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Financial statement analysis and insolvency forecast models:
a proposal for local firms

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Abstract

Understanding in time premonitory signals of a distress situation and taking actions to get out of these situations are financial management primary targets. Numerous contributions in accounting and finance have presented a plethora of studies about the Insolvency Forecast Models (IFMs) based on a statistical approach especially discriminant analysis, logit and probit techniques. The main issue sometimes seems to be that statistically meaning variables are not so meaningful in accounting.

The aim of this paper is to estimate construction and verify an IFM based on an alternative statistical approach to the discriminant analysis techniques. A specific model, descriptive and predictive, was developed to analyze the economic and financial conditions of the firms, comparing them with a reference group, through the financial statement analysis. The business distress was studied through financial statement ratios and through successive analysis of their distributions. Two fundamental dimensions were taken into consideration: the economic one (like profitability and growth) and the financial one (liability, capital structure, liquidity).

The use of these two dimensions allowed to develop a graphical system in which it was possible to appreciate the positioning of every firm considered and their economic and financial situation. Moreover, a comparison among the firms was done in a static and dynamic context, in order to evaluate the changes in the financial risk and default likelihood.

1. - Introduction

Understanding in time premonitory signals of a distress situation and taking actions to get out of these situations are financial management primary targets and in this perspective scholars and practitioners have contributed with the definition of a plurality of insolvency forecast models (IFMs). These approaches incorporate several disciplines ranging from accounting (Beaver, 1966), to statistics (Krzanowsky, 1988), from finance (Altman, 1968, 1993) to banking management (Basel Commission on Banking Supervision, 2001) and are

used in order to give a rating to the companies, to lend funds, to manage investor relationship activities.

The importance of IFMs was recently recalled in the content of the new Basel 2 agreements which, among numerous initiatives, turn greater attention to one more analytic determination of the default risk and its relative probability[1]. This happened also through IFMs and the rating systems developed inside the credit institutions. Such a possibility represents therefore an important opportunity for scholars and consultants, in order to elaborate approaches towards the local business, developing a series of *ad hoc* models accordingly to the different characteristics of the bank customers.

In this paper the first results about an empirical study will be explained. The aim of this paper is to estimate construction and verify an IFM based on an alternative statistical approach to the discriminant analysis techniques. In particular, using the financial statement analysis, a specific model, descriptive and predictive, was developed to analyze the economic and financial conditions of the firms which were studied, comparing them with a reference group. The analysis was managed with a static approach and also with a comparative approach, examining therefore the firms positions for a period of time and also for a time lag.

The structure of this paper is as follows. In the next paragraph I will do a quick IFMs literature review, in section 3 the model and in particular its estimation procedure its construction and the research hypothesis will be explained. In paragraph 4 the applications of the model and the results will be presented while in paragraph 5 the main conclusions and future research lines will be evidenced.

2. - Literature review

Numerous contributions in accounting and finance have presented a plethora of studies about the IFMs based on a statistical approach (especially univariate and descriptive methods). These studies do not have forecast objectives; they want to identify a difference between "healthy" firms ratios and "anomalous" firms ratios. The main hypothesis of these studies is that you can research and see the preliminary aspects of an insolvency condition in the dynamic of ratios, through a financial statement analysis. Among the most famous works in this field the studies of Smith (1930), Fitz Patrik (1932), Ramser e Foster (1931), Wall (1936), Merwin (1942), Tamari (1966) can be quoted, and finally the Beaver's empirical study (1966). Beaver demonstrated that healthy firms ratios and anomalous firms ratios were strongly different in the previous years to the insolvency events. Moreover, this difference increases approaching the insolvency period.

From 1968 IFMs studies showed a notable evolution in terms of research methodology and scientific severity after the Altman's empirical researches (1968). His studies represent a basic turning point in IFMs approaches which separate literature in univariate studies and multivariate surveys (using the discriminant analysis). The author uses, for the first time in

[1] Basel Commission on Banking Supervision [2001].

accounting, the discriminant analysis technique applied to financial ratios implementing a rating system to discriminate healthy firms from anomalous firms through a statistical function[2]. The Altman's model represent a milestone in IFMs researches and it is used nowadays by banks and rating agencies.

After 1968, the IFMs studies and researches developed in Altman's same direction, using statistical methodology and the discriminant analysis technique. Some studies wanted to verify and comment Altman's results (Altman, 1971; Deakin 1972; Edmister 1972) using a sophisticate approach and very analytical models (Blum, 1974; Elam, 1975; Libby, 1975; Altman, Haldeman, Narajanan, 1977; Taffler, 1982; Altman - Lavalle 1981; Lincoln, 1984)[3]. At the same time a new tendency of studies born in the international context, proposed non-parametric models, based on the causes analysis and on the symptoms explanation of the insolvency (Argenti, 1976). Other studies used the Recoursive Partitioning Algorithm (Frydman, Altman and Kao, 1985) or the neural network and the genetic algorithm (Coats-Fant, 1992)[4].

In Italy the first study about IFMs was done by Alberici (1975) who applied the discriminant analysis technique corroborating Altman's and Beaver's same results for the Italian firms. However, the Alberici's model does not have a previsional validity because it has not been verified on a specific sample. Further Italian researches were produced by Appetiti (1984), Cascioli-Provasoli (1986), Forestieri (1986), Mantoan-Mantovan (1987), Bozzolan (1992), who developed a series of models accompanied by numerous empirical surveys using a prevalent statistical approach (discriminant analysis, principal components, etc.).

However these models (Italian and foreign) are often built with a strong mathematical severity but sometimes statistically meaning variables are not so meaningful in accounting.

In fact a part of the accounting doctrine in Italy have studied the IFMs with a non statistical approach implementing conceptual framework based not only on the financial ratios analysis and their validity in a forecast way, but also on the qualitative aspects like environmental dynamics, strategic situations and business compositions. In this view the works of Coda (1975; 1977; 1984), Cattaneo (1976), Brunetti-Coda-Bergamin Barbato (1974), Cappelletto (1983), Gabrovec Mei (1984), Guatri (1986), Previti Flesca (1986), Brunetti-Coda-Favotto (1990) can be considered belonging to a particular accounting branch.

3. - The Model: estimation, hypothesis and construction

The main objective of this research is to identify a specific set of ratios (brief but exhaustive) in term of profitability and financial structure and to find an opportune procedure of analyses able to completely expose the conditions of the analysed enterprises.

[2] See Altman [1968].
[3] For a complete literature review and for a summarized description of the studies see Barontini [2000], Comuzzi [1995], Teodori [1989].
[4] See Barontini [2000].

The phenomena of business distress were studied in such a way that it considers also the complexity of the business activity and the external comparisons.

The research project presented here is an IFM based on a statistical approach as an alternative to the discriminant analysis techniques. The model has been estimated to a sample of 66 small local firms, mainly located in the province of Forlì-Cesena (Italy) and operating in the mechanical industry. Specifically, in order to create the sample, it has been focused on two groups of firms: the first one is the "healthy" one (without any relevant problem) and the second one is the "anomalous" one (wich will result bankrupt in the year 2000).

Exhibit 1. – The economic and the financial conditions of the esteem sample (1998)

		Sales	Asset	employees	ROI	V/CI	D/CI	D/V	OF/V	Liq.	IMASA
Healthy firms	*average*	€ 6.862	€ 6.073	44	9,9%	1,46	79%	0,61	2,6%	0,93	2,67
	median	€ 3.868	€ 2.884	28	8,3%	1,31	82%	0,62	2,2%	0,74	1,46
Anomalous firms	*average*	€ 4.610	€ 5.853	44	3,8%	0,84	88%	1,23	5,3%	0,63	1,11
	median	€ 3.226	€ 5.745	47	4,6%	0,78	90%	1,10	5,2%	0,55	0,82

Legenda

ROI	*Return on investment*
V/CI	*Asset turnover*
D/CI	*Debt ratio*
D/V	*Debt intensity*
OF/V	*Interest on sales*
Liq.	*Acid test*
IMASA	*structural margin*

The esteem sample was composed of 49 healthy firms and 17 anomalous firms. The two groups of firms have shown homogeneous features in terms of revenues, capital and employees (see exhibit 1). However, you can see relevant differences between the healthy firms and the anomalous firms in the profitability ratios and in the financial structure indicators[5].

In order to carry out appraisals of the economic and financial situation of the firms, comparisons to the other members of the industry in which the firm operate should be completed. This because financial ratios are not totally meaningful if extirpated from the external context. The economic-financial problems that are reflected on the value of the ratios will be therefore visible also in their distribution of frequency. The enterprises with low profitability performances or patrimonial imbalances, compared with a homogenous group of reference, will show ratios of inferior value and therefore they will be placed in

[5] Levelling criteria were not realized between the two groups of firms. The sampling has been effectuated as follows::

- sampling of healthy firms;
- sampling of anomalous firm (control sample);
- data collection: from 1997 to 2000.

the first quantils of their frequency distribution. On the contrary, the ratios of companies in good economic-patrimonial conditions will placed in the advanced quantils.

Consequently, reasoning in these terms, the values of anomalous firms ratios compared with those of the healthy firms, should rank, for the greater part, in the inferiors quantils of their distribution. These hypotheses of work have led to the development of a model of scoring based on a system of comparison between company and reference group through a graphical analysis of positioning.

During the period 1997-2002 a set of financial ratios about all the firms included in the sample was analysed, in order to estimate the model. In particular, for data collection problems, the estimation period was reduced to 1997-2000 and the first year is 1998. A group of ratios has been selected to briefly but effectively describe the econimic and financial condition of the firms through a subjective approach which consists of these criteria:

- *relevance in literature*: many authors have shown that, in the previous years to the insolvency events, there are considerable differences between healthy firms ratios and anomalous firms ratios. Moreover, these differences increase approaching the insolvency period (see also exhibit 1). Furthermore, literature review has indicated the more efficient ratios in the category of liquidity, solidity, profitability and growth[6].
- *No redundancy*: many ratios can be a linear transformation of other pointers. Therefore the model does not consider more ratios for the same phenomena.
- *Policy free financial statements*: the ratios in the model must not be (should not be) impacted from windows dressing policy and management discretionality.

Having to estimate and to reduce the business complexity to a limited number of ratios I chose to consider the management in its two fundamental dimensions: the economic one and the financial one. Therefore, the state of distress is not only appreciated in reference to the debt level but also considering profit, growth, solidity and liquidity. It was preferred to proceed choosing the explicative variable using a qualitative approach and then verifying the combinations through an empirical validation. After these considerations, the main variables of the models were[7]:

a) Free cash flow / Sales;
b) Revenues growth rate;
c) Coverage (EBITDA / Financial interest)
d) Return on investment (ROI);
e) ROI growth rate;
f) Return on sales (ROS);
g) Debt ratio (Debt / Total assets);
h) Debt intensity (Debt / Sales);
i) Liquidity ratio (Acid test);
j) Interests from liability on sales (Interest / Sales);

[6] See Altman [1968], Beaver [1966].
[7] Numerous experiments with different ratios have been effectuated. The ratios in the list maximized the effectiveness of the model (see *infra* section 4) and the distance between healthy firms and anomalous firms.

k) Structural hedge (Long terms liability + equity / Fixed assets).

To facilitate the comparison and the time and space investigation the ratios selected have been standardized this way[8]:
consider an indicator I for which M = max(I), m = min(I). To the aim of obtaining an indicator (I*) that:

- it assumes pertaining values belonging the range [0,1] in correspondence, respectively, to the min and max of I;
- it maintains the order of the units determined from I and the relative distance with reference to I;

the following transformation is adopted:
for directed pointers, higher is better (e.g. profitability),

$$I^* = \frac{I - m}{M - m}$$

and for inverse pointers, higher is worse (e.g. debt ratio)

$$I^* = 1 - \left[\frac{I - m}{M - m} \right]$$

Such a mechanism of conversion maintains an ordering directly proportional between the standardized ratios dimension and the level of the represented result. The standardized ratios can be compared among firms. They respect the original data order and, which is more, they are not influenced by outliers, which is different from the averages approaches.

The ratios selected have been standardized to their variation field and then split and distributed in decil statistical classes and determining therefore ten classes of belongings. This procedure was chosen to the aim of exceeding appraisals based on average values and therefore easy to influence from the sample characteristics and observation errors.

Subsequently, every value of a single indicator obtained by applying the standardization rule has been weighted based on the number of the decil class in which it was placed (from 1 to 10). The logical explanation in such approach is the following:

the standardized ratio value is emphasized to second its positioning in the distribution, that is in relation to the fact that it is placed in the first or in the last decils, with one consequent difference in the accumulated relative frequency. Standardized indicators, which assume a value next to 0 (therefore of low result), will be weighted with inferior decils compared to the respective distribution. Consequently the moltiplicative effect will be higher for standardized indicators with values next to 1 (better performance) and therefore they will put in the higher decils.

The summation of the standardized indicators weighed with their statistical class supplied two macro indicators (about the economic and the financial dimension) to estimate

[8] See Piccolo [2000].

a system of scoring for the firms in the sample. In particular, I proceeded building two distinguished levels of scoring: the first one including profitability, cash flows and growth ratios (SP, profitability score), the second one concerning variables of capital structure, liability and liquidity (SD, debt score). These two score indicators (standardized as above) were inserted in a system of Cartesian axes and created a position matrix based on two quantitative dimensions: profitability-growth and financial structure.

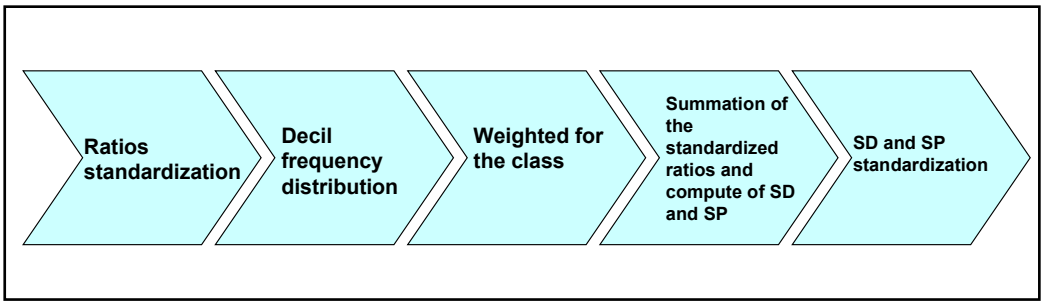
The analytical formulation is as follows:

[1] $$SP = \sum_{i=1}^{n} I_i^* \cdot p_i \qquad \text{with} \quad p \in N[1;10]$$

[2] $$SD = \sum_{i=1}^{n} I_i^* \cdot p_i \qquad \text{with} \quad p \in N[1;10]$$

In SR the ratios from a) to f) have been included (see the previous list in the text) while in SD the remaining indicators have been inserted.

Figure 1. – Statistical process



The data intercrossed in the matrix give a vision of every positioning of a single firm observed regarding the sample, prescinding however from average values and therefore from infuences of outliers. The positioning of the firms derives from the ratios values observed and standardized, weighted with the decil in which they ranked. The structure of the model finds foundation in the ratios distribution frequency (Chart 1).

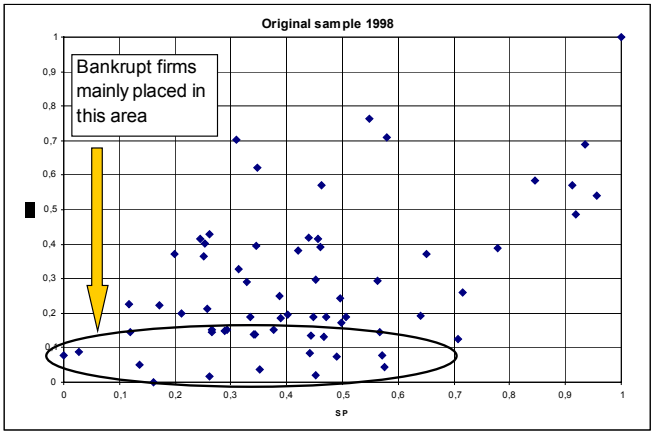
The appraisal carried out through the two score indicators has allowed to judge the financial and profitability situations of every single observed firms and therefore their position regarding the reference group. The matrix analysis has allowed to explain the economic and financial conditions of the firms studied and then the position as to the other firms in the sample. Insolvency risk was evaluated through a benchmarking approach. In fact, a different position in the matrix involves a different situation in the economic and financial variables and a different insolvency risk. It was observed and verified that the anomalous firms were placed in the lower zone of the matrix for all the years evaluated (1997-2000); viceversa good firms were placed in the upper area.

The graphical presentation of the matrix identifies a system of scoring in which every firm receives two scores about the economic and the patrimonial-financial situation. The

condition of the firms is estimated using these two dimensions and appreciating the positioning regarding the others. The anomalous firms have been placed in the inferior zone of the matrix, distinguishing themselves clearly from the healthy one and this phenomena has been observed along all the esteem period (see chart 1).

The model has been estimated for the year 1998 (two years before the bankruptcy events), then the results and the effectiveness have been tested during the esteem period (1997-2000). The observation of the empirical results shows that financial structure indicators are more useful to discriminate healthy companies from anomalous ones as reported in literature studies[9].

Chart 1. – Graphical distribution of the firms (esteem sample, 1998)



Analyzing the graphical distribution of healthy and anomalous firms in the matrix, in the two years previous to the failure (1998 and 1999), a parting value was searched which made it possible to classify correctly the two groups of firms (healthy *vs* anomalous) on the base of the empirical observations and to delimit a possible safety zone and a theoretical distress zone. Such a value, as a result of empirical tests and experiments, has been characterized in which that it is able to maximize the total discriminatory effectiveness of the model (classifing healthy firms as healthy and anomalous firms as anomalous) and consequently minimizing the allocation error.

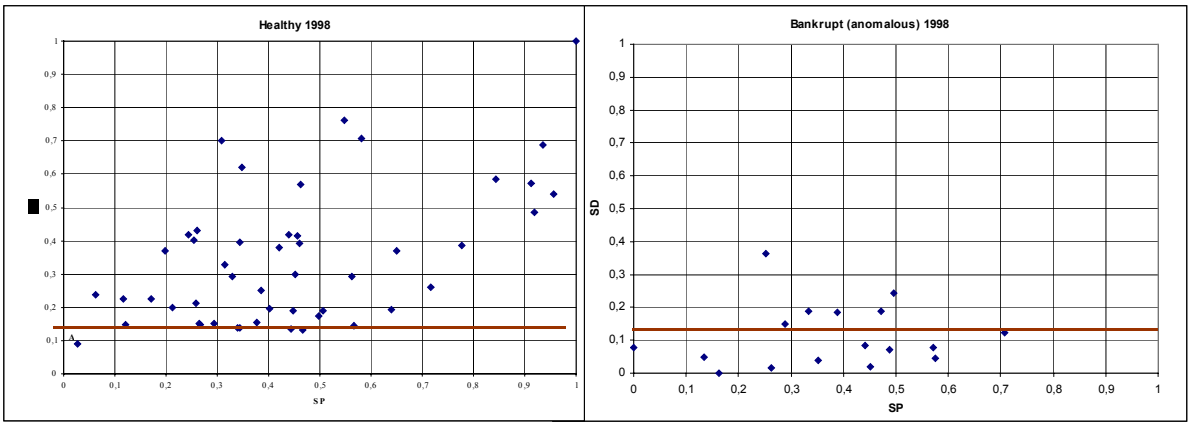
The parting value, therefore, has been determined in 0,131 on SD axis. You can see that the firms distributions have shown a discontinuity long such variable according to the previous studies in literature (chart. 2).

The value of 0,131 divides the cloud of the points in two areas: the higher ones where the healthy firms are placed, the inferior ones where the anomalous firms (bankrupt in 2000) are placed. Such a division assumes important reasoning in a dynamic analysis. The movements of the firms could be survey also in a previsional way, estimating the position changes from one zone to the other.

[9] See again Altman [1968] and Beaver [1966]. See also Barontini [2000], chapters 4 and 5.

The effectiveness of the model was estimated through the parting value for the three years previous to the bankruptcy events, in order to test the correctness of the statistical procedure implemented and the model previsional ability.

Chart 2. – Parting value and differences between healthy and anomalous firms (esteem sample, 1998)



About 1998 (the esteem period) the model has shown a 89% of total discriminatory effectiveness and a 11% of total error (see exhibit 2); a much satisfactory result also comparing it with the previous quoted studies. 98% of the healthy companies have been classified in the correct way, while, about the total of the bankrupt firms, the percentage of correct classification came down to 65%[10]. The first type error (to classify a bankrupt firm as a healthy one) was equal to 35%, while that the second type error (classifying a healthy firm as a bankrupt one) has shown a 2% value. For a credit institution the costs connected to these two errors are different: it is more onerous to grant a loan to a firm that later will become insolvent, rather than not granting it to one that later it will be discovered to be healthy. Consequently the first type error is more expensive (and mainly critical) than the second type error. However, it exists a trade-off between these two errors and it can not be possible to diminish them both.

Discriminatory effectiveness during 1999, a year before the bankruptcy events, was equal to 89%, showing an identical value to one of the previous period (exhibit 2). In this case the algorithm has classified correctly 96% of the healthy companies and 71% of the bankrupt ones, consequently modifying the dimension of the first and second type errors (respectively 29% and 4%).

In the year 2000, the bankruptcy period, the discriminatory effectiveness is increased to 91% and the total error is consequently taken down to 9%. All the healthy enterprises have been classified in the correct mode, while the failed ones have been grouped correctly in

[10] During this period it attracts an attention the fact that Firm A (chart. 3), classified among the anomalous ones but actually healthy, did not go bankrupt thanks to a huge increase of equity, which restored the patrimonial balance.

65% of the cases (exhibit. 2). The increase of the discriminatory correctness is expected when we approach to the bankruptcy events (as reported in literature). Observing the diagrams it is shown that approaching the bankruptcy period, the distance (and the performance differences) between the healthy enterprises and the anomalous enterprises increases, and in the year 2000 the second type error was equal to zero. However, an analysis carried out in the moment in which the crisis is already manifest, does not supply important information for the esteem and for the model previsional ability.

Exhibit 2. – Discriminatory effectiveness of the model

1997									Efficacy	Error
		Model					Model			
		HEALTHY	BANKRUPT				HEALTHY	BANKRUPT		
Observations	HEALTHY	45	4	49	Observations	HEALTHY	92%	8%		
	BANKRUPT	5	12	17		BANKRUPT	29%	71%	86%	14%
				66						
1998 esteem year										
		Model					Model			
		HEALTHY	BANKRUPT				HEALTHY	BANKRUPT		
Observations	HEALTHY	48	1	49	Observations	HEALTHY	98%	2%		
	BANKRUPT	6	11	17		BANKRUPT	35%	65%	89%	11%
		54	12	66						
1999										
		Model					Model			
		HEALTHY	BANKRUPT				HEALTHY	BANKRUPT		
Observations	HEALTHY	47	2	49	Observations	HEALTHY	96%	4%		
	BANKRUPT	5	12	17		BANKRUPT	29%	71%	89%	11%
		52	14	66						
2000										
		Model					Model			
		HEALTHY	BANKRUPT				HEALTHY	BANKRUPT		
Observations	HEALTHY	49	0	49	Observations	HEALTHY	100%	0%		
	BANKRUPT	6	11	17		BANKRUPT	35%	65%	91%	9%
		55	11	66						

Further verifications have been completed for the period 1997, a year before the parameters esteem and three years before the bankrupt declaration. In this case the healthy firms have been grouped like in 92% of the cases, while the anomalous ones have been grouped in 71%. The total discriminatory effectiveness was equal to 86%, with a total error of 14%. It is clear, therefore, that going away from the date of financial trouble the ratios effectiveness decrease, as widely demonstrated by the studies proposed in literature and as reported previously. However, such a tendency informs to us also about the operation correctness of the implemented statistical procedure and about the classification rule.

Moreover from Exhibit 2 you can observe that the first type error appears substantially unchanged in the course of the esteem period. The *a priori* division of the groups does not consider that a part of the bankrupt enterprises in 2000 have been characterized for the time of observation by economic and financial peculiarities not particularly dissimilar from those of the healthy companies. Such considerations become necessary after a careful analysis of the balance sheets of the failed enterprises, which have shown, in some cases, obvious managerial imbalances (profitability, liability, liquidity) while in other situations have marked almost a normal and in some cases not pathological condition.

Business failure does not depend exclusively on the pathological financial conditions. In fact, the bankrupt events are often linked to convenience decisions on the owners and in

greater measure to the loaner. The bankrupt events are also made of subjective aspects, which are not included in business dynamics and which prescind from quantitative measurements and deterministic aspects[11]. Some studies [Argenti, 1976; Coda, 1977] have shown that the primary cause of every business crisis has to be searched in management inefficacy and in managing complexity. This condition involves an insufficient informative system and a inability to fit to the external changes.

The empirical evidence shows that the anomalous firms have been mostly positioned in the left inferior part of the matrix, being characterized by low values of SD and SP. Therefore, a positioning in such area brings to light a problematic economic and financial situation and an high probability to incur, in the short term, in distress situations. The first empirical results deriving from the esteem process seem to manifest a correct discriminatory rule of the model and an efficient previsional ability. However, this result does not want to assume a determinist character. In fact, the positioning assigned by the model has to be interpreted as an alarm bell, a control system for the firm, through which actions will be undertaken in order to avoid further worsening and to lead to an improvement of its situation.

The esteem and construction process has been described. I still have to evaluate if such procedure of analysis can be totally usable and efficient in a descriptive ad previsional way also in different contexts from the esteem sample. I am going to verify the model on a new sample to understand if the results can be useful in the businesses distress forecast.

4. - The model: applications and results

In order to test the hypotheses issue during the esteem and the construction of the model, a verification has been led on a new sample of 28 firms not included in the esteem sample but homogeneous in terms of dimensions, locality and activities, for the period 2001-2002[12].

The model has been applied first of all to estimate the firms static positioning (reported to a single interval of time) and the relative economic and financial condition. Subsequently, the changes happened in the positioning and in the firms performance have been evaluated through a comparative analysis. Comparative analysis consists of comparing the matrices during different years (in this case 2001 and 2002).

4.1 - *The model validation: static analysis*

The verification results confirmed the effectiveness and the correctness of the discriminatory rule. The firms characterized by low performance and operating in strongly

[11] Personal guarantees (by managers or owners) should be considered in lending and score models. These guarantees increase the firm credit ability to prescind from its profitability and modify the probability of default (PD) and the loss given default (LGD). See Basel Commission on Banking Supervision [2001].

[12] 28 new enterprises (not included in the esteem sample) were sampled. Their characteristics are as follows: operating in the mechanical industry, with an average sales of five million Euros, average assets of four million Euros, average number of employees 38.

managerial imbalance contexts have been placed in the inferior part of the matrix. Viceversa, in the higher zone of the diagram the best companies of the sample are shown (in terms of profit and capital structure). In the next few pages the main results of the model applications will be described through a static approach, individually evaluating the firms positioning.

In 2001 the model classified 11 firms (39% of the validation sample) into the distress area (with a SD value inferior to 0,131). Such companies have shown a graphical concentration towards the axes origin of the matrix, showing also low values of SP (see chart 3).

Later analyzing the financial statements of these firms a non optimal economic and financial situation was found and this situation was much worse regarding the other elements of the sample, characterized by low growth, low and decreasing profitability, elevated liability and low liquidity. The positioning matrix shows therefore that in 39% of the considered firms a distress situation could be outlined in the short term (see for example the positions of firms number 6, 7, 13 and 16).

The remaining enterprises do not seem to manifest any particular skirmishes of crisis even if the differences in the positioning have to be carefully considered. The companies marked by number 1, 17 and 21, for example, appear next to the separation frontier and therefore next to the distress area.

They are characterized by different levels of SP. At the same time the best performances of firms 4, 25 and 27 can be noticed, either in relative terms or in absolute value, as verified through the financial statement analysis.

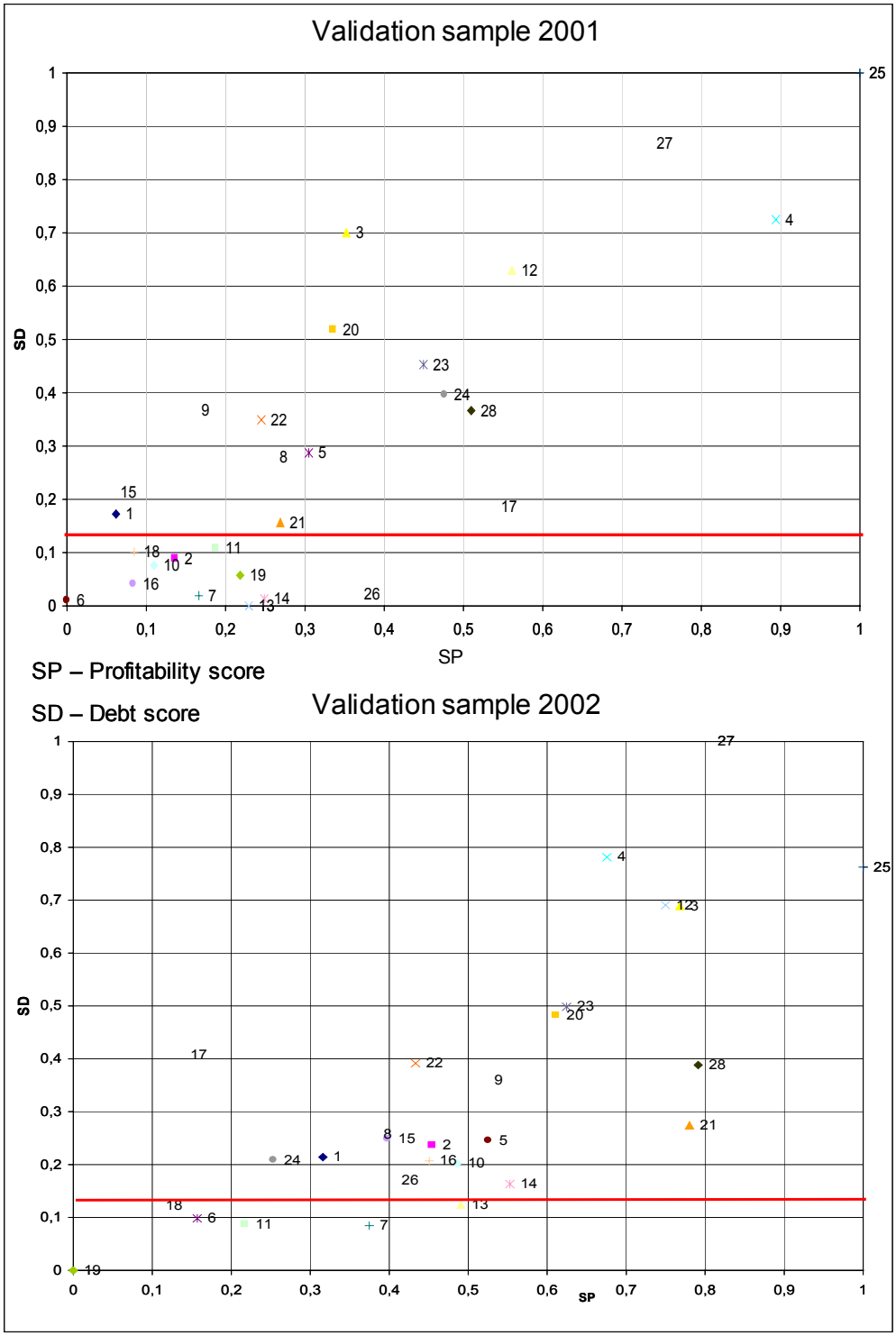
The static aspect of the matrix and the consequent positioning analysis could become useful, for example, during a loan evaluation in which a credit institution can estimate, in relative terms, the firm conditions in order to entrust the loan, carrying out comparisons with other companies about the loans portfolio or about the industry.

The firm positioning evaluation can carry further analysis also through qualitative surveys and meetings with managers and owners. Such aspect, moreover, assumes a determining value as an instrument of strategic control for the enterprises themselves, which can estimate their positioning in comparison with the main competitors using a benchmarking-based approach.

4.2. - *The model validation: comparative analysis*

In the next few pages the main results of the model applications will be described through a comparative approach. The comparative approach consists of evaluating the firms "movements", observing and comparing the matrices in different periods. The firms movements correspond to improvements or worsenings of the economic and financial situation and, hence, of the performance and financial risk (chart. 3). We will proceed, therefore, examining the movements observed in the distress area, in the safety zone and between these two.

Chart 3. – Validation sample: static and comparative analysis



Six firms out of eleven (classified in the distress zone during 2001) were placed in the same area (also partly revealing a tendency towards improvement), while the remaining five manifested a movement towards the higher zone of the matrix, getting out from the distress area. The enterprises marked by number 2, 10, 14, 16 and 26, for example, moved towards the safety zone improving their positioning (chart 3). These firms showed a generalized increment in the profitability ratios (operating, sales, growth), in the coverage ratios, in liquidity ratios and in the structural margin.

The same things happened also to enterprises number 1, 21 and 17, which, in 2001, were particularly near the separation frontier between the two areas. Particularly the companies marked by number 1 and 21 modified their position going away from the line of separation as an effect of these better performances in terms of growth, profitability, margins on sales, coverage of interests, liability level. The firm number 17, instead, went away from the distress zone as an effect of the reduction of its financial debts, with a greater patrimonial solidity and a better liquidity but a reduction of SP has shown.

In the distress area we showed a slight improvement for enterprises number 6, 7, 13 and 18, which approached the frontier but that however still remained in a strongly imbalance situations. These firms manifested remarkable problems linked to the sales growth rate, to the profitability, to the interest coverage and to the patrimonial structure (liability level, patrimonial balance and liquidity) (chart 3).

Firm number 11 showed a slight increment of the profit scoring, however it got worse as far as the debt scoring through a reduction of liquidity ratio and patrimonial composition (structural margin). Firm number 19 showed a worsening of its situation, showing a bad economic and financial situation in terms of profitability, growth and liability level. Considering its positioning into the matrix (at the axes origin) and the hypotheses to the basis of such a model, this firm is likely to incur in events of crisis in the short period unless extraordinary operations (like for example an equity injection) will be done. Completing further surveys, it was verified that such a firm was declared failed in 2003, confirming therefore a result worth the attention and the model forecast effectiveness here showed.

The remaining enterprises classified over of the parting frontier (with the exclusion of number 1, 17 and 21 previously dealt) were characterized by the following dynamics:·

- 43% of these last ones (12, 15, 22, 23, 27 and 28), show a total improvement in positioning with an increment of both score (debt and profit), compared with the previous year. This phenomena can be explain with a generalized increasing of all the financial and economic variables (in particular profitability, coverage ratio, liquidity andiability);·
- an enterprise (number 24) instead manifested a movement towards the inferior part of the matrix, getting its economic and financial situation and its respective positioning worse (decreasing both score indicators). This firm, in fact, reduced its profitability and growth but increased debts and its corresponding financial costs;
- 43% of the enterprises classified into the safety area increased SP (particularly sales margins) and decreased SD (particularly liquidity). However the SD variations were small. The financial structure of firms number 3, 5, 8, 9, 20 and 25 showed a stability

compared with 2001. Anyway, these firms do not raise particular worries because they show high profitability;

- a firm (number 4) has decreased SP (main causes: profitability and growth) but it increased SD (principal causes: liability and liquidity).

Considering therefore the complete validation sample in the year 2001-2002 the following results were shown:

- 61% of the sampled enterprises showed some upgrading in their positioning and a generalized improvement in their economic and financial situation exposed;
- 11% manifested a downgrading of both scores (SP and SD);
- 7% increased SD but reduced SP;
- the remaining 21% increased SP but decreased SD.

Such tendency can be furthermore observed in the different positioning of the data cloud (2002 *vs* 2001) with a distribution which is directed more towards the right part of the matrix.

5. – Concluding remarks

In the present contribution the procedure of esteem, construction and successive verification of an IFM based on an alternative approach to the discriminating techniques was discussed. The business distress was studied through financial statement ratios and through successive analysis of their distributions. Two fundamental dimensions were taken into consideration: the economic one (like profitability and growth,) and the financial one (indebtdness, capital structure, liquidity). The use of these two dimensions allowed to develop a graphical system in which it was possible to appreciate the positioning of every firm considered regarding the reference group. A comparison among the firms was done in a static and dynamic context.

The results seems to confirm the research hypotheses: the positioning of the companies is, in fact, indicative of their economic and financial condition and a different positioning in the matrix involves different managerial orders and financial risks. In particular it was observed that, during the esteem and the validation period, anomalous firms have always been placed in the inferior zone of the diagram. This fact consented to determine a parting value to classify and discriminate the firms through the observations of the empirical data. The matrix was split in two potential areas (distress *vs* safety). The model showed an about 90% classification effectiveness in 1998 and also in 1999, 2000 and 1997.

It must be observed, however, that the judgment expressed on the firms positioning is relative because it depends on the other firms performances. The instruments introduced in this contribution allow to estimate the firm situation (and its dynamics in time) compared to a given group of other enterprises. The introduction of the same one in different reference group could change the positioning and, consequently, the final result. Moreover, both an improvement (graphically evidenced with the matrix) could be emphasized by the inferior performances of the remaining enterprises and a worsening could derive from an advanced performance found in the reference group.

It is clear that the efforts of further surveys, by scholars, managers and credit institutions, must be focused essentially on those firms classified in the lower zone of the matrix or next to the parting frontier. The causes of distress must be studied estimating the tendency and the tenability of the business activity through simulation models and undertaking the opportune corrective actions in order to get out from distress situations. This with the awareness that the model here proposed is a further instrument to evaluate informations and to make more rational decisions.

6. – References

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