be immobilized over a certain period. The economic return is expected in a specific time period.

The two perspectives

These two perspectives are somewhat in contrast, since:

- The entrepreneur adopts an intrinsic value logic;

- The investor's interest is the selling price at the end of the period. His time range is the shortest possible. Therefore, there's also a possibility that the market could not be able to appreciate the real firm value and its potentiality in such a short time. In this last scenario, the result is the market underestimates the firm value.

New businesses and intangibles

Usually, intangibles are a large share of a new business activities. Most of such assets cannot be recorded in the balance sheet.

The presence of intangibles can determine a gap between the book value and the market value.

Traditional economic and financial methods of evaluation are not fully able to measure intangibles value.

The Tobin's q

• The Tobin's q is used to measure the degree of intangibles of a firm. This measure is given by the ratio between the market value and the cost for assets replacement.

• The ratio it is also used as a proxy to measure intangibles performance. When the value of the ratio goes down, then, this could be a signal that also the intangibles value is decreasing.

• However, it must be taken into account that, after a market bubble bursts, investors tend to be more risk adverse and the value of overall market shares results diminished.

The Tobin's q and the price to book value (PBV)

Once adjusted for the distortion caused by the market sentiment; the Tobin's q can be used to compare firms operating in similar competitive settings.
If the value is both greater than one and greater than the one of competitors, than, this could be interpreted as a greater performance capability of the firm than the one of competitors.

Similarly to Tobin's q, the price to book value (PBV) is given by the ratio between the firm's market value and net assets.

New business and intangibles

Factors that influence the market value

				F.M.
			G	G
		B.I.	B.I.	B.I.
	PL	PL	PL	PL
B.V.	B.V.	B.V.	B.V.	B.V.

Source: GUATRI L., BINI M., 2003

B.V. = Book Value, the firm’s value as emerging from the balance sheet
PL = the difference between economic value of certain assets and their value in the balance sheet
B.I. = value of some specific intangibles that are not recorded in the balance sheet
G = Goodwill: a positive value that expresses the value added by a set of intangibles
F.M. = market factors

Factors that influence the market value

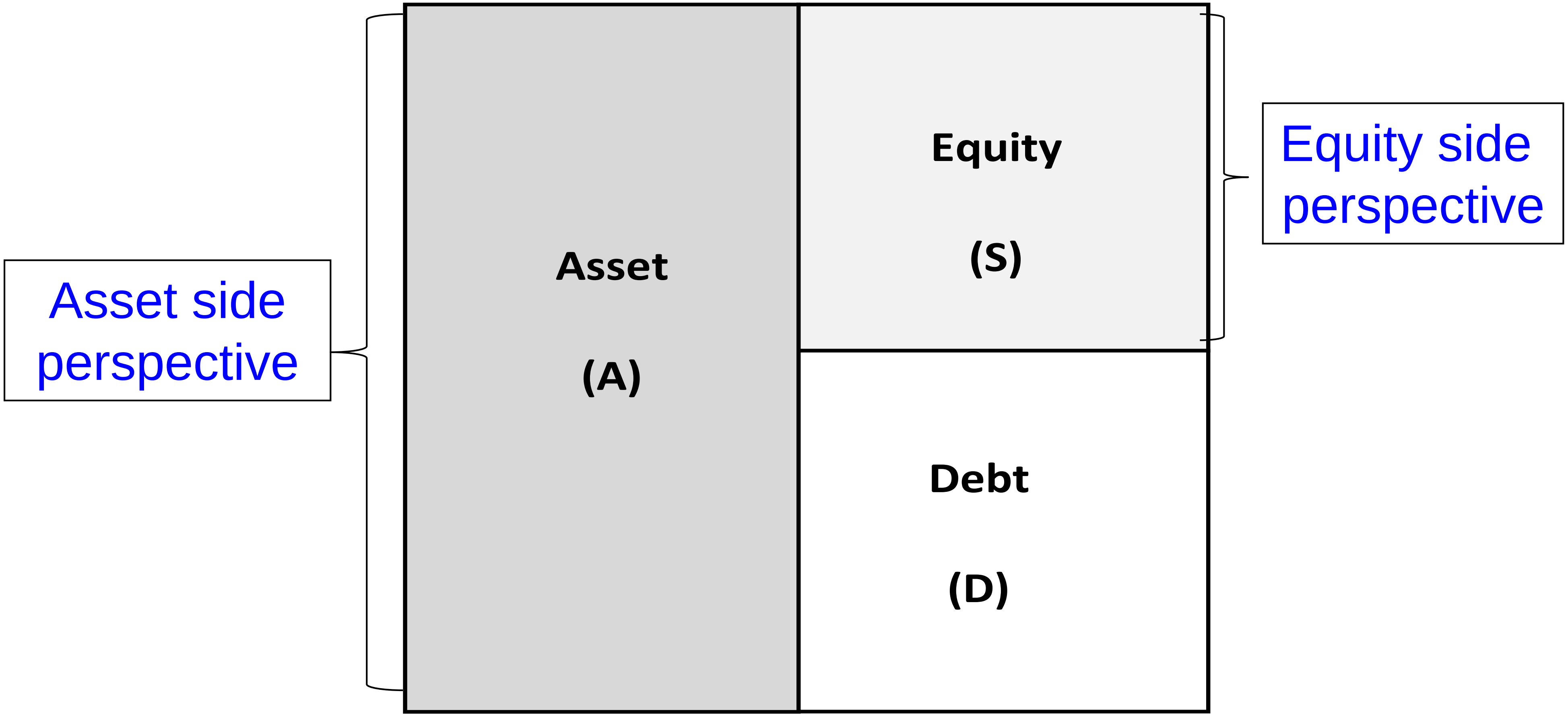
The market value can be lower than the book value when:

- The economic value of assets is lower than their accounting value;
- The Goodwill has a negative value, that is named “Badwill”;
- The market factors are adverse;

Market factors

- Changes about the trust in market investments.
- “Noise factor” and irrational behaviors.
- Financial analysts’ inattention to fundamental analysis.

The asset side and equity side perspectives



The DCF approach

Revenues	Revenues
- Cost of sold goods	- Cost of sold goods
- Other operating costs	- Other operating costs
-Amortizations	-Amortizations
= EBIT	**= EBIT**
- Taxes on Operating Income	- Interests
= NOPAT	- Taxes
+ Amortizations	**= Net Profit**
- Appreciation in accounts receivable	+ Amortizations
- Appreciation in Inventories	- Appreciation in accounts receivable
+ Appreciation in commercial liabilities	- Appreciation in Inventories
- Net Investment flow	+ Appreciation in commercial liabilities
= Free Cash flow to Firm (FCFF)	- Net Investment flow
	= Free Cash Flow to Equity (FCFE)

Asset side perspective

Equity side Perspective

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Cost of capital

Wacc

$$\mathrm{Wacc} = ke_j \left[\frac{S_j}{D_j + S_j}\right] + k_{ij}\left[\frac{D_j}{D_j + S_j}\right](1-\tau)$$

ke_j= *equity cost* of j;
k_{ij} = *debt cost* of j;
S_j = *equity* of j;
D_j = financial debt

Asset side perspective

Equity cost

$$ke_j = Rf + (\tilde{R}_m - Rf)\cdot\beta_j$$

βj = coefficient of systematic risk
Rf = risk free rate
Rm= return of market portfolio

Equity side perspective

The DCF approach

Enterprise value

$$EV = \sum_{t=1}^{t=n} \frac{FCFF_t}{(1+Wacc)^t} + \frac{TV_n}{(1+Wacc)^n}$$

EV= Enterprise Value
FCFF= FCF to firm
TV= terminal value

Asset side

Equity value

$$EqV = \sum_{t=1}^{t=n} \frac{FCFE_t}{(1+ke_j)^t} + \frac{TV_n}{(1+ke_j)^n}$$

FCFE = = FCF to equity

Equity side

The terminal value in case of growth absence

$$TV_n = \frac{\left[\frac{FCFF}{Wacc}\right]}{(1+Wacc)^n}$$

Asset side

$$TV_n = \frac{\left[\frac{FCFE}{ke_j}\right]}{(1+ke_j)^n}$$

Equity side

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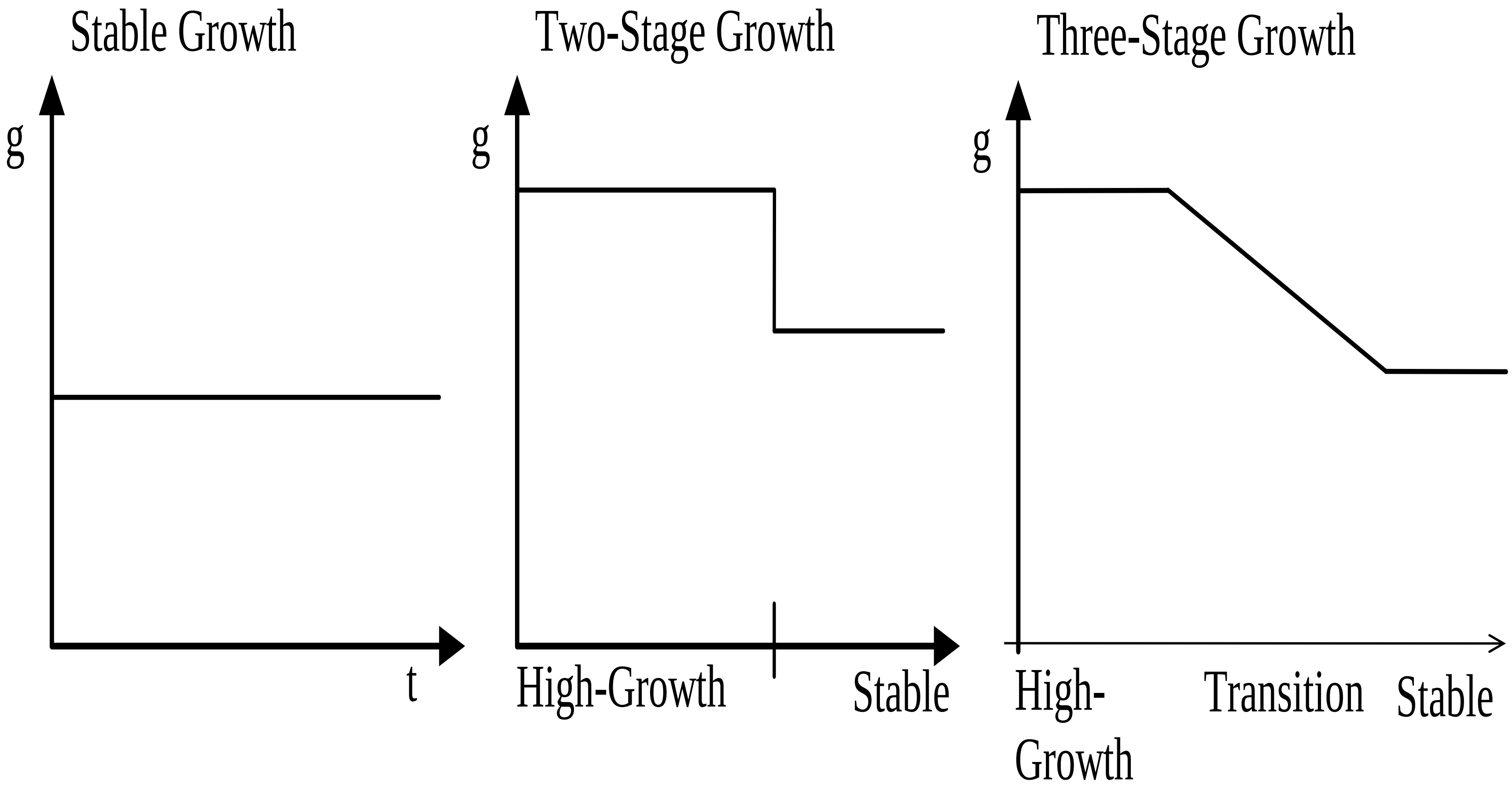
DCF and different growth (g) hypotheses

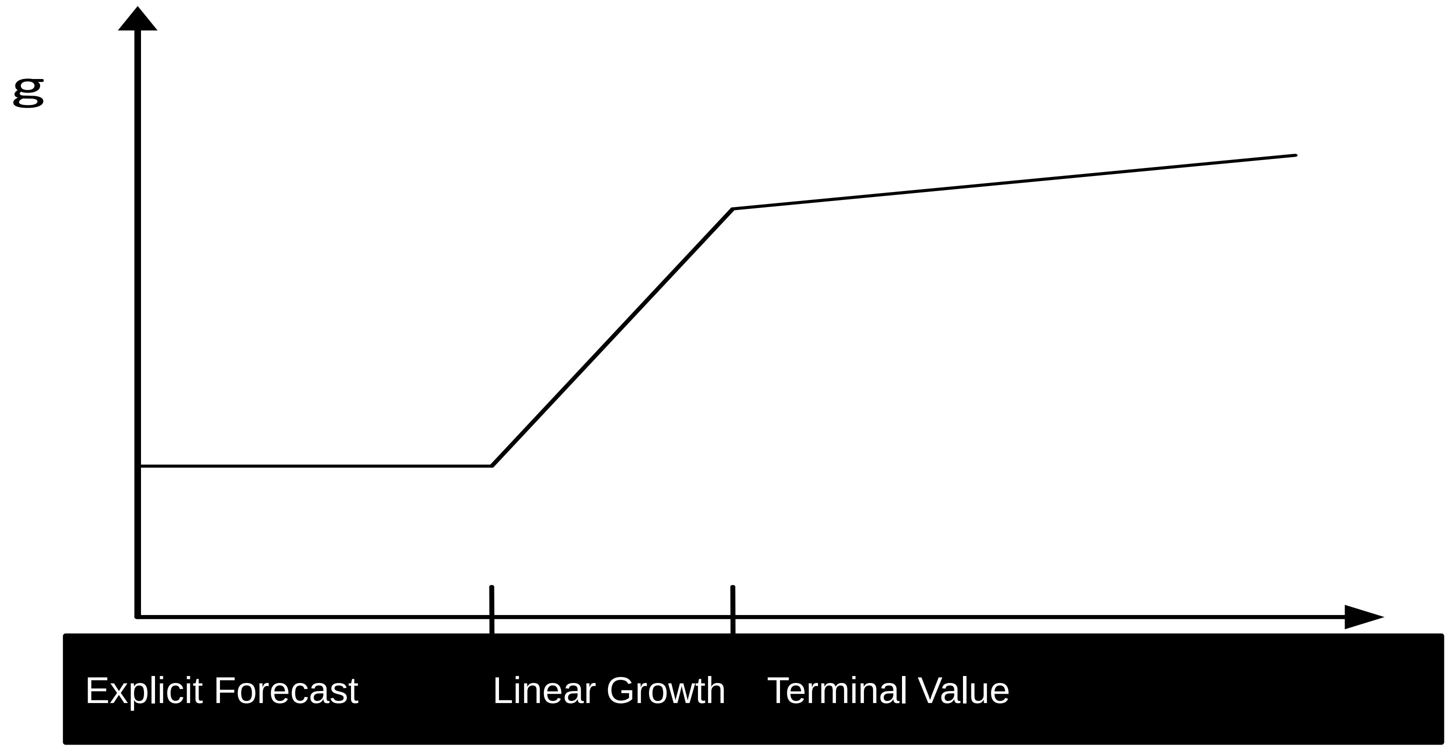
- Stable growth model
- Two-stage growth model
- Three-stage growth model

DCF and classic growth (g) hypotheses



The DCF approach

DCF and growth in case of start up firms



DCF and growth in case of start up firms

a) **Explicit forecast phase:** this phase has the most reliable cash flow forecast, where the sum of flows is measured to control their trend.

b) **Linear growth phase:** there's the assumption of a high development rate. Therefore, the growth rate is considered as ≥ sector average.

c) **Steady growth rate :** both flows and growth rate are normalized. The growth rate is g_n considered as "normal", or $g_n < g$; while cash flow are assumed equal to those ones esteemed at the end of the phase b *(esteemed growth)*.

DCF and growth in case of start up firms

Asset side perspective

$$EV = \underbrace{\sum_{t=1}^{x} FCFF(1+Wacc_j)^{-t}}_{a} + \underbrace{\sum_{t'=x+1}^{n} FCFF_t \left(\frac{1+g}{1+Wacc_j}\right)^{t'}}_{b} + \underbrace{\frac{FCFF_n(1+g_n)}{(Wacc_j - g_n)(1+ke_j)^n}}_{c}$$

Equity side perspective

$$EqV = \underbrace{\sum_{t=1}^{x} FCFE(1+ke_j)^{-t}}_{a} + \underbrace{\sum_{t'=x+1}^{n} FCFE_t \left(\frac{1+g}{1+ke_j}\right)^{t'}}_{b} + \underbrace{\frac{FCFE_n(1+g_n)}{(ke_j - g_n)(1+ke_j)^n}}_{c}$$

This logic is applicable to the early stages of the life cycle of start-up: from the seed stage to the venture capital business, therefore, earlier stages in the IPO.

The APV method (Adjusted Present Value)

The APV method is a specific case of the DCF, and it is adopted when it's needed to measure the unlevered value of a venture. The unlevered value refers to the value of an initiative when it is entirely financed with equity; while the levered value refers to the value of a venture that is financed both with equity and debt.

According to APV, financing with debt has both advantages and disadvantages. As an advantage, there's the tax shelter. However, more debt causes more costs; and, therefore, an increased default risk.

The APV method (Adjusted Present Value)

Unlevered value

+

Tax advantage of financial debts

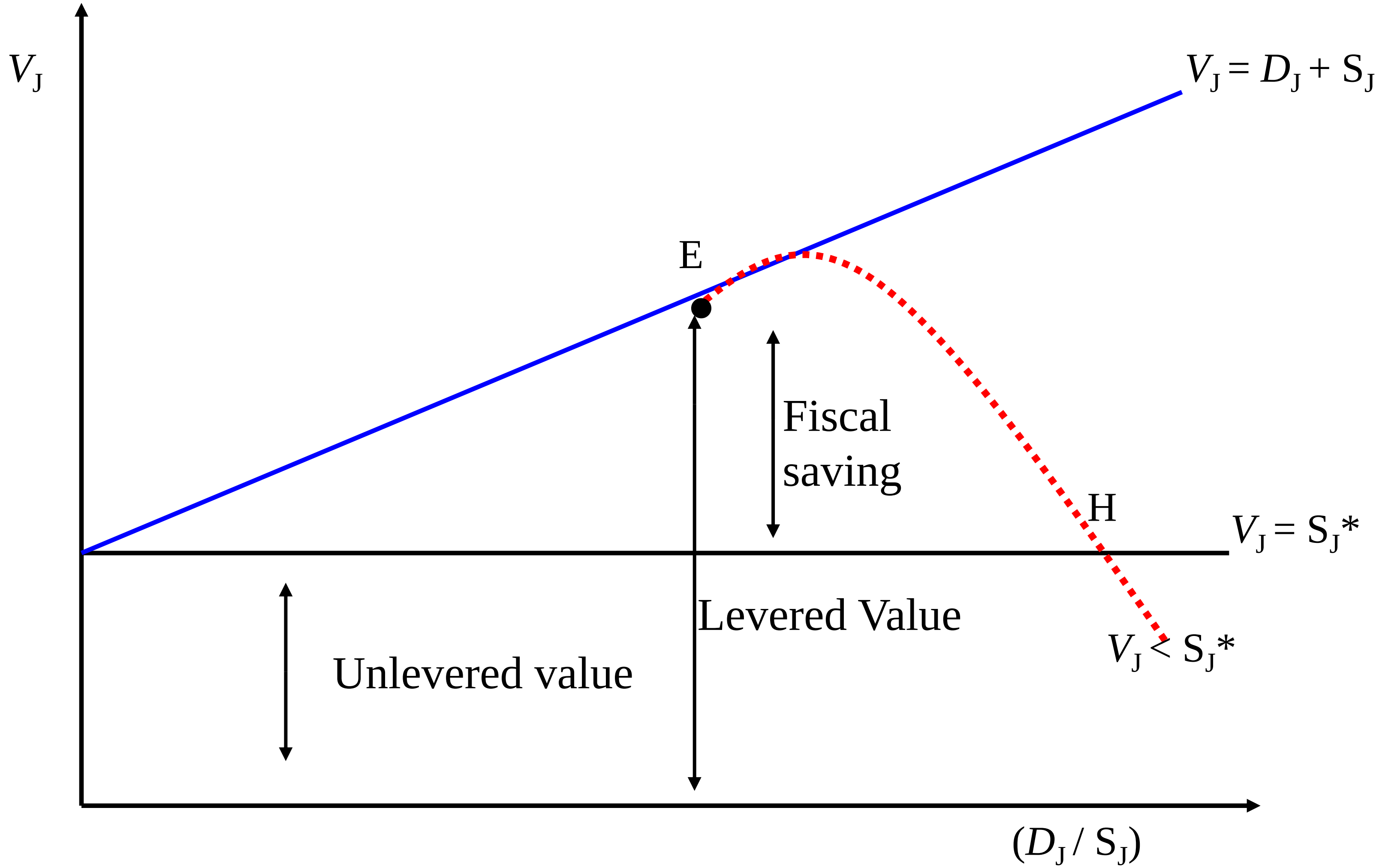
–

Default risk due to financial debts

=

Leverage value

Trade-off theory and cost of default



The APV method (Adjusted Present Value)

Unlevered equity value (W_u)

$$W_u = \frac{FCFF_o(1+g)}{(ke_u - g)}$$

FCFFo= net operating cash flow (operating cash - taxes);
ke_u= unlevered equity cost (cost of equity in absence of debt);
g= expected growth rate.

Present value of the fiscal advantage (PVFA)

$$PVFA = \frac{\tau k_i D_j}{k_i} = \tau D_j$$

τ = fiscal rate;
k_i = cost of debt;
D_j= debt.

Discounted value of the cost of default (VCF)

$$VCF = \pi BC$$

π = default probability
BC = discounted default cost

Levered value (W_L)

$$W_L = \frac{FCFF_0(1+g)}{(ke_u - g)} + \tau D_j - \pi_a BC$$

The APV method for new ventures

• Normally, in the early years there are no tax benefits

•The financial leverage is lower than the average of existing firms

• The overall risk depends primarily on the operational risk

• For each level of debt, the costs of failure is higher than the average of existing firms

Market multiples and comparable transactions

The so-called market methods are based on the following hypotheses:

$\boxed{\text{Economic value}} = \boxed{\text{Market value}} = \boxed{\text{Price X number of shares}}$

In case of a private company, it is needed to select some public firms that can be considered as comparables.

Market multiples approach

The estimate of a private firm's value can be done using the value of public companies, operating in the same sector and with similar characteristics.

First, there's the selection of one or more benchmark public companies. Hence, the ratio among the price of the public company and a reference parameter is our multiple.

Multiple= Market Value of the comparable/ reference parameter

Target firm value= multiple x reference parameter of the firm

Market multiples approach: Price earning (PE)

$$PE = \frac{P}{E}$$

$$PV_j = PE_S(E_j)$$

PE_s = Price earning of cluster s
PV_j = Present value of j
E_j = Current earning of j

Comparable transaction approach

This methodology is similar to market multiples ones.

However, in this case there's the use of a different firms' panel as benchmark. In particular, the benchmark value is the one of similar firms that went under a takeover (as instance, the price of the deal).

Venture Capital method (VCM)

The VCM is the forecast of a future value (as instance, by five years from now). This future value is discounted at a high rate (e.g. 50%).

The VCM allows to determine the pre-money value (before the firm is financed from a third party) in case of both poor historical data for making a forecast and high risk-return expections.

This method can be considered as a variation of the DCF: the forecast concerns the start up firm value (expected cash flow) at the external financer’s exit moment (when the backer will sell his share).

Venture Capital method (VCM)

Phases of the VCM

• Determination of the cash flow at the time of the venture capitalist’s exit.

•Future value estimation using comparables: in general, it is adopted the market multiples method to measure the firm value in the later period. This last value is considered as the terminal value: it is measured considering expected revenues after a certain date and using a multiple (as instance Price/Earnings from exit onward).

•The *terminal value* is discounted at a high rate, which reflects the high risk of the initiative. The discount rate is estimated according to the capital gain expected by the venture capitalist. Usually, this rate is extremely high.

Venture Capital method (VCM)

Present value, final value and target return

$$FV = Inv.(1+TR)^n \qquad Inv. = \frac{FV}{(1+TR)^n}$$

$$(1+TR)^n = \frac{FV}{Inv.} \qquad TR = \left(\frac{FV}{Inv.}\right)^{1/n} -1$$

Inv. = Initial investment
FV = Final value
TR = Target return
n = Years between the venture capitalist's investment and his exit.

INV		80
yars (n)		5
TR		50%
$(1+TR)^n$	Multiple of initial investment	7,59
$FV = INV(1+TR)^n$		607,50
$FV/INV = (1+TR)^n$		7,59
$TR=(FV/INV)^{1/n}-1$		50%

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Target return and business life

Phase	Target Return
Start up	50-70%
First stage	40-60%
Second stage	35-50%
Bridge / IPO	25-35%

Source: Damodaran, 2009.

VCM and price earning

$$FV = FE_j \cdot PEs$$

$$TR = \left(\frac{FV}{Inv.}\right)^{1/n} - 1 = \left(\frac{FE_j \cdot PE_s}{Inv.}\right)^{1/n} - 1$$

Period	0	1	2	3	4	5
Earning	-20	0	0	0	0	20
Initial investment	100					
P/E (cluster s)	20	20	20	20	20	20
Final Value						400
Target Return	31,95%					

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Feasibility analysis

Assumptions	
PE of cluster	15
Maximum Waiting Time	6 years
Minum Return	40%

Project	A	B	C	D	E	F
Final earnings	20	30	40	50	60	300
Initial Investment	100	140	150	120	100	250
Years to exit	3	4	3	6	9	8
FV = PE(Final earnings)	300	450	600	750	900	4500
FV/INV= PE(Final earnings)/ INV	3	3,214286	4	6,25	9	18
TR = (PE(Final earnings)/ INV)$^{1/n}$ -1	44,22%	33,90%	58,74%	35,72%	27,65%	43,52%
Subjective feasibility (perspective of a single venture capitalist)	Feasible	No Feasible	Feasible	No Feasible	No Feasible	No Feasible

Portfolio return

Project	A	C	
TR = (PE(Final earnings)/ INV)$^{1/n}$ -1	44,22%	58,74%	Σ
Initial Investment	100	150	250
X	40%	60%	1
XTR	17,69%	35,24%	52,93%

Entrepreneurship and new ventures finance

Venture evaluation (2) : the equity cost

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Agenda

The need to contextualize the equity cost analysis

The equity cost analysis as a piece of actualization process

The equity cost analysis in the neoclassical perspective

The Capital Asset Pricing Model (CAPM)

The comparables approach

The bottom up approach: general framework

Specific risk according to bottom up approach

The reworking of CAPM according to bottom up approach

The reworking of CAPM according to the Total Beta Model

The reworking of CAPM according to four correction factors

The need to contextualize the equity cost analysis

Key word: Contextualization

- Contextualization of the valuation object

- Contextualization the subjective perspective of the investor

In venture finance processes the valuation objects are new ventures

The actors involved in a venture finance process tend to have a long term perspective.

The equity cost analysis as a piece of actualization process

DCF and equity cost (kej)

Asset side valuation

$$\text{Expected results} = \text{Free cash flows to firm}$$

$$\text{Discount rate} = ke_j \left[\frac{S_j}{D_j + S_j} \right] + k_{ij} \left[\frac{D_j}{D_j + S_j} \right] (1 - \tau)$$

Equity side valuation

$$\text{Expected results} = \text{Free cash flows to equity}$$

$$\text{Discount rate} = ke_j$$

APV and equity cost

Unlevered equity value

Expected results = Unlvered free cash flows

Discount rate = Unlevered equity cost ($ke_{j(u)}$)

(+) Fiscal benefits

Financial leverage

(-) Failure risk

Levered equity value

Market equilibrium hypothesis

The market equilibrium hypothesis is linked to the following assumptions:

- Informational efficiency

- Economic rationality of investors

The equity cost analysis in neoclassical perspective

Informational efficiency

- Everyone has the availability of the best information about each stock;
- Therefore, among the different types of investors, there aren't differences about the possibility to optimize investments decisions.

Economic rationality

- Each investor aspires to maximize his (or her) economic utility
- The economic utility is maximized when for a given level of risk the expected return is maximum, or for a given level of expected return the risk is minimum.
- Each investor has the knowledge to make a risk-return analysis
- The personal emotions of investors don't act on their investment decisions

Equilibrium hypothesis and market prices

Informational efficiency
Economic rationality

→

Homogeneity
of expectations

Equilibrium: Demand of Stock = Supply of stocks

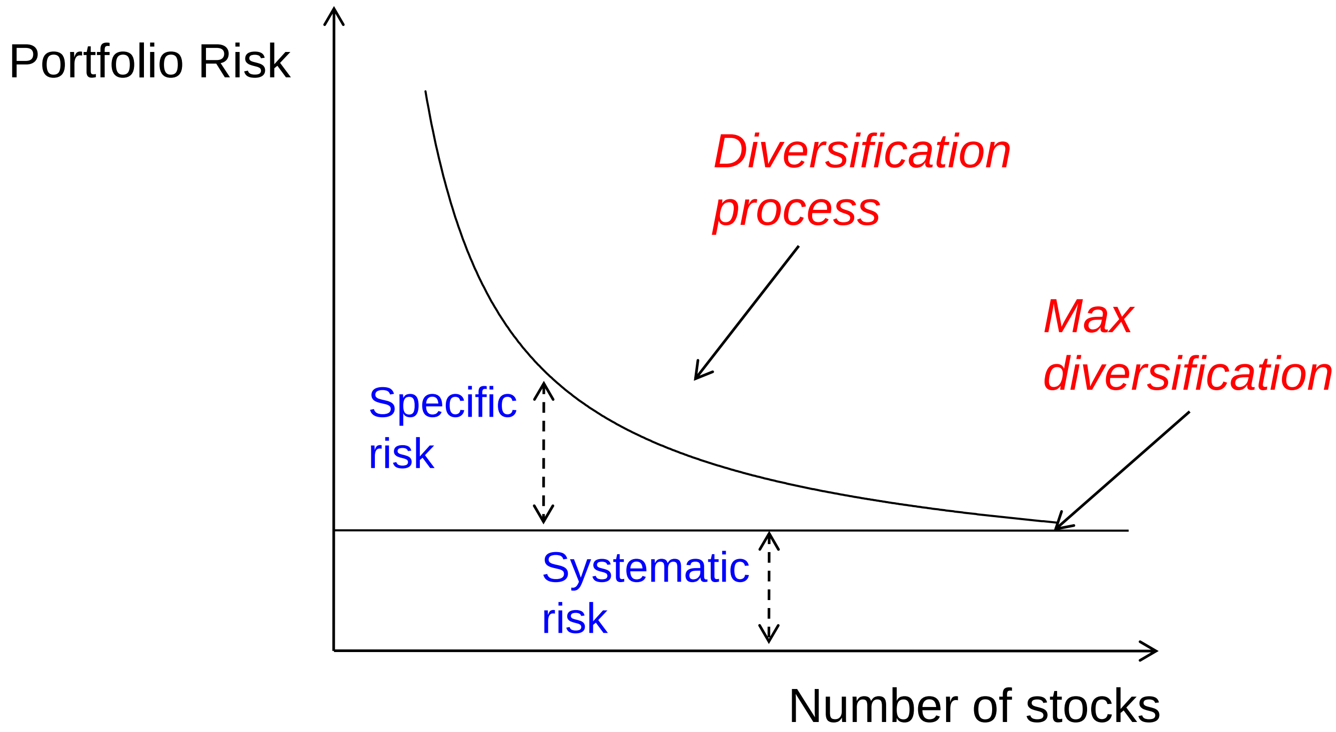
Market prices = Fair values (or intrinsic values)

No stock is overestimated or underestimated

The three fundamental theoretical steps

Authors	Focus
Markowitz's Theory	Financial portfolios' optimization
Tobin's Theorem	Expected return in equilibrium conditions
Capital Asset Pricing Model (CAPM) of Sharp and others	Expected return in function of systematic risk

Specific risk and systematic risk



Assumptions

- Market equilibrium;
- Diversification as tool for optimizing financial portfolios
- The investor operates just as a take-over and take-risk: He can't affect the market prices.

Variables of CAPM:

- Risk free rate (Rf);
- Market return(R_m);
- Beta (β_j).

$$ke_j = f(Rf, R_m, \beta_j)$$

The Capital Asset Pricing Model (CAPM)

CAPM Formula

$$ke_j = Rf + (\tilde{R}_m - Rf) \cdot \beta_j \qquad \beta_j = \frac{ke_j - Rf}{\tilde{R}_m - Rf}$$

$$\beta_j = \frac{\sigma_{j,m}}{\sigma_m^2}$$

$\sigma_{j,m}$ = covariance j,m; σ^2_j = variance m

Covariance is a measure of how much two random variables change together.

The covariance j,m measures how j return changes for each change of the average return of market portfolio and vice versa.

Variance m measures the capital market volatility.

$\sigma_{j,m}$ = systematic risk of j

σ^2_j = 100% of systematic risk

β_j = systematic risk coefficient

The Capital Asset Pricing Model (CAPM)

Covariance Formulas

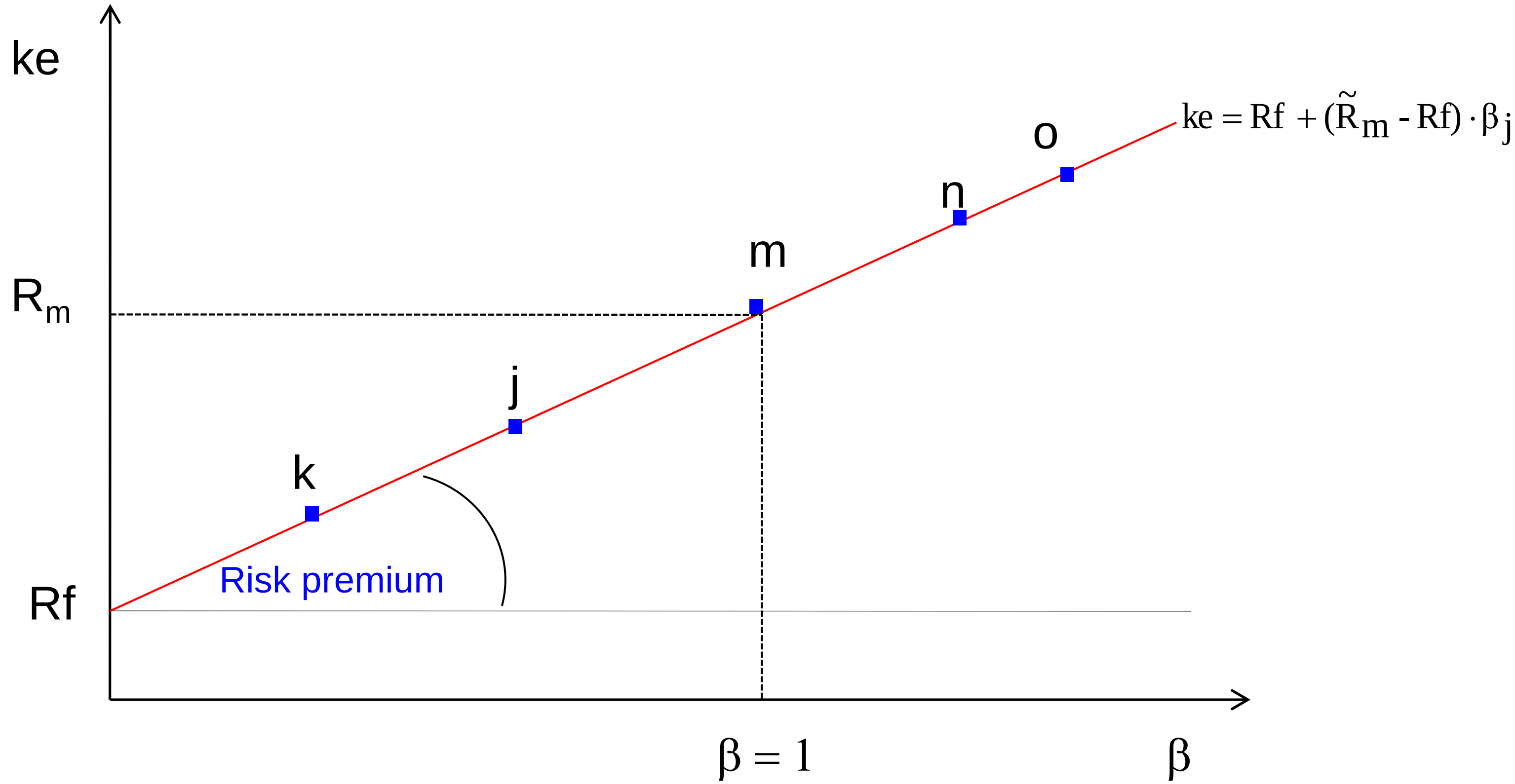
$$\beta_j = \frac{\sigma_{j,m}}{\sigma_m^2} = \frac{\sum_{i=1}^{n} p(ke_{ji} - ke_j)(R_{mi} - \tilde{R}_m)}{\sum_{i=1}^{n} p(R_{mi} - \tilde{R}_m)^2}$$

Approach based on subjective probabilities (according to the original theory)

$$\beta_j = \frac{\sigma_{j,m}}{\sigma_m^2} = \frac{\sum_{i=1}^{n} (ke_{ji} - \overline{ke_j})(R_{mi} - \overline{R_m})}{\sum_{i=1}^{n} (R_{mi} - \overline{R_m})^2}$$

Approach based on historical data (according to the practice of analysts)

The security market line



The SML shows the expected return of single stocks as a function of systematic risk. The “m” point indicates the expected return of market portfolio. An individual stock with $\beta = 1$ entails the same risk-return relationship of the market portfolio.

The effect of financial leverage on beta size

$$\beta_{j(L)} = \beta_{j(u)} \cdot \left(1 + \frac{D_j \cdot (1-\tau)}{Sj}\right)$$

$\beta_{j(u)}$ = unlevered beta (business j)
$\beta_{j(L)}$ = levered beta (business j)
D_j = debt value
S_j = equity value
D_j / S_j = financial leverage

Leverage

$$\left(\frac{\beta_{j(L)}}{\beta_{j(u)}} - 1\right) \cdot \frac{1}{1-\tau} = \frac{D_j}{Sj}$$

Leverage effect

$$\beta_{j(L)} - \beta_{j(u)} = \beta_{j(u)} \cdot \frac{D_j \cdot (1-\tau)}{Sj}$$

The Capital Asset Pricing Model (CAPM)

The CAPM assumes the possibility to measure systematic risk with a direct correlation between returns of individual stock and returns of market portfolio. The market equilibrium hypothesis causes homogeneous expectations.

From the application point of view, analysts use CAPM with strong compromises, so that the model used in the real world is substantially different from its the original version

Market model

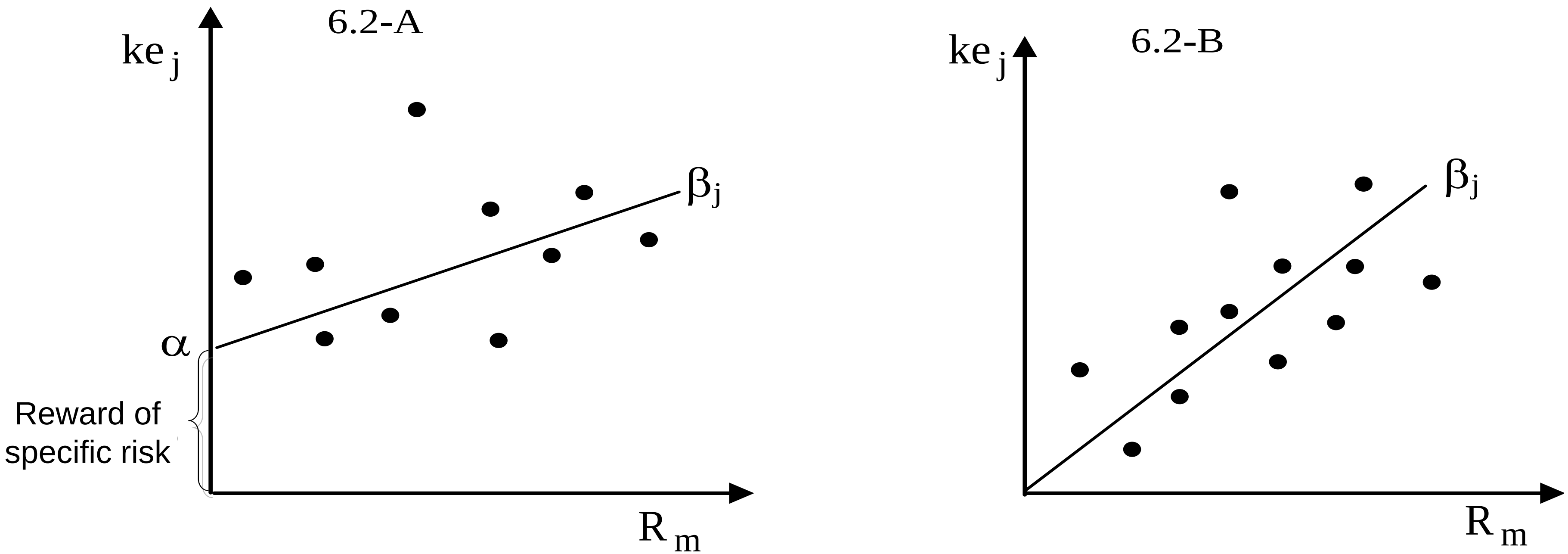
Analysts prefer to build linear regression based on historical data

According to the top-down approach, the historical performances of a stock are estimated, period by period, as a percentage change of its market value. Furthermore, the market portfolio is generally approximated to a sufficiently representative basket of securities (stock index).

Market model

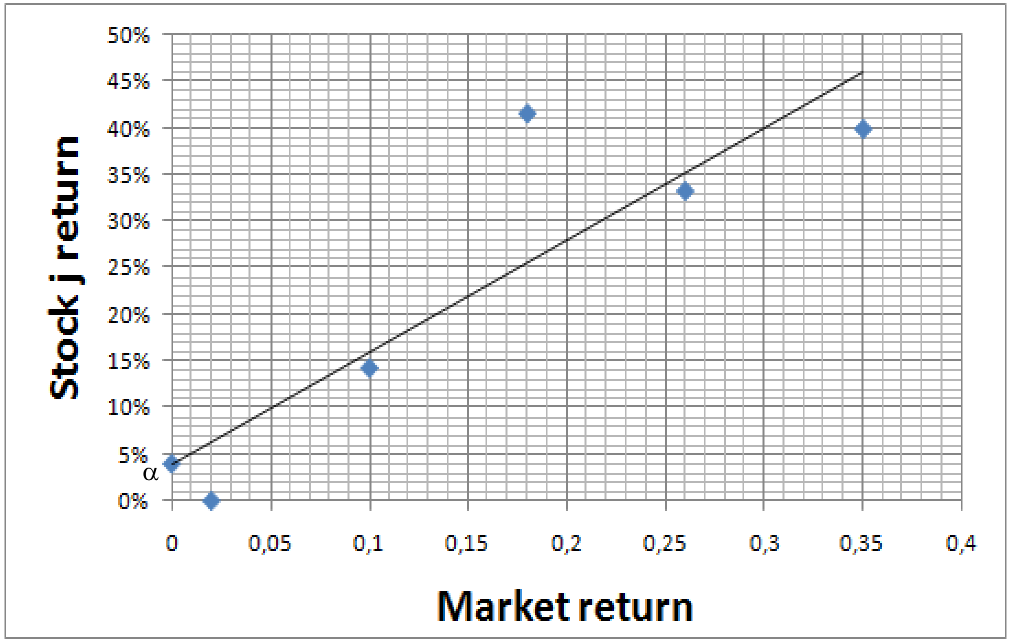
β = Regression coefficient
α = Regression intercept
ε = Standard error.

$$ke_j = \alpha + \beta_j(\overline{R}_m) + \varepsilon$$



Market model

Year	p_j	Dividend per share	Return j	Market index
1	10	0		
2	12	2	40,00%	35%
3	15	2	41,67%	18%
4	15	5	33,33%	26%
5	14	1	0,00%	2%
6	14	2	14,29%	10%
Med			25,86%	18,20%
Var			2,62%	1,35%
St. Dev			16,18%	11,60%
Cov (j,m)	0,0161			
Correlation (j,m)	0,860			
β_j	1,20			
α_j	0,040			



$$\beta_j = \frac{0{,}0161}{0{,}0135} = 1{,}2$$

$R^2 = (\text{Correlation})^2$	0,739

R-squared (R^2) is a measure of how close the data are to the fitted regression line. **$1-R^2$ is a measure of specific risk:**

1-0,739 = 0,261

Applied problems of the CAPM in relation to new businesses

- The market model is not applicable in direct way in the case of private firms: absence of data about past prices

- In the case of new businesses the valuation problem regards especially unlevered beta

- In the case of new business, the hypothesis of maximum diversification is not realistic.

- The CAPM implicitly assumes the absence of liquidity risk of the securities; risk that, instead, is normally present in the case of start-up.

The comparables approach

The easiest way to estimate the beta of a private firm is to use the unlevered beta of the sector which the enterprise belongs.

$$\beta_{j(s)} = \sum_{i=1}^{N} \beta_{i(u)} \Big/ N$$

$$\text{Hypothesis}: \beta_{j(u)} = \beta_{s(u)}$$

$$ke_j = Rf + \beta_{s(u)} \left(1 + \frac{D_j}{S_j}(1-t)\right)\left(\tilde{R}_m - Rf\right)$$

$$\beta_{j(L)} = \beta_{s(u)} \left(1 + \frac{D_j}{S_j}(1-t)\right)$$

$\beta_{j(u)}$ = Unlevered beta of the firm j

$\beta_{j(L)}$ = Levered beta of the firm j

$\beta_{s(u)}$ = Average unlevered beta of the sector s

D_j = Debt of j

S_j = Equity of j

The comparables approach

Example of comparables approach: New business in the filed of Healthcare Support Services

Industry	*Number of firms*	*Unlevered beta*
Advertising	52	0,80
Aerospace/Defense	93	1,00
Air Transport	22	0,59
Apparel	64	0,84
Auto & Truck	22	0,54
Auto Parts	75	1,07
Bank (Money Center)	13	0,31
Banks (Regional)	676	0,33
Beverage (Alcoholic)	22	0,88
...	...	...
Healthcare Support Services	**138**	**0,86**
...	..	...
Oil/Gas (Integrated)	8	0,81
Oil/Gas (Production and Exploration)	392	1,27
Oil/Gas Distribution	85	0,96
Oilfield Svcs/Equip.	161	1,54
...	...	...

$\beta_{j(u)} = \beta_{s(u)}$	**0,86**
D_j	400
S_j	500
D_j / S_j	0,8
Tax rate	0,2
$\beta_j(L)$	**1,404**
Risk free rate	0,020
Market risk premium	0,050
ke_j	**0,090**

Source:Damodaran, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html

The comparables approach

• The equality $\beta_{j(u)} = \beta_{s(u)}$ occurs when, for instance, a large private company is similar (in terms of size and strategies) - to a certain cluster of public companies.

• However, such circumstances occur rather infrequently: in most cases, unlisted companies differ markedly in terms of both structural and strategic than those listed.

•The problem about a low comparability among companies listed and unlisted arises even more clearly in the case of start-ups.

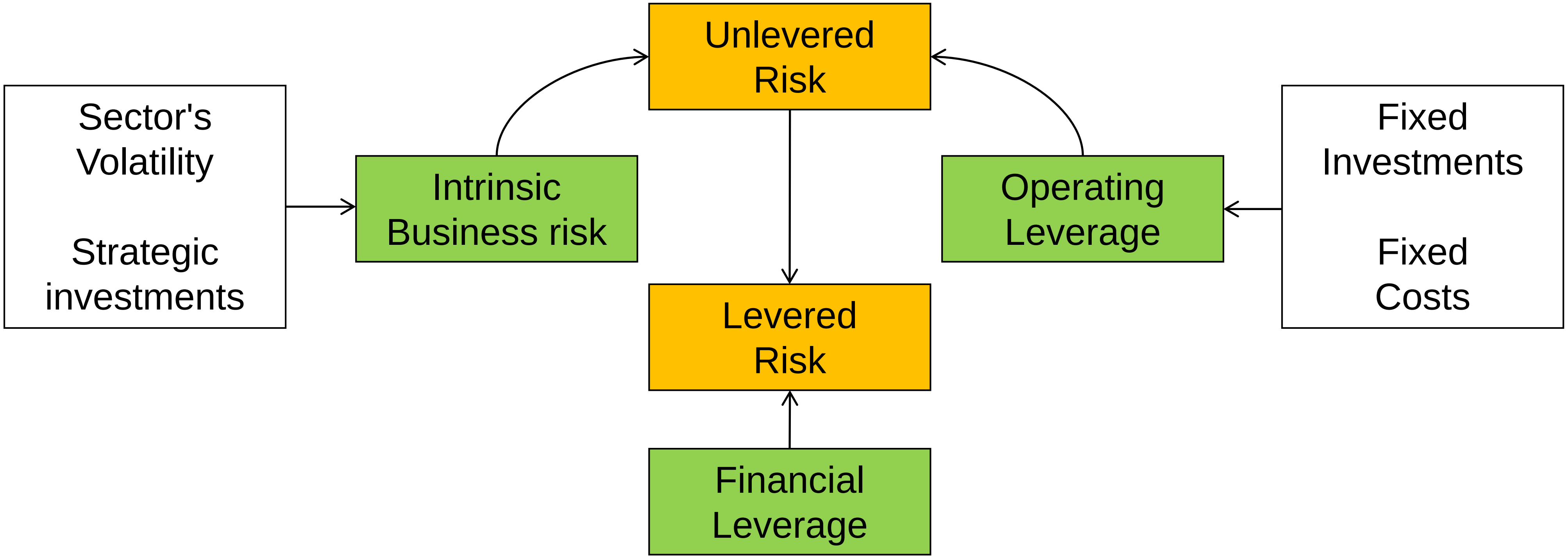
• The comparable beta can be assumed as the starting point; the final result ($\beta_{j(u)}$) should be estimated taking into account the characteristics of the new business.

The bottom up approach: general framework

According to the bottom-up approach, the risk (specific and systematic) comes from the combination between firm characteristics and the volatility degree of a certain core business.

Equity cost = *f* (firm specific factors, intrinsic business risk, capital market volatility)

The bottom up approach: general framework



$$\text{Levered Risk} = \underbrace{\text{Intrinsic Business Risk} \times \text{Operating Leverage}}_{\text{Unlevered Risk}} \times \text{Financial Leverage}$$

Specific risk according to bottom up approach

Intrinsic business risk

Exogenous volatility		Endogenous volatility
Price and demand volatility caused by macroeconomic factors	→ **Volatility in revenues** ←	Price and demand volatility caused by strategic decisions

$$IBR = \sqrt{\sum_{i=1}^{n} p_i \left(REV_i - RE\tilde{V}\right)^2}$$

$$RE\tilde{V} = \sum_{i=1}^{n} p_i \left(REV_i\right)$$

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Motivations bottom up approach

- Analysis of the risk factors.

- Analysis about the effect of management decisions on risk (for instance how a growth strategy affects the systematic risk)

- Evaluation of private firms

- Evaluation of market efficiency

Degree of operating leverage (DOL)

$$DOL = \frac{\Delta Ebit}{Ebit_{(t0)}} \Big/ \frac{\Delta REV}{REV_{(t0)}} = \frac{\Delta Ebit}{Ebit_{(t0)}} \cdot \frac{REV_{(t0)}}{\Delta REV}$$

The value of DOL can be positive, null or negative. The use of DOL in a risk return analysis requires a positive value:

$$DOL' = \sqrt{\left(\frac{\Delta Ebit}{Ebit_{(t0)}} \cdot \frac{REV_{(t0)}}{\Delta REV}\right)^2}$$

DOL measures that part of intrinsic absorbed by a specific business

Specific risk according to bottom up approach

Unlevered risk (σ_u), degree of operating leverage (DOL), intrinsic business risk (IBR) and unlevered risk (σ_u)

$$\sigma_u = \sqrt{\sum_{i=1}^{n} p_i \left(\mathrm{ROI}_i - \mathrm{RO\tilde{I}}\right)^2}$$

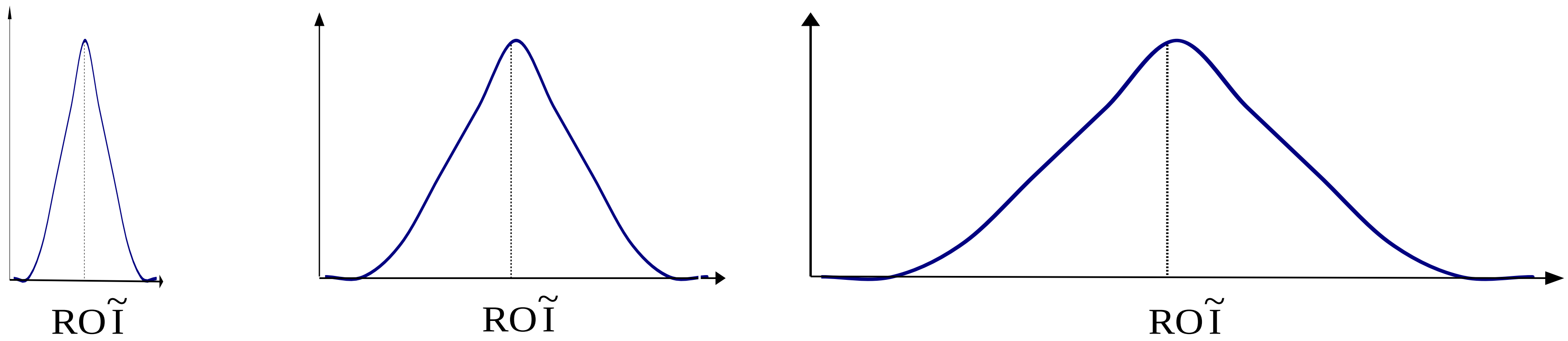
$$\mathrm{ROI} = \frac{\mathrm{EBIT}}{\mathrm{NI}}; \qquad \mathrm{RO\tilde{I}} = \sum_{i=1}^{n} p_i \left(\mathrm{ROI}_i\right)$$

DOL = 1 → σ_u = IBR

DOL > 1 → σ_u > IBR

Unlevered risk with a constant operating leverage

Growing unlevered risk due to greater volatility in the competitive environment



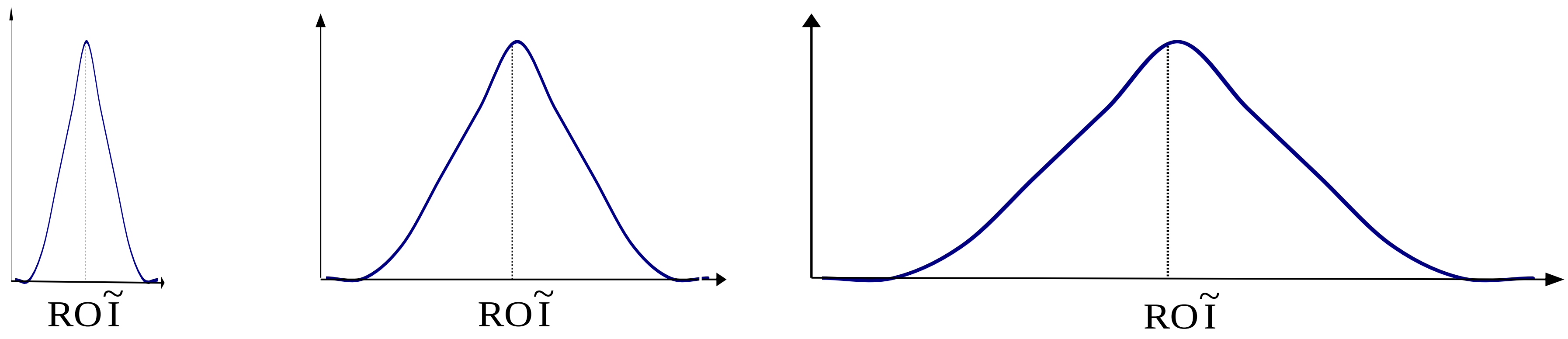
σ_u = 0,1 **σ_u = 0,2** **σ_u = 0,4**

Decreasing unlevered risk due to lower volatility in the competitive environment

Dall'approccio top down all'approccio bottom up (6/7)

Unlevered risk with a constant IBR

Growing unlevered risk due to greater DOL



DOL = 1 **DOL = 2** **DOL = 5**

Decreasing unlevered risk due to lower DLO

DOL and fixed costs

If price per unit (p), cost per unit (c) are and fixed costs (FC) constants, the DOL depends on fixed costs:

$$(\Delta p = 0; \Delta c = 0; \Delta FC = 0) \rightarrow \left[\Delta Ebit = \Delta Q(p - c);\ \ \Delta REV = \Delta Q(p)\right]$$

$$DOL = \frac{\Delta Ebit}{Ebit_{(t0)}} \cdot \frac{REV_{(t0)}}{\Delta REV} = \frac{\Delta Q(p - c)}{Ebit_{(t0)}} \cdot \frac{Q(p)}{\Delta Q(p)} = \frac{REV_{(t0)} - VC_{(t0)}}{REV_{(t0)} - VC_{(t0)} - FC_{(t0)}} = 1 + \frac{FC_{(t0)}}{Ebit_{(t0)}}$$

$$DOL' = \sqrt{\left(1 + \frac{FC_{(t0)}}{Ebit_{(t0)}}\right)^2}$$

The increase endogenous risk depends on the increase in resources (+ FC) and / or loss of efficiency (- Ebit)

Bottom up analysis of unlevered risk: static approach

$$\sigma_u = \frac{IBR}{V_{t0}} \cdot DOL' \sqrt{ROI_{t0}^2} = \frac{IBR}{V_{t0}} \cdot \sqrt{\left(1 + \frac{CFO_{t0}}{EBIT_{t0}}\right)^2 \cdot ROI_{t0}^2}$$

Constant values of price per unit, variable cost per unit, fixed costs and net investments

Specific unlevered risk: static approach (Forecasting analysis)

Analysis phases :

$$\text{Expected ROI }(\text{RO}\tilde{\text{I}}) = \sum_{i=1}^{n} p_i(\text{ROI}_i);$$

$$\text{Expected Revenues }(\text{RE}\tilde{\text{V}}) = \sum_{i=1}^{n} p_i(\text{REV}_i);$$

$$\text{Expected Ebit }(\text{Ebi}\tilde{\text{t}}) = \sum_{i=1}^{n} p_i(\text{Ebi}\tilde{\text{t}});$$

$$\text{Expected DOL }(\text{DL}\tilde{\text{O}}) = 1 + \frac{\text{FC}}{\text{EBI}\tilde{\text{T}}}$$

$$\sigma_u = \frac{\text{IBR}}{\text{RE}\tilde{\text{V}}} \cdot \sqrt{\left(\text{DO}\tilde{\text{L}} \cdot \text{RO}\tilde{\text{I}}\right)^2}$$

Specific risk according to bottom up approach

Scenarios	Probab.	Exspected demand	Price per unit	REV_i	Probab. (REV_i)	Probab. (REV_i - Expected REV)^2
1	0,1	400	4	1600	160	25000
2	0,2	350	4	1400	280	18000
3	0,3	300	4	1200	360	3000
4	0,4	250	4	1000	400	4000
Σ	1				1200	50000

Expected REV	1200
Var REV	50000
IBR	223,61
IBR / Expecred REV	0,186

Scenarios	Price per unit - Cost per unit	Fixed cost	$Ebit_i$	Probab. ($Ebit_i$)	Net Investments	ROI_i	Probab. (ROI_i)	Probab. (ROI_i - Expected ROI)^2
1	2	800	0	0	2000	0	0	0,0001225
2	2	800	-100	-20	2000	-0,01	-0,002	0,000125
3	2	800	-200	-60	2000	-0,03	-0,009	7,5E-06
4	2	800	-300	-120	2000	-0,06	-0,024	0,00025
Σ	2			-200			-0,035	0,000505

Expected Ebit	-200
Expected ROI	-0,035
Var ROI	0,000505
$\sigma_{(u)}$	0,02

$$\sigma_u = \frac{IBR}{RE\tilde{V}} \cdot \sqrt{\left(DO\tilde{L} \cdot RO\tilde{I}\right)^2}$$

DOL = 1+ FC/Expected Ebit	**-3**
A) IBR / Expected REV	**0,186**
Expected ROI	**-0,035**
B) (DOL(Expcted ROI))^2	**0,011025**
(B)$^{1/2}$	**0,105**
σ_u = (A) x (B)$^{1/2}$	**0,020**

Specific risk according to bottom up approach

	1	2	3
Expected REV	1200	1250	1300
REV Var	50000	4500	4500
IBR	223,61	67,08	67,08
A) IBR / Expected REV	0,186339	0,05	0,05
Expected Ebit	-200	-150	30
Expected ROI	-0,035	-0,02	0,2
Fixed costs	800	800	900
DOL	-3	-4,33333	31,000
B) $(DOL(Expcted\ ROI))^2$	0,011025	0,007511	38,44
$(B)^{1/2}$	0,105	0,086667	6,2
$\sigma_u = (A) \times (B)^{1/2}$	0,020	0,005	0,320

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Bottom up analysis of unlevered risk: dynamic approach

In the case of no constant value of price per unit, variable cost per unit, fixed costs and net investments, the unlevered risk depends on the following ratios:

$$\theta_j = \frac{CM_j}{NI_j}; \quad \mu_j = \frac{FC_j}{NI_j}$$

CM = Contribution margin (Revenues – Variable Costs)
FC = Fixed costs
NI = Net investments

$$ROI_j = \theta_j - \mu_j = \frac{REV_j - \text{Variable Costs}_j}{NI_j} - \frac{\text{Fixed Costs}_j}{NI_j}$$

Bottom up analysis of unlevered risk: dynamic approach

Independent variables

- Variance of θ (volatility of contribution margin). It affects in positive way the unlevered risk (σ_u).

- Variance of μ (structural instability: volatility of the ratio FC/NI). It affects in positive way the unlevered risk (σ_u).

- Covariance θ, μ. It affects in negative way the unlevered risk (σ_u).

Bottom up analysis of unlevered risk: dynamic approach

$$\sigma_{j(u)} = \sqrt{\sigma^2_{\theta j} + \sigma^2_{\mu j} - 2 \cdot \sigma_{\theta,\mu}}$$

Managerial interpretation of $\sigma_{\theta,\mu}$

- **$\sigma_{\theta,\mu}>0$ shows the managerial capability to compensate the growth in investment and fixed costs with the increase in contribution margin. It decreases the unlevered risk linked to growth strategies.**

- **$\sigma_{\theta,\mu}<0$ amplifies the unlevered risk caused by growth strategies**

Specific risk according to bottom up approach

Scenarios	Probab.	Exspected demand	Price per unit - Variable cost per unit	Contribution Margin$_i$	Fixed cost
1	0,25	300	4	1200	400
2	0,25	260	3	780	400
3	0,25	200	2	400	300
4	0,25	100	2	200	200

Scenarios	Ebit$_i$	Net Investments	ROI$_i$	Probab. (ROI$_i$)	Probab. $(ROI_i - ROI)^2$
1	800	2000	0,4	0,1	0,0139
2	380	2000	0,19	0,0475	0,0002
3	100	1500	0,067	0,0167	0,0024
4	0	1200	0	0	0,0067
Σ				**0,164**	**0,0232**

Variance ROI	**0,0232**
$\sigma_{(u)}$	**0,152**

Scenarios	θi	Probab. (θ_i)	Probab. $(\theta_i - \theta)^2$	μi	Probab. (μ_i)	Probab. $(\mu_i - \mu)^2$
1	0,600	0,150	0,0149	0,200	0,050	0,00002
2	0,390	0,098	0,0003	0,200	0,050	0,00002
3	0,267	0,067	0,0020	0,200	0,050	0,00002
4	0,167	0,042	0,0089	0,167	0,042	0,00016
Σ		**0,356**	**0,026**		**0,192**	**0,000**

A) Variance θ	**0,0261**
B) Variance μ	**0,00021**
C)Covar. θ,μ	**0,0016**
$\sigma_{(u)} = (A+B-2C)^{1/2}$	**0,1523**

The reworking of CAPM according to bottom up approach

Assumptions

- Each industrial sector absorbs a share of market volatility
- Each firm absorbs a share of sector volatility

Beta of sector x Correction Factor = Firm's Beta

Static approach: Correction Factor = f(ROI, DOL)

Dynamic approach: Correction Factor = $f(\sigma_{\theta}, \sigma_{\mu}, \sigma_{\theta,\mu})$

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Correction Factor

Static approach: Correction factor comes from the relationship between the firm DOL and the sector DOL.

Dynamic approach: Correction factor comes from the relationship comes from the drivers of firm risk in dynamic conditions (σ_{θ}, σ_{μ}, $\sigma_{\theta,\mu}$) and the same variables referred to the sector.

The reworking of CAPM according to bottom up approach

The correction factor (ϕ): static approach

$$\phi_j = \sqrt{\lambda_j \cdot \gamma_j} = \sqrt{\left(\frac{\widetilde{DOL}_j}{\widetilde{DOL}_s} \cdot \frac{\widetilde{ROI}_j}{\widetilde{ROI}_S} \right)^2} = \frac{\beta_{j(u)}}{\beta_{j(s)}}$$

Constant values of price per unit, variable cost per unit, fixed costs and net investments . In addition this formula assumes constant the market quote of j

$$\beta^b_{j(L)} = \underbrace{\beta_{s(u)} \cdot \phi_j}_{\beta^b_{j(u)}} \cdot \left(1 + \frac{D_j (1-\tau)}{S_j} \right)$$

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The correction factor (ϕ): static approach

Prob.	R_{mi}
0,25	0,2
0,25	0,3
0,25	0,4
0,25	0,5

R_m	0,35
σ^2_m	0,0125

Prob.	Q_s	Price per unit - Cost per unit	REV_s-VC_s	FC_s	$EBIT_s$	NI_s	ROI_s
0,25	100	20	2000	1800	200	4300	0,047
0,25	115	20	2300	1800	500	4300	0,116
0,25	130	20	2600	1800	800	4300	0,186
0,25	145	20	2900	1800	1100	4300	0,256

ROI_s	0,151
$\sigma_{s,m}$	0,00872
$\beta_{s(u)}$	0,69767

Average $EBIT_s$	650	
Average DOL_s	4	$1+CFO_s$ / $EBIT_s$

Prob.	Q_j	Price per unit - Cost per unit	REV_{sj}-VC_j	FC_j	$EBIT_j$	NI_j	ROI_j
0,25	20,0	18	360	350	10	750	0,013
0,25	23,0	18	414	350	64	750	0,085
0,25	26,0	18	468	350	118	750	0,157
0,25	29,0	18	522	350	172	750	0,229

ROI_j	0,121
$\sigma_{j,m}$	0,00900
$\beta_{j(u)}$	0,72000

Average $EBIT_j$	91	
Average DOL_j	5	$1+CFO_j$ / $EBIT_j$

$\phi_{j(u)} = \beta_{j(u)}/\beta_{s(u)}$	1,03200

γ_j	0,6443
λ_j	1,6531
$\lambda_j\gamma_j$	1,0650

$(\lambda_j\gamma_j)^{1/2}$	1,03200
$\beta_{j(u)}=\beta_{s(u)}(\lambda_j\gamma_j)^{1/2}$	0,72000

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The reworking of CAPM according to bottom up approach

The correction factor (ϕ): static approach

$$\frac{\widetilde{DOL}_j}{\widetilde{DOL}_s} = \frac{1+CF_j}{Ebit_j} \cdot \frac{Ebit_s}{1+CF_s} = \frac{4{,}846115}{3{,}769230} = 1{,}285704242$$

$$\frac{RO\tilde{I}_j}{RO\tilde{I}_S} = \frac{0{,}121}{0{,}15125} = 0{,}8$$

$$\phi_j = (1{,}285704242)(0{,}8) = 1{,}0285633936$$

$$(\phi_j)(\beta_s) = (1{,}0285633936)(0{,}69767) = 0{,}72$$

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The reworking of CAPM according to bottom up approach

The correction factor (ϕ): dynamic approach

$$\phi_j = \frac{\rho_{j,m}}{\rho_{s,m}} \cdot \frac{\sqrt{\sigma^2_{\theta j} + \sigma^2_{\mu j} - 2 \cdot \sigma_{\mu j,\theta j}}}{\sqrt{\sigma^2_{\theta s} + \sigma^2_{\mu s} - 2 \cdot \sigma_{\mu s,\theta s}}} = \frac{\beta_{j(u)}}{\beta_{j(s)}}$$

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The reworking of CAPM according to bottom up approach

The correction factor (ϕ): dynamic approach

Prob.	R_{mi}
0,25	0,2
0,25	0,3
0,25	0,4
0,25	0,5

R_m	0,35
σ^2_m	0,0125
σ_m	0,111803

Prob.	Q_s	Price per unit - Cost per unit	REV_s-VC_s	FC_s	$EBIT_s$	NI_s	ROI_s
0,25	100	22	2200	1800	400	4300	0,093
0,25	115	21	2415	1800	615	4300	0,143
0,25	130	21	2730	1900	830	4300	0,193
0,25	145	19	2755	1900	855	4300	0,199

ROI_s	0,157
$\sigma_{s,m}$	0,00459
$\beta_{s(u)}$	0,36744

$\sigma_{s(u)}$	0,04283
$\rho_{s,m}$	0,95925

Prob.	Q_j	Price per unit - Cost per unit	REV_{sj}-VC_j	FC_j	$EBIT_j$	NI_j	ROI_j
0,25	20,0	20	400	350	50	750	0,067
0,25	23,0	19	437	350	87	750	0,116
0,25	26,0	28	728	350	378	750	0,504
0,25	29,0	18	522	360	162	750	0,216

ROI_j	0,226
$\sigma_{j,m}$	0,01045
$\beta_{j(u)}$	0,83600

$\sigma_{j(u)}$	0,16946
$\rho_{j,m}$	0,55155

$\phi_{j(u)} = \beta_{j(u)}/\beta_{s(u)}$	2,27519

μ_j	θ_j	μ_s	θ_s
0,467	0,533	0,419	0,512
0,467	0,583	0,419	0,562
0,467	0,971	0,442	0,635
0,480	0,696	0,442	0,641

a)	$\sigma^2_{\mu j}$	0,000033
b)	$\sigma^2_{\theta j}$	0,0287
c)	$\sigma_{\theta j,\mu j}$	0,000001
d)	a+b-2c	0,028717667

e)	$\sigma^2_{\mu s}$	0,000135
f)	$\sigma^2_{\theta s}$	0,0029
g)	$\sigma_{\theta s,\mu s}$	0,000588
h)	e+f-2g	0,001834

i)	$\rho_{j,m}/\rho_{s,m}$	0,5750
	$(i)(d/h)^{1/2}$	2,27519

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The reworking of CAPM according to bottom up approach

Trade-off between growth and conservation

$$\underbrace{\phi_j}_{\text{Without strategic investments strategici}} - \underbrace{\phi_{j(G)}}_{\text{With strategic investments}} = \sqrt{\lambda_j \cdot \gamma_j} - \frac{\rho_{j,m}}{\rho_{s,m}} \cdot \frac{\sqrt{\sigma^2_{\theta j} + \sigma^2_{\mu j} - \sigma_{\theta j,\mu j}}}{\sigma_{s(u)}}$$

Short-term effects

$a)\ \phi_{j(G)} < \phi_j$ → **The strategic growth decreases the unlevered beta**

$b)\ \phi_{j(G)} = \phi_j$ → **The strategic growth doesn’t affect the unlevered beta**

$c)\ \phi_{j(G)} > \phi_j$ → **The strategic growth increases the unlevered beta**

The reworking of CAPM according to the Total Beta Model

The issue of diversification

The CAPM considers pure financial investors. Normally they pay a little attention to strategic perspectives of firms. Therefore they consider the “diversification power” like the main way to optimize their risk-return relationship.

However, there are other types of investors who look at the risk-return relationship with a logic partially or totally different the traditional financial logic. This happens when an operators has interest in a long-term perspective.

Typically the entrepreneur doesn’t diversify. He tends to invest his capital in one business.

The typical venture capitalist doesn’t exploit the overall diversification benefits. In fact he tends to combine the diversification benefits with specialization benefits.

The reworking of CAPM according to the Total Beta Model

Total Beta (Tβ)

$$T\beta_j = \frac{\beta_{j(L)}}{\rho_{k,m}} = \beta_{j(L)} \cdot \frac{\sigma_k \cdot \sigma_m}{\sigma_{k,m}}$$

$\rho_{k,m}$ = correlation coefficient between the portfolio of investor (k) and market portfolio (m)
$\sigma_{k,m}$ = covariance between the portfolio of investor and market portfolio
σ_k = st. deviation of portfolio k
σ_m = st. deviation of m

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The reworking of CAPM according to four correction factors

$$ke_j = Rf + \left(Rm - Rf\right) \cdot \underbrace{\left(\underbrace{\overbrace{\underbrace{\beta_{s(u)} \cdot \overbrace{\phi_j}^{\textit{Correction factor } (1)}}_{\beta^{b}_{j(u)}} \cdot \overbrace{\left(1 + \frac{D_j(1-\tau)}{S_j}\right)}^{\textit{Correction factor } (2)}}^{\text{Bottom up anlysis}}}_{\beta^{b}_{j(L)}} \cdot \overbrace{\frac{1}{\rho_{k,m}}}^{\textit{Correction factor } (3)} \right)}_{T\beta_j} + \overbrace{\pi_j}^{\textit{Correction factor } (4)}$$

π_j measures the premium linked to the liquidity risk

Entrepreneurship and new ventures finance

Venture evaluation (3): Real options (first part)

Prof. Antonio Renzi

FACOLTÀ DI ECONOMIA

SAPIENZA
UNIVERSITÀ DI ROMA

Agenda

Ex ante flexibility and ex post flexibility

The Real Option Approach: general logic

The real options classification

The extended NPV

Ex ante flexibility and ex post flexibility

The ex ante flexibility regards the faculty to make strategic investments before the occurrence of the expected changes. For example, the firm makes an investment to improve its productivity in the perspective of a demand growth.

The managerial flexibility regards the possibility to change the investment strategies after the occurrence of new scenarios. For example, an investment aimed to improve the productivity could be reduced, when the real growth of the demand is lower than the potential growth estimated before the investment decision.

Ex ante flexibility and ex post flexibility

The combination of these two flexibility kinds (*ex ante* and *managerial flexibility*) allows:

- **To realize investments aimed to exploit expected changes**

- **To correct investment decisions, once verified the effective dynamic of several independent variables.**

Ex ante flexibility and ex post flexibility

During the 70s, several studies highlighted the inadequacy of the DCF logic.

These studies have shown that the traditional approach based on a linear actualization implies an underestimation of investment decisions. This phenomenon is due to several factors.

An important factor about the underestimation phenomenon is that the DCF result doesn’t include the component of managerial flexibility value.

Ex ante flexibility and ex post flexibility

The role of managerial flexibility is double:

- It is a "cushion" on the negative side of the uncertainty;
- It is a leverage to exploit the positive side of the uncertainty.

This implies asymmetric risk conditions, in the sense that the investor has the faculty to give up on a given investment when its real performance is lower than the initial expectations. At the same time, the investor has the possibility to exploit as much as possible the benefits linked to a positive volatility, when the real performance is higher than the average expected return.

The Real Option Approach (ROA): general logic

The idea that the decision maker has the faculty to change strategies in place, after the observation of one or more phenomena, has led to the development of non linear models.

This has entailed new ways to capture the value

Risk and value of flexibility

The value of managerial flexibility is positively correlated with the risk:

The increase in the risk of investment increases the utility function of the managerial flexibility.

This positive correlation is similar to that between risky securities and the value of financial options.

Risk and value of flexibility

This similarity (between the managerial flexibility related to investments in real assets and flexibility produced by financial options) has resulted in the ROA.

The main goal of the ROA is to enlarge the logic of DCF, thanks to a dynamic risk valuation linked to the possibility to defer decisions to the future or modify those already approved.

General definition

Real options represent elements of managerial flexibility that allow the correction, the postponement or abandonment of investment, after the observation of one or more events.

Real option and market discipline

In the traditional financial perspective of the allocative efficiency of resources is seen as necessary to create value.

Instead, according to a strategic perspective the strategic resources potentially exploitable in future assume the role of positive drivers of value.

The ROA can be an important tool, to bring out, even in the eyes of financial investors, the shadow value related to a portfolio of strategic resources.

The real options classifications

First Classification:
Real options and flexibilities

Options tied to the time factor:
- Options to defer
- Options to temporarily suspend

Options tied to the investment size:
- Expansion Options
- Reduction Options
- Growth Options

Options tied to opportunities to change:
- Switching Options;
- Options to abandon

Second Classification:
Real options assimilated to financial options

European Real Options:
- European call options;
- European put options

American Real Options:
- American call options;
- American put options

Options to defer

- The option to defer the start of a project reduces the sunk cost problems

- The option to delay the investment decision is a real call option.

- The strike price is equal to the initial investment

- This real option implies an opportunity cost equal to the profits lost in the waiting period. So that if the entrepreneur (or the investor) is certain to realize the new business, the late entry only produces economic damage.

Options to defer

The decision to realize the business under any circumstance could depend on:

- Non rationality of the entrepreneur;

- Negative observations (down side market) , in a limited period, could be insufficient to tell if the business will fail.

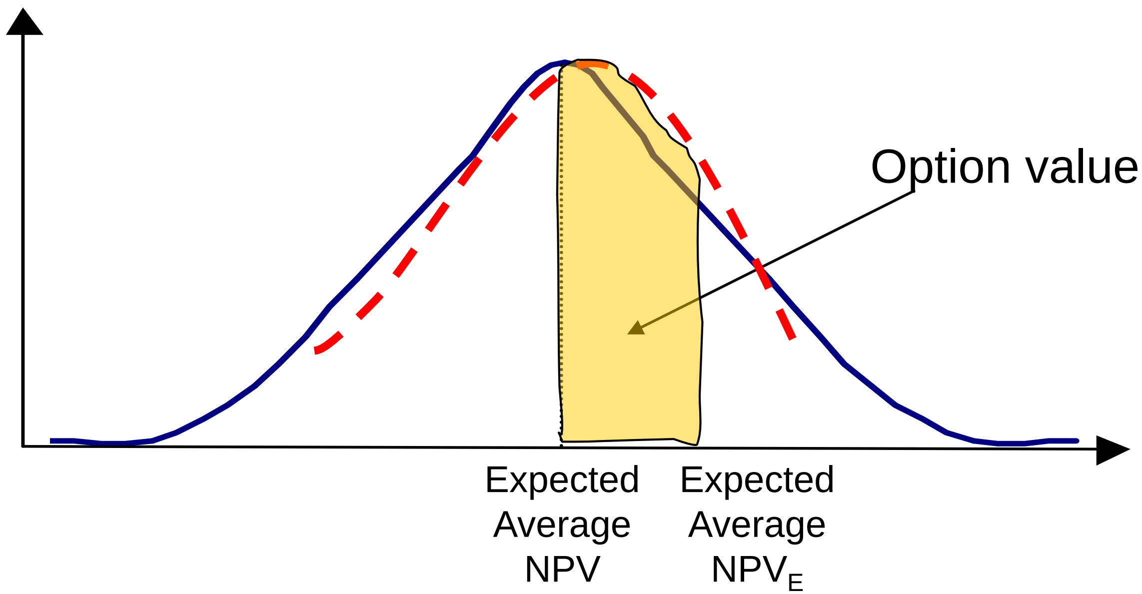
The extended NPV (NPV_E)

$$\mathrm{NPV_E} = \underbrace{-\,\mathrm{I_0} + \sum_{t=1}^{N} \mathrm{FCFF}_t \cdot (1+\mathrm{Wacc})^{-n}}_{\mathrm{NPV}} + \underbrace{\mathrm{OP}}_{\text{Option value}}$$

The extended NPV (NPV_E)

Symmetrical distribution of NPV and asymmetrical distribution of NPV_E

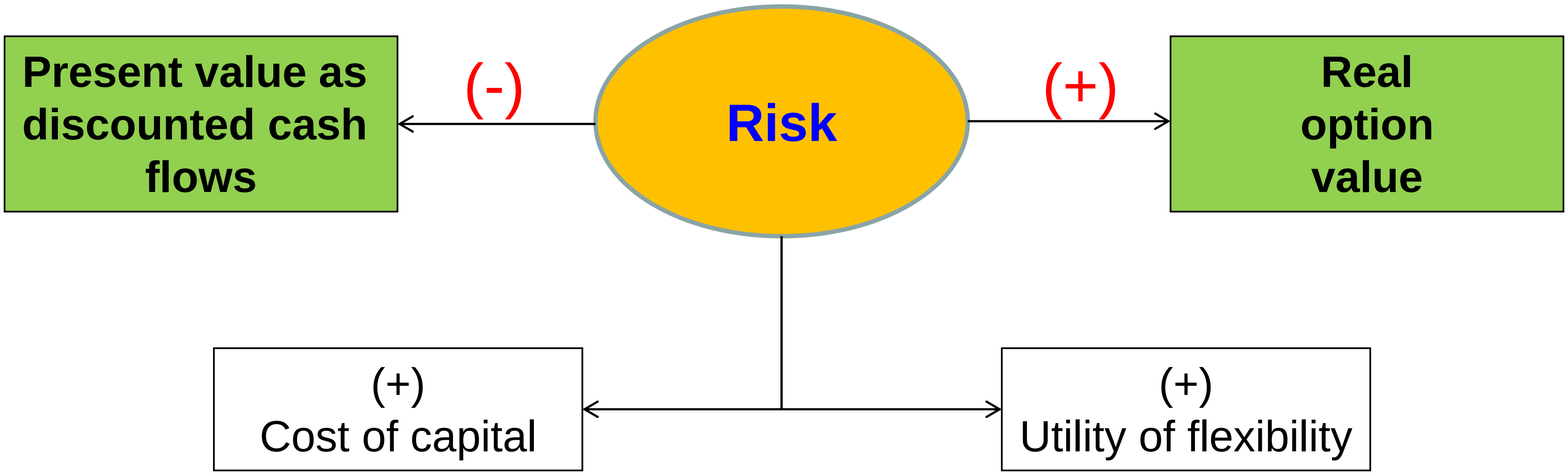
$$0 \leq (VAN_E - VAN = OP) \leq \infty$$



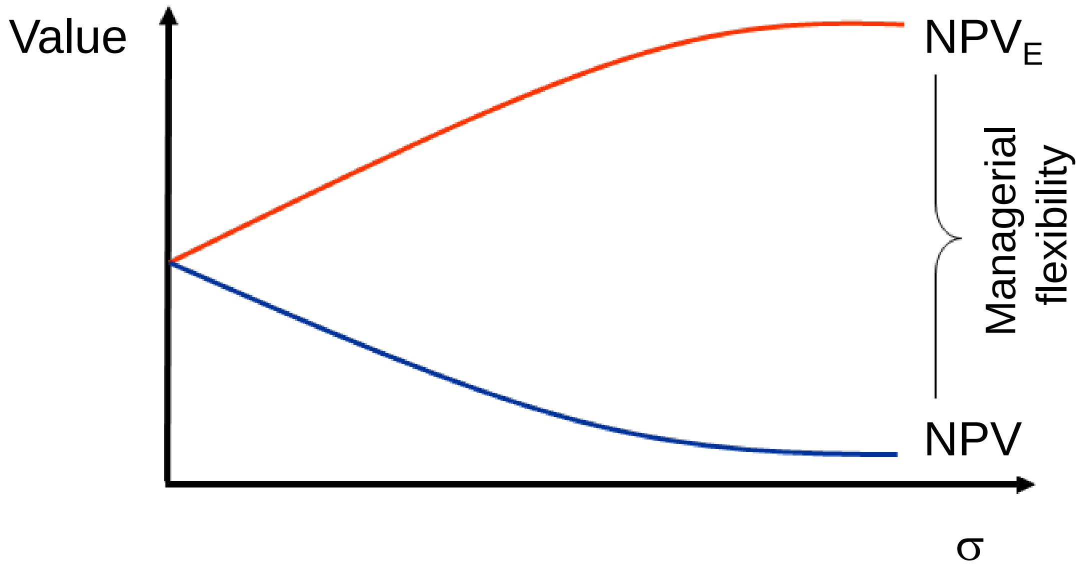
The possibility of exploiting risk asymmetric conditions allows a risk immunization process

The double effect of the risk on NPV_E

The volatility of the expected cash flows increases both the cost of capital and the value of real options.



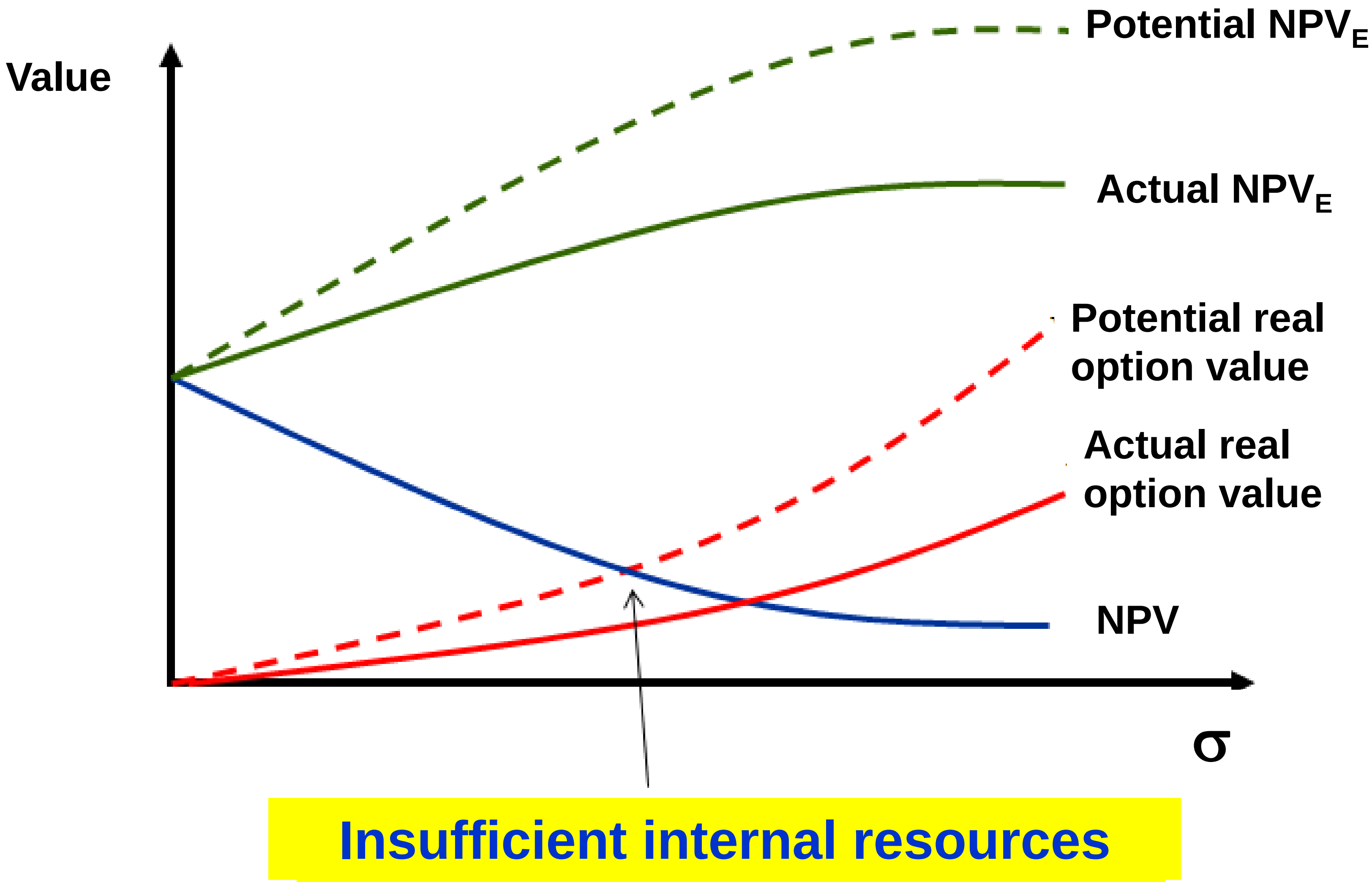
The double effect of the risk on NPV_E



$OP_J = f(\sigma)$

OP_J = Value of real option j

Potential NPV_E and actual NPV_E: A path dependence logic



Entrepreneurship and new ventures finance

Venture evaluation (4): Real options (second part)

Prof. Antonio Renzi

Facoltà di Economia

Sapienza Università di Roma

Agenda

The certainty equivalent method

Call and put value: general logic

Binomial model

Equivalent portfolios

Black & Schols Formula

Differences between financial options and real options

The certainty equivalent method

Both in the case of forward contracts and in the financial options for each expected value in uncertainty conditions there is a certainty equivalent:

Present value of j in uncertainty conditions

=

Present value of j in certainty conditions .

This logic is the base to estimate both financial and real options

The certainty equivalent method

One period analysis

$$(Q_{J1})(1+R_J)^{-1} = Q_{J0} = (S_1)(1+Rf)^{-1} = S_0$$

$$Q_{J1} - S_1 = (Q_{J0})(1+R_J) - (S_0)(1+Rf)$$

(Q_{J1}) = Expected value in uncertainty conditions

Q_{J0} = Present value of Q_{J1}

R_J = Risk free rate + resk premiun

S_1 = Forward price

S_0 = Present value of forward price

Rf = Risk free rate

One period analysis

p = objective probability in the up state 1- *q* = objective probability in the down state	*q* = intrinsic probability in the up state 1- *q* = objective probability in the down state

$$Q_{J0} = \frac{p\, Q_{Ju} + (1-p)\, Q_{Jd}}{1 + \tilde{R}_J} = \frac{q\, Q_{Ju} + (1-q)\, Q_{Jd}}{1 + Rf}$$

$$Q_{J0}\,(1 + Rf) = q\, Q_{Ju} + (1-q)\, Q_{Jd}$$
$$Q_{J0}\,(1 + Rf) = q\, (Q_{Ju} - Q_{Jd}) + Q_{Jd}$$

$$Q_{J0}\,(1 + \tilde{R}_J) = p\, Q_{Ju} + (1-p)\, Q_{Jd}$$
$$Q_{J0}\,(1 + \tilde{R}_J) = p\, (Q_{Ju} - Q_{Jd}) + Q_{Jd}$$

$$\downarrow \qquad\qquad \downarrow$$

$$\frac{Q_{J0}\,(1 + Rf) - Q_{Jd}}{Q_{Ju} - Q_{Jd}} = q < p = \frac{Q_{J0}\,(1 + \tilde{R}_J) - Q_{Jd}}{Q_{Ju} - Q_{Jd}}$$

The certainty equivalent method

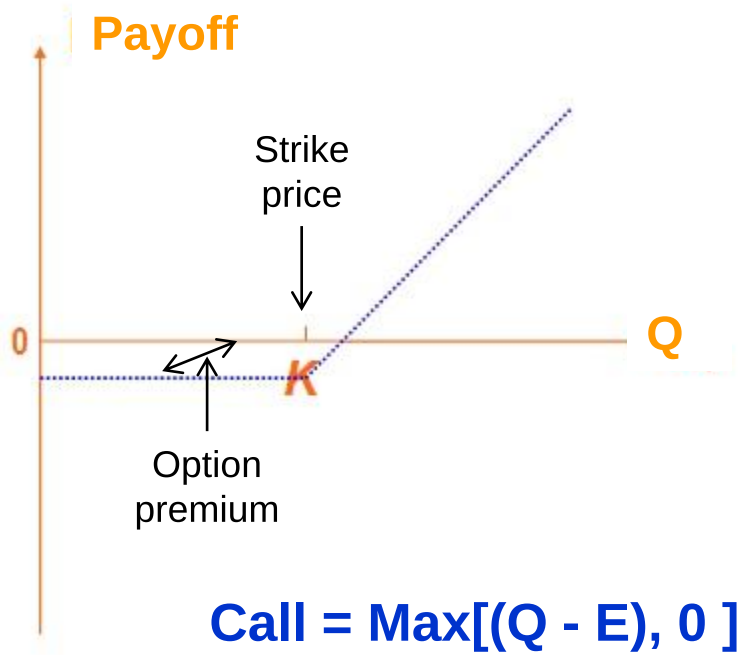
One period analysis

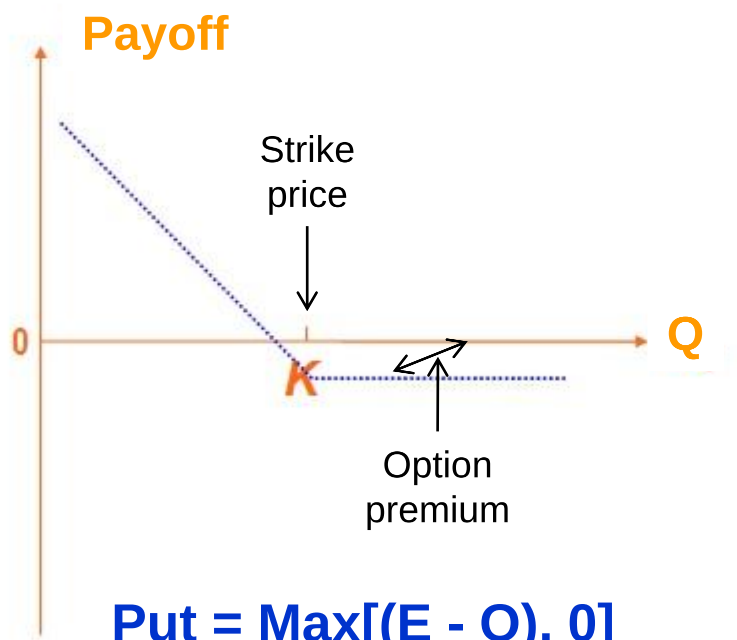
	0	1	Objective probabilities	Intrinsic probabilities
Q_{J1u}		100	0,5	0,409
Q_{J1d}		60	0,5	0,591
$R_J = 0,1$				
$Q_{J0} = 0,5(100 + 60)(1,1)^{-1}$	72,727			
$Rf = 0,05$				
$Q_{J0} = (0,409(100) + 0,591(60))(1,05)^{-1}$	72,727			

Time to maturity equal to zero

Call Option **Put Option**

T = 0





Call = Max[(Q - E), 0]

Payoff = Call – Option Premium

Put = Max[(E - Q), 0]

Payoff = Put – Option Premium

T = Time to maturity; Q = Current price; E = Strike price

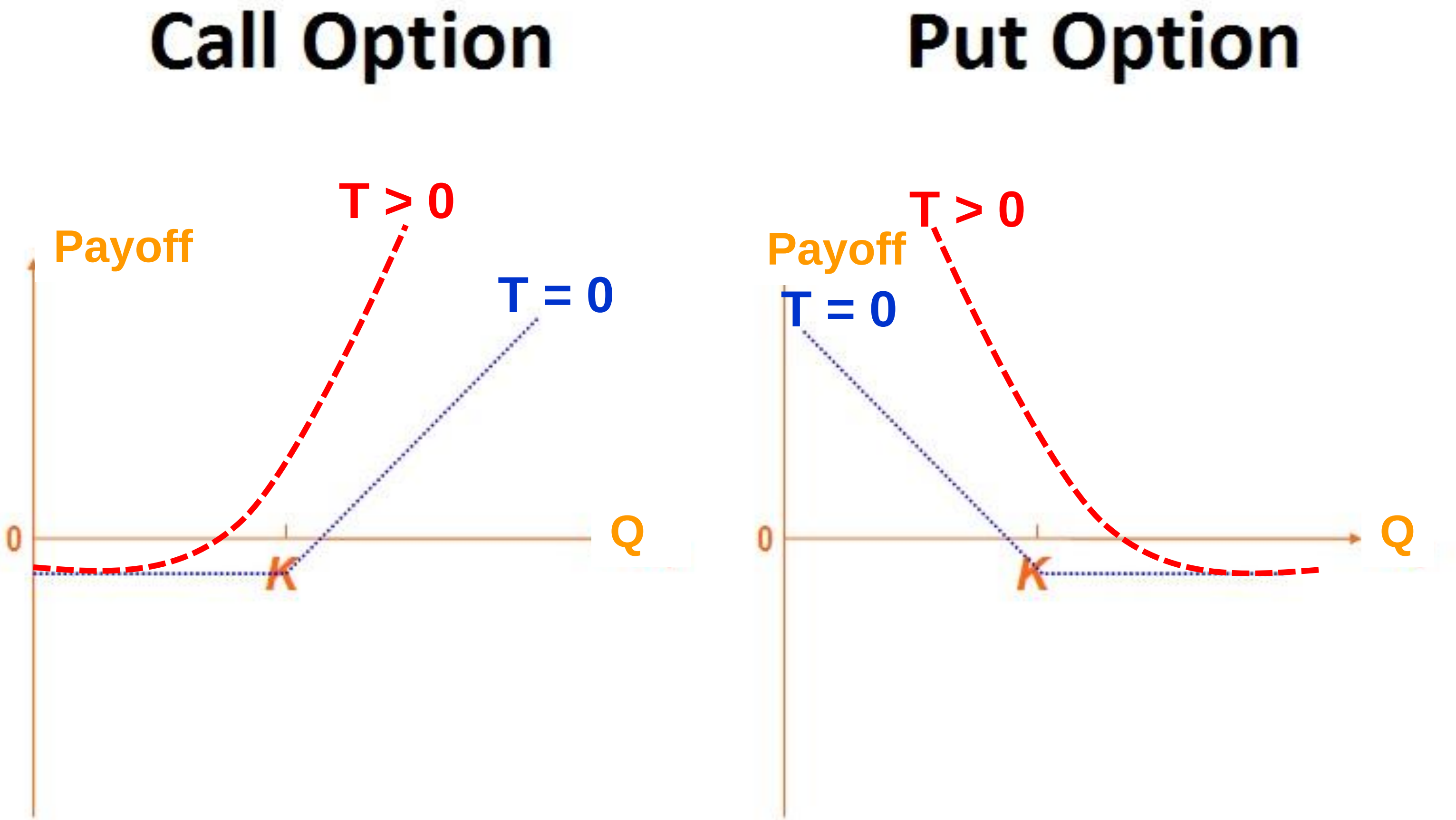
Call and put value: General logic

Time to maturity equal to zero

Option value	*Rational Behavior*
Q > E Call = Max[(Q - E), 0] > 0 (In the money)	**Option Exercise**
Q = E Call = Max[(Q - E), 0] = 0 (At the money)	**Point of indifference**
Q < E Call = Max[(Q - E), 0] = 0 (Out of the money)	**Payment the current market price**

Q < E → Put = Max[(E - Q), 0] > 0 (In the money)	**Option Exercise**
Q = E → Put = Max[(E - Q), 0] = 0 (At the money)	**Point of indifference**
Q > E → Put = Max[(E - Q), 0] = 0 (Out of the money)	**Sale to the current market price**

Call and put value: General logic



If T>0 the value of a call option is positive also in the case of K>Q. This depend on the expectations about the future possibility of K<Q.
Equally, in the case of a put option, with T>0 and K<Q, the expectations can cause a positive value.

Call Value (one period analysis)

$$Q_0 \begin{cases} Q_u & \text{Expected value of underlying asset (up state scenario)} \\ Q_d & \text{Expected value of underlying asset (down state scenario)} \end{cases}$$

$$C_0 \begin{cases} C_u = \text{Max}[(Q_u - E), 0] & \text{Expected call value (up state scenario)} \\ C_d = \text{Max}[(Q_d - E), 0] & \text{Expected call value (down state scenario)} \end{cases}$$

$$C_0 = [(q)C_u + (1 - q)C_d](1 + Rf)^{-1}$$

Binomial Model

The binomial model is based on discrete process, where the price of underlying asset could become period by period one of two values:

- Up state value;
- Down state value.

The up state value depends on a multiplying factor (u)
The Down state value depends on a reductive factor (d)

One period analysis

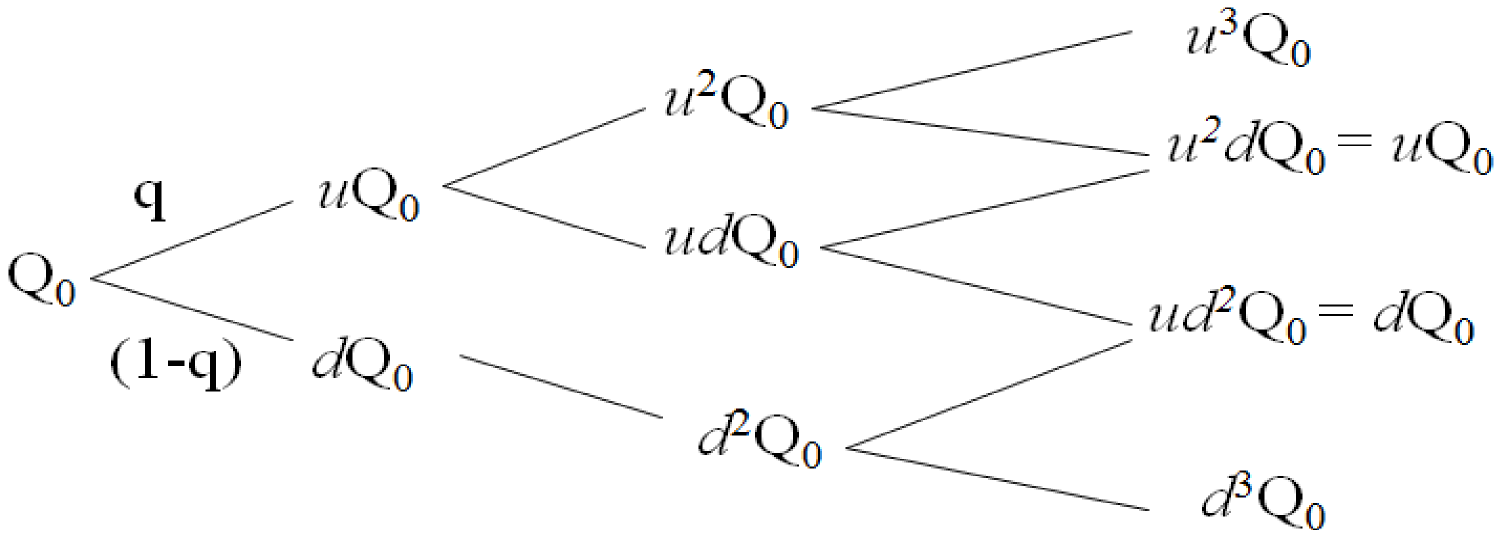
$$Q_0 \begin{cases} Q_u = u\, Q_0 \\ \\ Q_d = d\, Q_0 \end{cases}$$

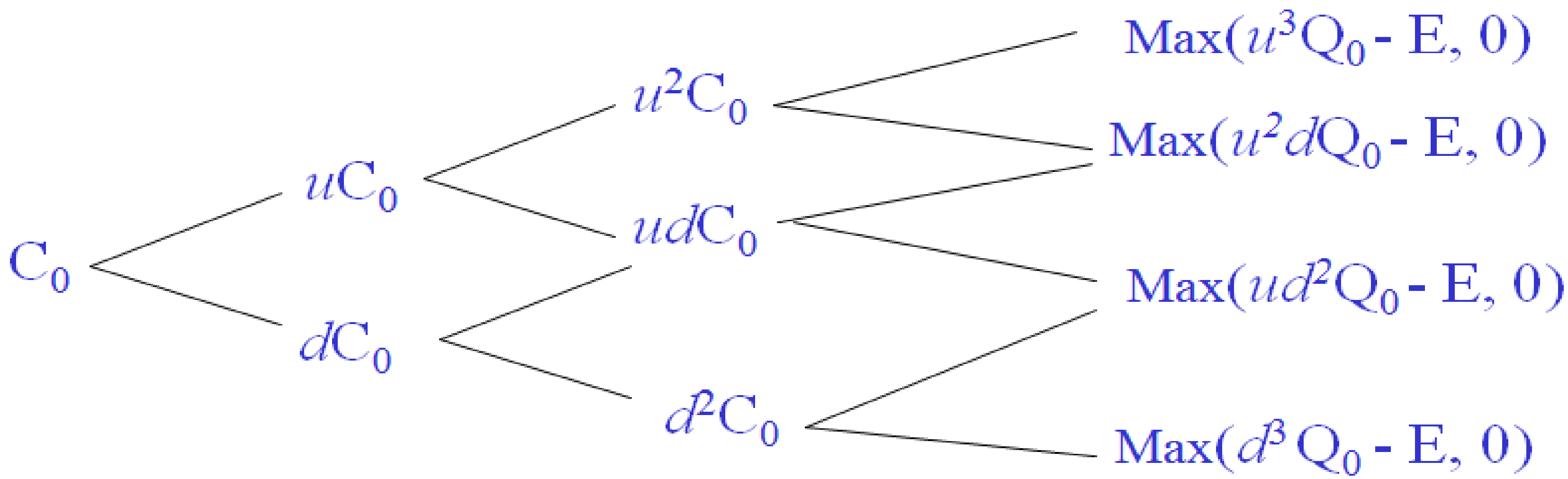
$$C_0 \begin{cases} C_u = \text{Max}[(Q_u - E), 0] = \text{Max}(u\, Q_0 - E, 0) \\ \\ C_d = \text{Max}[d(Q_d - E), 0] = \text{Max}(d\, Q_0 - E, 0) \end{cases}$$

$$C_0 = [(q)C_u + (1 - q)C_d] / (1 + Rf)$$

$$q = \frac{Q_0\,(1 + Rf) - dQ_0}{Q_0\,(u - d)}$$

Multiple period analysis





Multiple period analysis and reverse process (three stages)

$$(u^3 Q_0 - E,\ 0)$$

$$C_{2u} = \text{Max}\{[(u^3 q)Q_0 - E],0\} + \text{Max}\{[u^2 d(1\text{-}q)Q_0 - E],0\}/(1 + Rf)$$

$$(u^2 d Q_0 - E,\ 0)$$

$$C_{2ud} = \text{Max}\{[(u^2 d q)Q_0 - E],0\} + \text{Max}\{[u d^2(1\text{-}q)Q_0 - E],0\}/(1 + Rf)$$

$$(u d^2 Q_0 - E,\ 0)$$

$$C_{2d} = \text{Max}\{[(u d^2 q)Q_0 - E],0\} + \text{Max}\{[d^3(1\text{-}q)Q_0 - E],0\}/(1 + Rf)$$

$$(d^3 Q_0 - E,\ 0)$$

Stage 3

Multiple period analysis

(C_{2u})

$$C_{1u} = [(q)C_{2u}] + [(1\text{-}q)\ C_{2ud}]\ /(1 + Rf)$$

(C_{2ud})

$$C_{1d} = [(q)C_{2ud}] + [(1\text{-}q)\ C_{2ud}]\ /(1 + Rf)$$

(C_{2d})

Stage 2

(C_{1u})

$$C_0 = [(q)C_{1u}] + [(1\text{-}q)\ C_{1d}]/(1 + Rf)$$

(C_{1d})

Stage 1

Binomial Model

Q0 = Present value	1000
u	1,0617966
d	0,9418
q	0,5198
1 – *q*	0,4802
E = Initilal investment	900
Rf (per year)	0,05
Rf (per month)	0,0042

Months	0	1	2	3	4
	1000,00	1061,80	1127,41	1197,08	1271,06
		941,80	1000,00	1061,80	1127,41
			886,99	941,80	1000,00
				835,36	886,99
					786,75

C	?	174,40	234,88	300,83	371,058
		57,17	110,44	165,54	227,41
			0,00	51,76	100,00
				0,00	0,00
					0,00

Reverse process

$C_{u3} = (q371,19+(1-q)227,47)/(1+Rf)$	300,83
$C_{ud3} = (q227,47+(1-q)100)/(1+Rf)$	165,54
$C_{d3} = (q100)/(1+Rf)$	51,76
$C_{u2} = (q300,92+(1-q)165,57)/(1+Rf)$	234,88
$C_{ud2} = (q165,57+(1-q)51,76)/(1+Rf)$	110,44
$C_{u1} = (q234,88+(1-q)110,44)/(1+Rf)$	174,40
$C_{d1} = (q110)/(1+Rf)$	57,17
$C_0 = (q174,40+(1-q)57,17)/(1+Rf)$	**117,62**

Factors “u” and “d”

u = multiplying factor> 1
d = reductive factor = 1/u

$$u = e^{\sigma}$$
$$d = e^{-\sigma}$$

$$\sigma = \ln(u)$$

ln = Natural logarithm
e = Base of natural logarithm
σ = standard deviation of underlying asset

Continuous discounting

$$C_0 = [(q)C_u + (1 - q)C_u]e^{-Rf}$$

$e =$ Base of natural logarithms $= 2{,}71828$

$1/(e^{Rf}) =$ Discounting factor

$$C_0 = [(q)(uQ_0 - E) + (1 - q)(dQ_0 - E)] \,/\, e^{Rf}$$

$$q = \frac{Rf - d}{u - d}$$

The binomial tree as a decisional tool

0	1	2	3	4
C > 0	C > 0	C > 0	C > 0	Max (0. Q - E) > 0
	C > 0	C > 0	C > 0	Max (0. Q - E) > 0
		C = 0	C > 0	Max (0. Q - E) > 0
			C = 0	Max (0. Q - E) = 0
				Max (0. Q - E) = 0

Decision during the option life (T > 0)

0	1	2	3
Waiting	Waiting	Yes	Yes
	Waiting	Waiting	Yes
		Waiting	Waiting
			NO

Decision at the end of the option life (T= 0)

4	
Yes	Exploitation
Yes	
Yes	
NO	Abandon
NO	

Equivalent Portfolio

The equivalent portfolio model allows to identify equivalences between the option payoff and a virtual financial portfolio of the underlying asset, partially financed with a riskless debt.

For each future scenario the option value is given by:

Option Value
=
Amount invested in the underlying asset
x
Price of the underlying asset
–
Riskless debt

Equivalent Portfolio

$$C_0 = xQ - y$$

$x =$ **Amount invested in the underlying asset**

$y =$ **Amount of riskless debt**

$$x = (C_u - C_d) \,/\, [Q_0(u - d)]$$

$$y = (dC_u - uC_d) \,/\, [(1 + Rf)(u - d)] \quad y = (dC_u - uC_d) \,/\, [(e^{Rf})(u - d)]$$

Discrete discounting

C_{u1}	174,40
C_{d1}	57,17
u	1,06180
d	0,9418
Q_0	1000,00
$1 + Rf/12$	1,004166667
x	0,977
y	859,33330
$x Q_0 - y$	117,61

Continuous discounting

C_{u1}	174,40
C_{d1}	57,17
u	1,06
d	0,94
Q_0	1000,00
e	2,7182818
$e^{(Rf/12)}$	1,0041754
x	0,977
y	859,32587
$x Q_0 - y$	117,62

The Black & Schols Formula

$$C_0 = \underbrace{N(d_1)Q}_{x(Q)} - \underbrace{N(d_2)Ee}_{y}{}^{-Rf(t)}$$

Equivalent Portfolio

$$d_1 = \frac{[\ln(Q/E) + (Rf + 0{,}5\sigma^2)]t}{\sigma\sqrt{t}}$$

$$d_2 = = d_1 - \sigma\sqrt{t}$$

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Differences between real options and financial options

The 6 variables of the call option value

Financial options (Call)	The 6 variables of the call option value	Real options (Call)
It is contractually defined	Time to maturity (+)	**Time required for the knowledge formation**
Volatility about the underlying financial asset	Volatility (+)	**Volatility about the underlying real asset**
Price of the underlying financial asset	Price of und. asset (+)	**Present value as summation of discounted cash flows**
Risk free rate	Interest rate (+)	**Risk free rate**
Value of the underlying financial asset	Strike price (-)	**Initial investment**
Dividends lost during the waiting period	Dividends (-)	**Cash flows lost during the waiting period**

Differences between real options and financial options

Financial options	Real options
They are contractually defined	Normally they are not contractually defined
They are traded on regulated markets	They can't traded on regulated markets
They are easy to classify	They are not easy to classify
Their margin of exploitation does not depend on the quality of individual operators	Their margin of exploitation could depend on firm characteristics
Their value tends to change in a continuous way	Their value tends to change in a discrete way