Université de Liège

Faculté d'Economie, de Gestion et de Sciences Sociales

Ecole d'Administration des Affaires

Service de Diagnostic et de Contrôle de l'Entreprise

Another look at the empirical research on bankruptcy

By D. Van Caillie

Associate Professor,
School of Business Administration, University of Liege

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Our conceptual framework

- Since the early '30s, business failure process and legal bankruptcy have heavily been studied, both by practitioners and academics

- This conceptual and (essentially) applied research has mainly been focused on the detection of

  - Early warning

  - Financial signals

  Allowing to predict if and when a company may fail

  ☞ This research is focused on the early prediction of bankruptcy on the only basis

And today ?

- At the same time, empirical research in finance and strategy has rarely investigated why a company fails. Questions such as :

  – What is the dynamics of the process ?

  – Are there some characteristic failure paths or failing patterns amongst companies ?

  – If so, is it then possible to prevent bankruptcy ?

  Have very rarely been asked ... And answered !

And today ?

- We still do not have a strong theoretical and conceptual framework to understand how companies enter in a business failure process and why some companies go bankrupt and some do not !
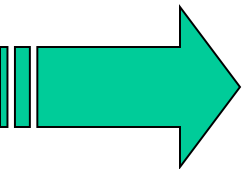
« ... A unifying theory of business failure has not been developed, in spite of a few notable efforts » (Dimitras e.a., 1996)

"What the models really seem to be indicating is (rather unsurprisingly) that companies which go bankrupt report low profits and high borrowings immediately before their demise. But the reverse is not the case : not all companies reporting low profits and high borrowings collapse. And the question is 'why' ?" (Morris, 1997)

Why this communication ?

- In this context, this communication investigates if it's possible,

  - By using essentially financial data

  - By using some different statistical and mathematical techniques which have frequently been explored in the numerous empirical research on bankruptcy

    - Discriminant analysis
    - Logit or probit regression
    - Neural networks
    - Classification trees ...

  To focus on a more proactive approach of failure processes, allowing at least to prevent a potential legal bankruptcy, giving then **another look at the business failure process** a true proactive approach, allowing to take corrective managerial decisions, is far less costly for economic welfare than a reactive one or a simply predictive approach

Structure

1. Estimating the risk of business failure, what does that mean ?

    1. An organizational view of the failing company
    2. A financial approach
    3. Towards the identification of failing paths

2. How to use then statistical and mathematical techniques to prevent bankruptcy ?

3. What kind of data do we need ?

4. Conclusion : is it possible to say something interesting to managers by using mathematical approaches ?

Estimating the risk of business failure

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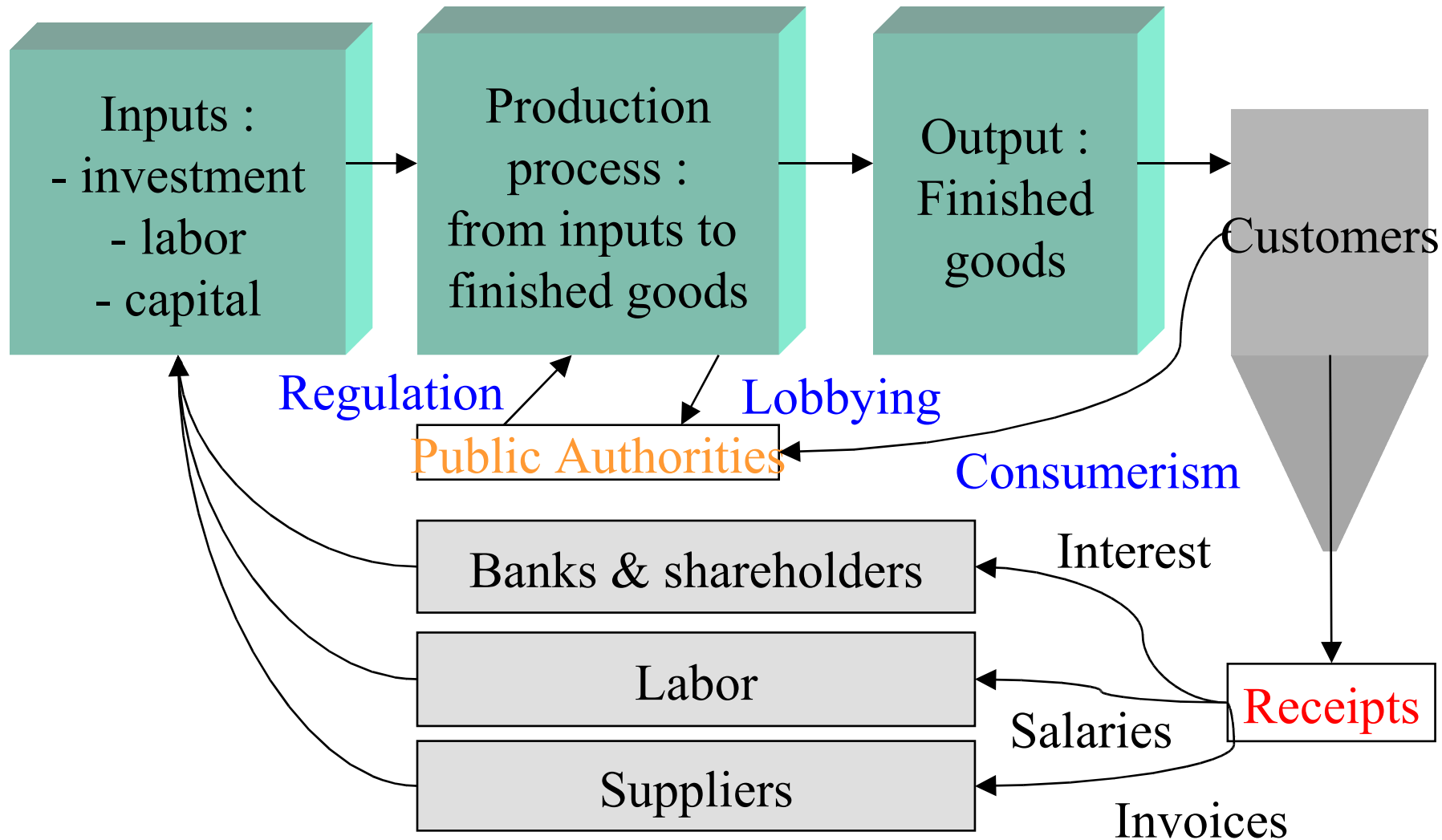
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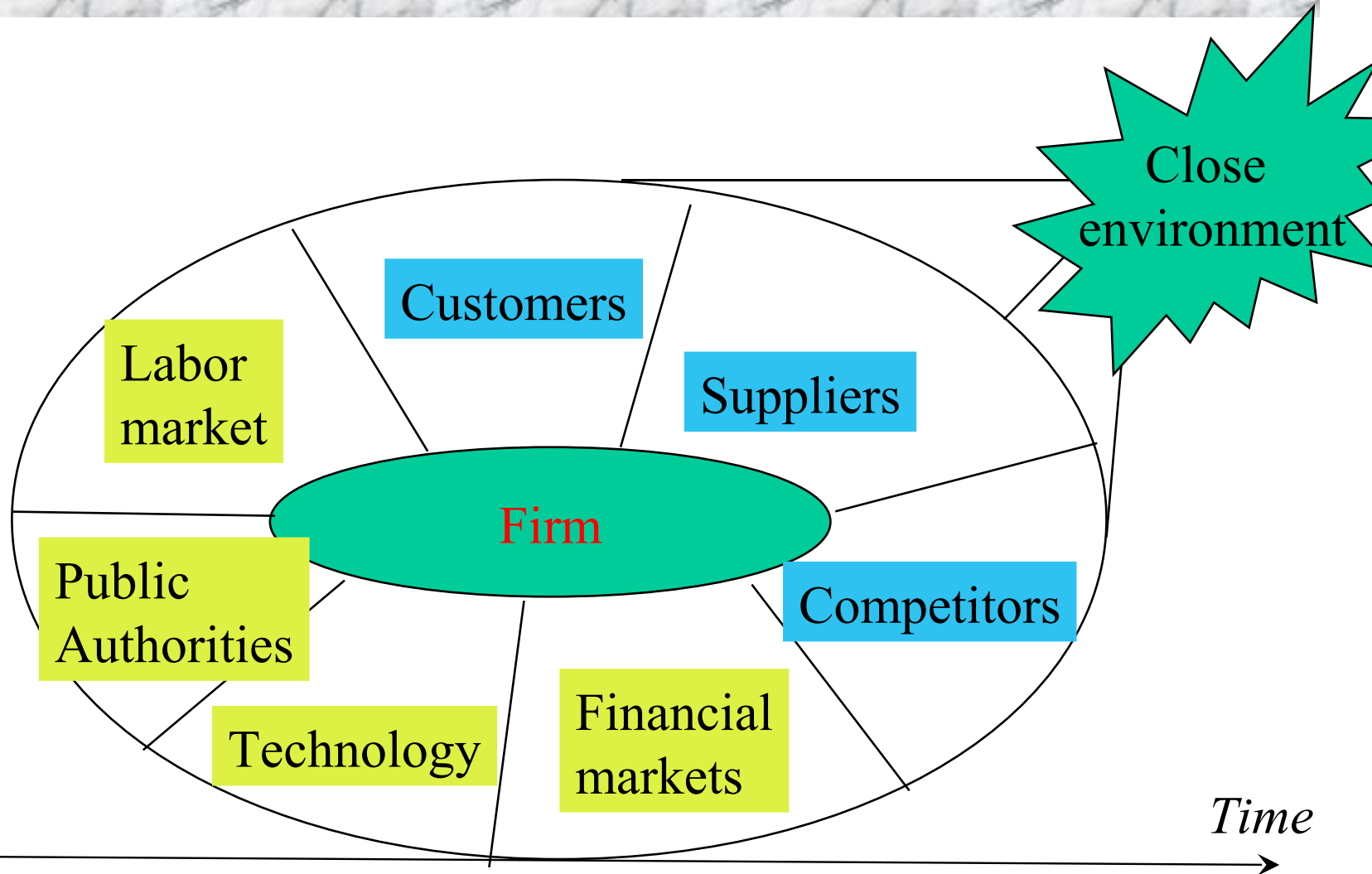
What's a firm ?

- To understand why and how a company may fail, it's necessary to first understand what is a firm

- A firm is now frequently considered as an open flexible system closely linked to its environment :

    - A firm is a dynamic system evolving over time

    - This system is inserted in a fast-evolving environment

    - A firm depends more on the different components of its environment (especially its close environment, i.e. its customers, its suppliers and its competitors) than it has an influence on them

A firm as an open system ...

... Closely linked to its environment

Close environment

Customers

Labor market

Suppliers

Firm

Public Authorities

Competitors

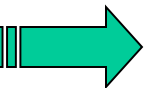Technology

Financial markets

Time

What's a failing firm ?

- A failing firm is a company that doesn't meet on a regular basis the multiple requirements of all the components of its environment.

- At the extreme, a firm goes bankrupt on a legal basis when its cash position doesn't enable it to pay for its partners
  - Suppliers
  - Employees
  - Fiscal expenses ...

What's a failing firm ?

- A failing firm is thus unable :

  - To create value for its customers with products meeting completely the requirements of these customers (price, quality, financing conditions, ...)

  - To correctly pay its labor force

  - To satisfy the requirements of its capital owners (interest on its debts and "dividends" on its equities)

  - To self-create the internal funds flow that are necessary to develop the company

A failing firm is a company which is unable to create value for its environment **on a continuous basis**

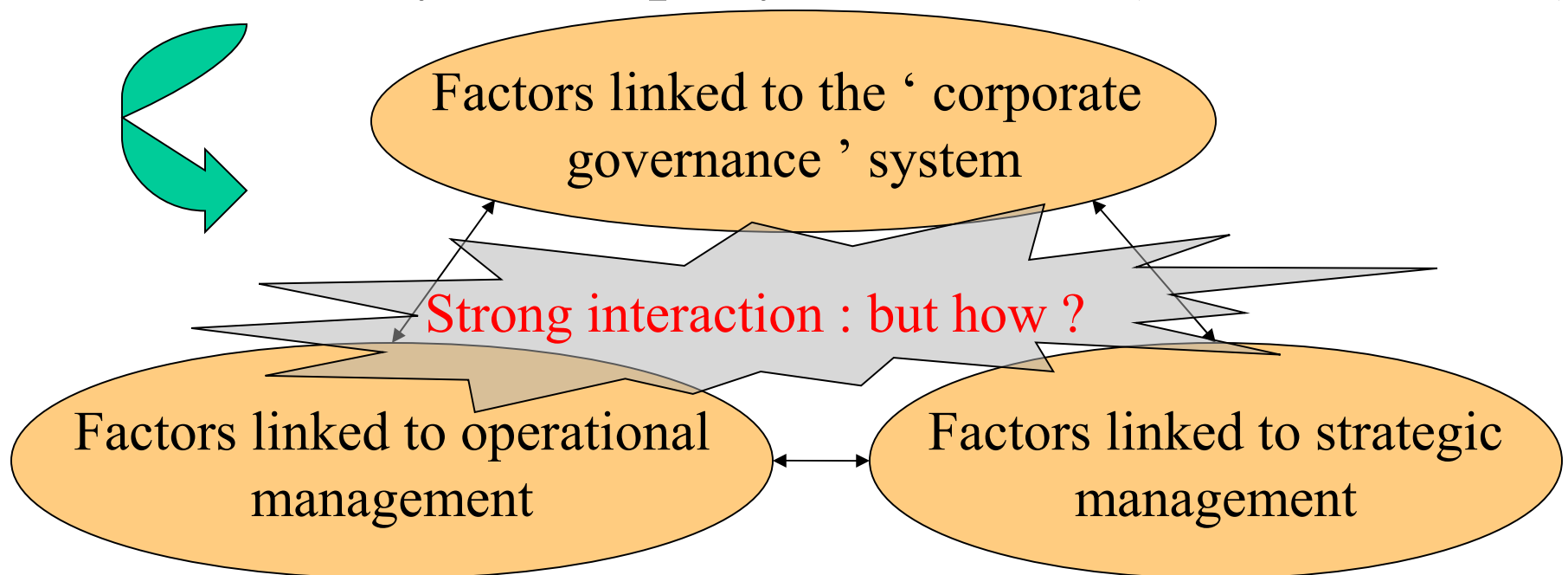# Estimating the risk of business failure : the organizational approach

- Most bankruptcy prediction models are derived on an ad hoc basis, with little theoretical underpinning

☞ Most of the research on bankruptcy is based rather on **positive statements**, using inductive reasoning against empirical evidence, than on **normative statements**, using deductive reasoning to develop statements reflecting some grounded theoretical approach of the phenomenon

Estimating the risk of business failure : the organizational approach

- Argenti (1976) is the first author to consider that the most important explanatory factors of corporate collapse have to be found **inside the company**, in the person of the managers and in the inappropriate management processes they implement inside the company

- These weaknesses in the structure of a firm and in its management allow changes in its macroeconomic environment and the occurrence of ' normal business hazards ' brings a firm to crisis

- It's thus difficult (impossible) to predict / to prevent a bankruptcy if the observer is not an insider or a member of its close environment

Estimating the risk of business failure : an organizational approach

- Many authors explore then the micro-aspects depicted by Argenti : they identify clusters of managerial factors explaining the symptomatic reasons why a company has failed (not the causes)

Factors linked to the ' corporate governance ' system

Strong interaction : but how ?

Factors linked to operational management

Factors linked to strategic management

Estimating the risk of business failure

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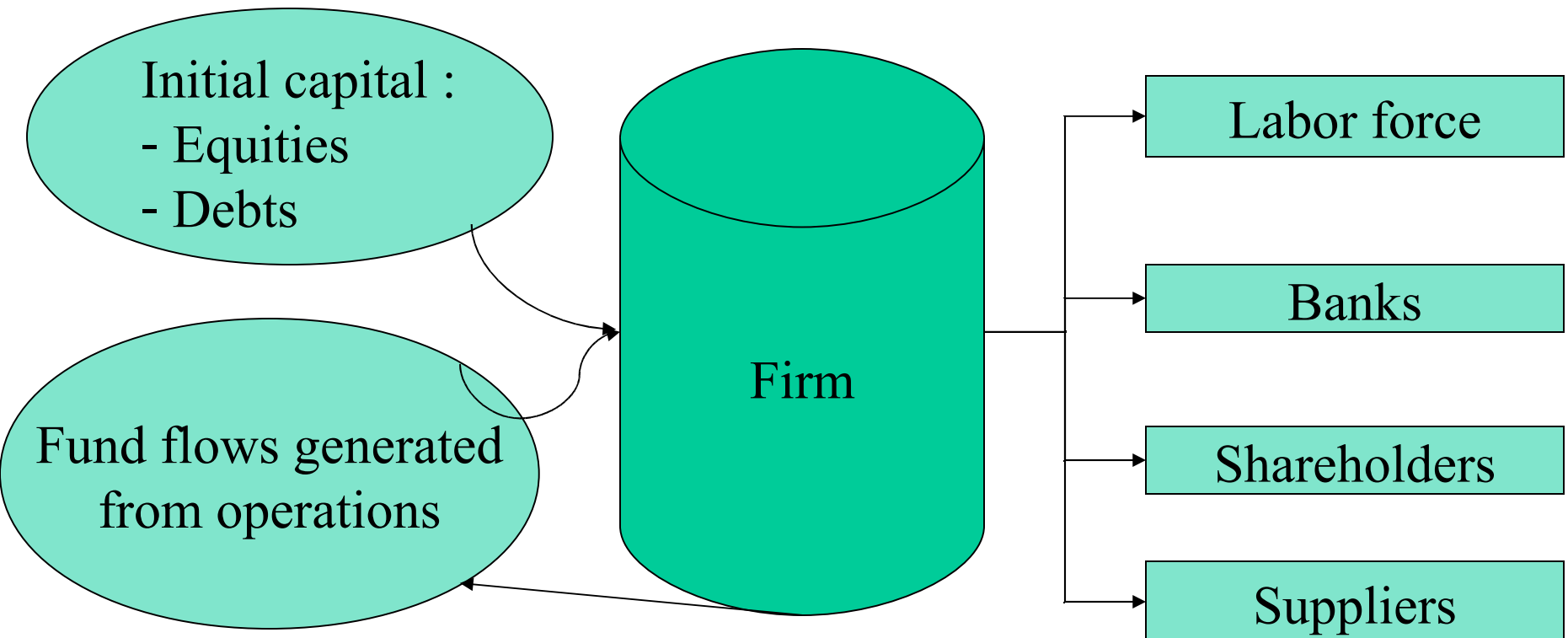# Estimating the risk of business failure : a financial approach

- As most observers don't have access to inside information on how a firm is managed and how it will develop in the near future, researchers have focused their attention on financial information disclosed by private companies :
    - This information is credible, due to legal and regular audits by professional external firms
    - This information is more and more often public, easily and almost costless available

Estimating the risk of business failure : a financial approach

- These researches are usually classified into two categories :

  - Fund flow approaches, based on the fund flows generated by the company's normal activities

  - Multivariate approaches, integrating the four traditional financial dimensions used by financial analysts (liquidity, solvency, profitability, efficiency)

Estimating the risk of business failure : a financial approach

- **Beaver (1966) and the fund flow approach** : the firm is a pool of liquid assets which is drained and fed by the activities of the firm

Initial capital :
- Equities
- Debts

Fund flows generated from operations

Firm

Labor force

Banks

Shareholders

Suppliers

Estimating the risk of business failure : a financial approach

➔ four proposals :

    ❶ the larger the reservoir, the smaller the probability of failure

    ❷ the larger the net liquid asset flow from operations (i.e. cash flow), the smaller the probability of failure

    ❸ the larger the fund expenditures from operations, the greater the probability of failure

    ❹ the larger the amount of debt held, the greater the probability of failure

➢ A firm without treasury or liquidity cushion and / or unable to create self-financing fund flows may fail, soon or later !

• If all was already said on bankruptcy prediction at that time ? Is an univariate approach sufficient to predict corporate bankruptcy ?

Estimating the risk of business failure : a financial approach

- **Altman (1968) and the interaction between some key financial indicators**
  - ➔ Altman proposes a multivariate approach of business failure
  - ➔ Using discriminant analysis, he validates a linear predictive model associating five key financial ratios
  - ➔ A balanced capital structure, long-term investment largely financed by long-term resources, a strong ability to self-finance activity with retained earnings, a good turnover of assets, and important operational earnings are factors that characterize wealthy firms

➔ It's now possible to accurately measure the risk of business failure : research is then focused on the estimation of the risk of credit (a credit-risk perspective)

Estimating the risk of business failure
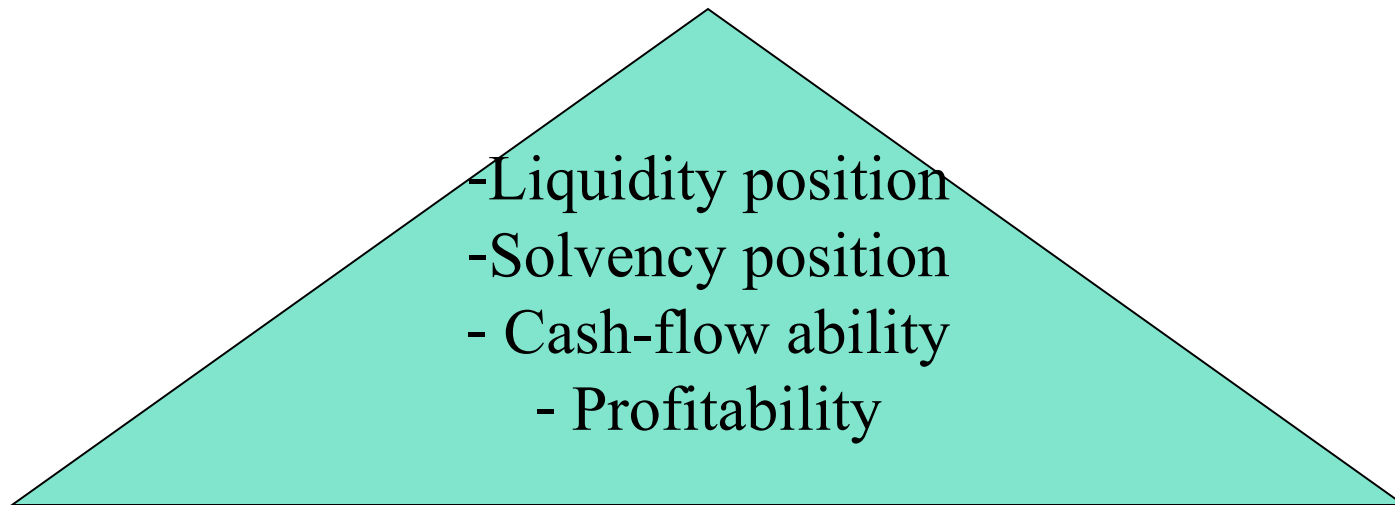
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Estimating the risk of business failure : identifying failure paths

- Current research (Laitinen, Van Wymeersch, ...) is now turning to a more global approach, focused on a global environment perspective : if we want to prevent a bankruptcy and if we want to avoid its dramatic economic, social and financial consequences, we must learn **how (and not only why)** a company fails (the true causes and not only the symptoms) !

- The dynamics of the failing process and the identification of multiple and different failure paths, contingent to both internal and external conditions (still to determine) are the forthcoming research themes. **But how to do that ?**
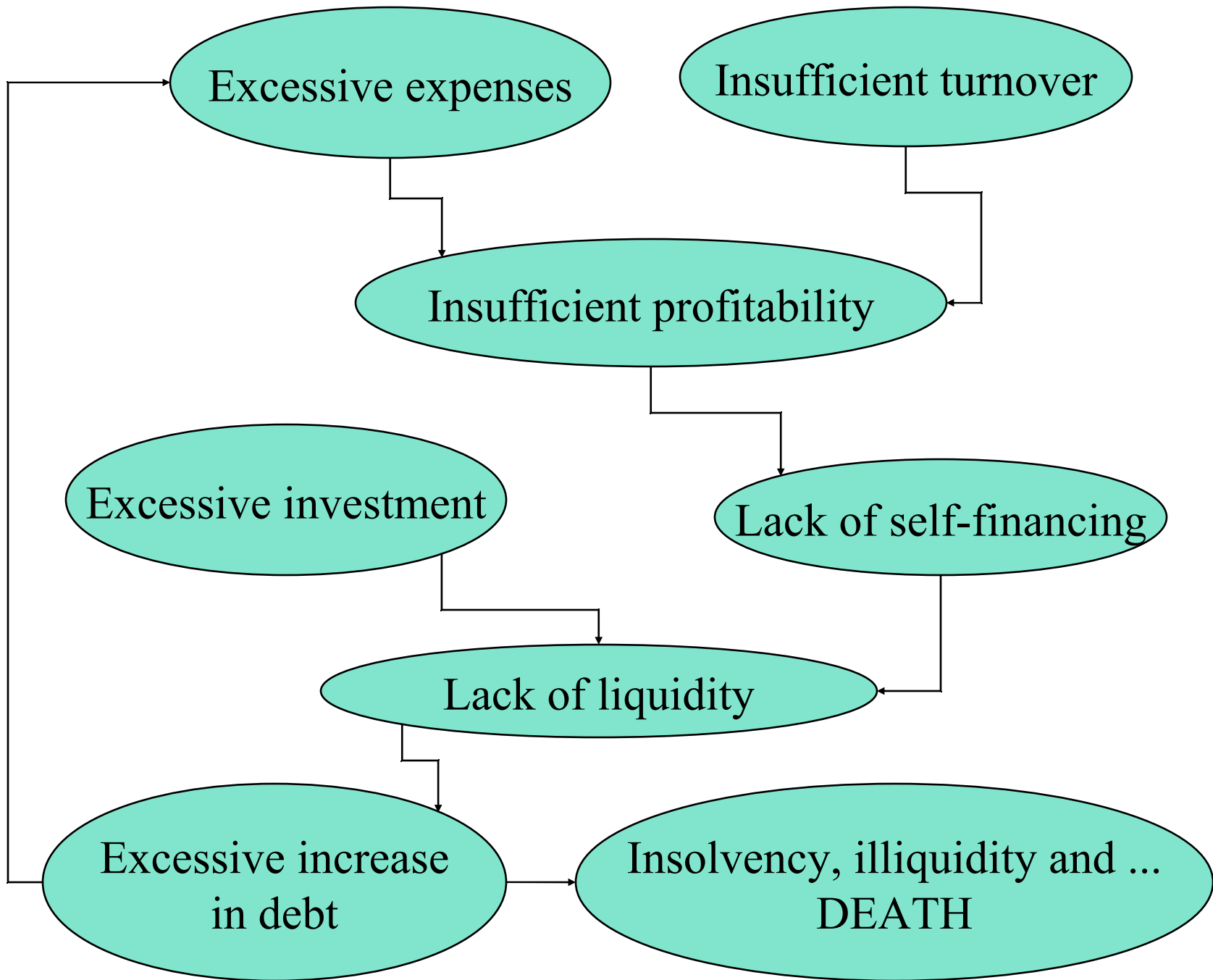
Estimating the risk of business failure : identifying failure paths

- If we postulate that financial data are still the most credible, objective and available data, we have to deepen two financial conceptual approaches :
  - The pyramid of financial ratios and its internal interactions

-Liquidity position
-Solvency position
- Cash-flow ability
- Profitability

- Added-value creation
  - The theoretical failing path which directly results from this pyramid :

The Failing Path, a financial dynamic approach

Excessive expenses

Insufficient turnover

Insufficient profitability

Excessive investment

Lack of self-financing

Lack of liquidity

Excessive increase in debt

Insolvency, illiquidity and ...
DEATH

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How to use statistical and mathematical techniques ?

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Positive theories of corporate failure: which methods ?

- The most widely applied methods used to develop business failure models are usually classified into three main categories :

    - Univariate models, based on the statistical analysis of some key financial ratios

    - Multivariate models, based on multivariate data analysis methods applied to a set of key financial ratios (ideally independent)

    - Iterative models, combining some weighted explanatory variables to separate failing from non-failing companies

Positive theories of corporate failure: an univariate approach

- **Principle** : the analyst examines a series of variables (usually financial ratios) one-by-one and determines if their behaviour (distribution) is significantly different amongst failing firms and non-failing firms

- **Conceptual problems :**
    - Which benchmark to use against which to compare a ratio : what's a "good" value for each ratio ? (contingency problem)
    - Most financial figures relate to a legal rather than to an economic entity :
        - Activities within diversified companies are pooled : how can we then get a "true and fair view" of each economic activity ?
        - Accounting and fiscal legislations let "a space of freedom" to implement accounting measures
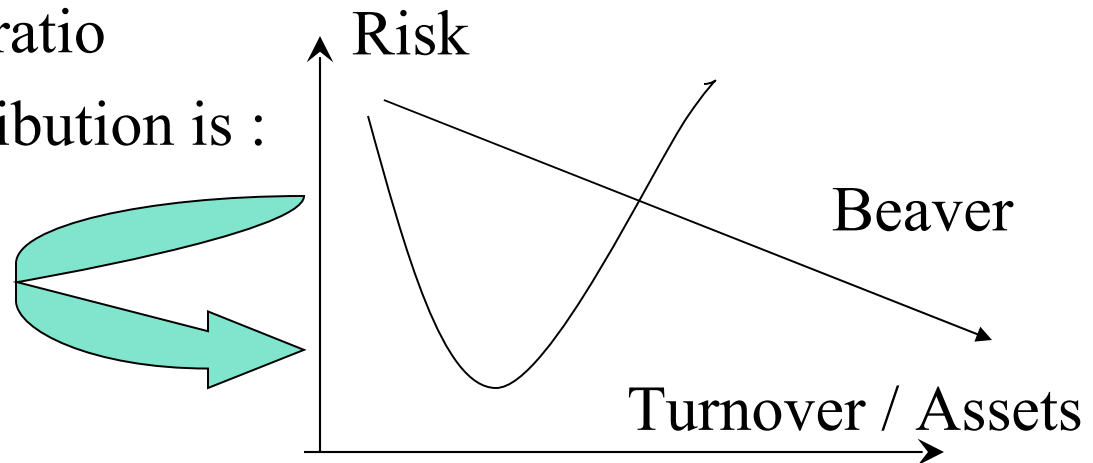
Positive theories of corporate failure: an univariate approach

- **Statistical problems linked to the nature of financial ratios (these problems are also present in most multivariate approaches)** :

  - There are strong communalities and interrelationships between financial ratios, due to strong links between the different financial dimensions they reflect (cfr. Pyramid of ratios)

  - Most statistical distributions of financial ratios tend not to be symmetric (thus not normal, while the assumption of normality is strong to may implement such an approach)

  - The means and distributions of particular ratios tend to vary considerably between industries and between different sizes of firms operating whitin a same sector, while samples of firms used to implement such approaches are almost always global samples (from multiple industries)

Positive theories of corporate failure: an univariate approach

– Such an approach makes an implicit assumption of linear proportionality, which doesn't reflect most often any financial reality :

- Ex. : Turnover / Assets

- Univariate approach (Beaver, 1966) : a non-failing firm maximizes this ratio

- In fact, the distribution is :

Risk

Beaver

Turnover / Assets

The optimum appears when Turnover and Assets are at an equilibrium point depending on the size of the firm and on its industry

Positive theories of corporate failure: a multivariate approach

- **Principle :** The status of a potential bankrupt/non – bankrupt company is determined on the basis of multiple variables, mostly financial, whose linear simultaneous interactions are explored

- The most frequent techniques which are used are :
  - Multiple discriminant analysis, despite the fact that most of its underlying statistical requirements are frequently violated, if not tested at all (equality of variance-covariance matrix, multi-normality of financial ratios, ...)
  - Logit or probit regression (on large samples) and its refinements (multilogit models, marginal or incremental logit models, rolling logit models where the dependent variable score of the preceding year's model is an explanatory variable for the current period...)

Positive theories of corporate failure: a multivariate approach

- **Some particular conceptual problems :**

  - The potential inadequacy of the control and validation procedures effectively used : most models are "sample specific" due to the use of matched pairing techniques (inconsistent with the true proportions of failed/non-failed companies in the different economic sectors) and due to the pooling of data over time

  - Most of these models are willing to "predict" failure N years before bankruptcy, just like if companies were "black boxes" unable to take corrective decisions : the dynamics of the business failure process and interactions of financial ratios with qualitative variables reflecting a managerial ability to take corrective decisions are largely neglected (with the notable exception of some "survival models")

Positive theories of corporate failure: some iterative models

- Various iterative (or search) procedures have been used to develop some multivariate models :

    - Credit scoring techniques, associating both qualitatives and quantitatives variables, have largely been used, mainly in bank environments (most are built with trial-and-errors procedures)

    - Recursive partitioning has been used to search for the best combination of weighted explanatory variables which best separates failing from non-failing companies, with lags between explanatory data and failure becoming more and more important (☞ insolvency is initially due to value creation problems)

Positive theories of corporate failure: some iterative models

- Neural networks procedures and artificial intelligence are also explored, but complex interactions between so-called "hidden" variables don't allow an easy and meaningful interpretation and thus a significant use for managers

- Most of these models are data-driven models and too few papers are questioning which are the failure patterns that derive from these empirical representations

What kind of data do we need ?

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What kind of data do we need ?

- Exploration of pure financial data with multiple different statistical or iterative techniques has conducted, during the last four decades, to a strong knowledge of the financial symptoms announcing a potential bankruptcy

  - Cross-sectional analysis on different periods of time before bankruptcy have allowed to understand where potential true causes may be found

  - It's now reasonably credible to accurately predict if and when a company may fail (in a zero-action hypothesis)

What kind of data do we need ?

- To go further in the comprehension of the dynamics of the business failure process and to depict the probably multiple failure paths through which a company may pass (thus if we adopt a normative approach of the phenomenon), it's now necessary :

  - To gather comprehensive data banks, associating both qualitative variables, reflecting strategic and operational managerial decisions, and quantitative variables, especially the financial ones (as a result, panel data are promising)

  - To explore techniques used in panel data analysis, to depict the true dynamics of the business failure process

Conclusion

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Conclusion

- As a conclusion, is it still possible to say something interesting to managers in the field of business failure prediction while using mathematical or statistical techniques ?

- Surely, because we still don't know much on how a company fails and on the true origin of failure paths : in a normative approach,

  - There are certainly characteristics linked to the industry sector, to the origin of the company or to its size

  - There are certainly characteristics linked to the person of the owner or to the managers of the firm

Conclusion

- In a context where a normative approach of the phenomenon of business failure process develops, the current question are thus more than ever :

  – Which methods for which data ?

  – At which cost ?

  – With which reliability ?

  – **With which links with the different normative approaches of this process ?**