

Analysis of the Financial Rigidity of Economic Management and Study of Income and Financial Equilibrium of the Company's Activity. A Measurement of the Synthesis on Company Management Economics: The Financial Flexibility Index.

Erik Giarratana¹

Doctor of Economy and Commerce, Certified Public Accountant, e.giarratana@giarratana-salin.net.

ABSTRACT

In these last few years, the evolution of business markets has stressed the importance of budget strategic analysis as a tool to hypothesize the company's solvency through various calculations and analysis of specific ratios, capable of creating a good level of economy in the business concerned. The work involved includes a synthesis indicator of income and budget dynamics of the company, finding ways to explain the presuppositions and the logic related to the model, the verification of statistics and possible applications in a simulative perspective.

INTRODUCTION

The analysis outlayed in this study is the evolution of the arguments discussed in a previous work² that proposed a measurement of the synthesis of income and budget dynamics of the company's activity. The original idea that brought about the development of the model was the growing emphasis that the balance sheet analysis has received in the last years thanks to the development

¹Doctor of Economy and Commerce, Certified Public Accountant, Professor of Applied Company Finance at the University of Parma, and Secretary of the National Commission of Innovative Finance Accountants and New Horizon Professionals erik.giarratana@studiogiarratana.it

²Giarratana Erik, *Analisi della Rigidità Finanziaria della Gestione Economica. Il Financial Flexibility Index*, *Banche e Banchieri*, gennaio-febbraio 2008, p. 56-70.

of credit worthiness valuation techniques to measure the capacity of economic activity in order to face engagements of financial nature.

The estimate of risk degree of a business can be related to the possibility of the same to last in the market, condition that can be fulfilled if the business activity is carried out guaranteeing adequate remuneration of invested capital that is generally classified in:

- Financial Capital: that which derives from third parties, for example bank or bond debt, whose compensation is done through the payment of a financial commission;
- Physical Capital: available in Fixed and Current form, its return is based on marginality.

Thus a company is destined to last in the market if two conditions are respected:

- the prices of goods/services that are offered guarantee to cover all costs;
- the financial dynamics of the business provide balancing between business needs and financing funds in the short term as well as in the medium and long term.

The fulfilment of both conditions satisfies the concept of management economics that determines the economic convenience of the business.

Durability is therefore a concept that is related in reverse and contrary mode to the risk degree of the company's activity and this is why the models used to hypothesise business solvency are aimed at individualising the fundamental principles of correct management; in practice the valuation schemes of company risk, although in different modality and ponderance, tend to consider the same aspects which are:

- profitability;
- the covering of financial costs;
- capitalisation grade;
- debt level.

The objective of the work presented is the illustration of the development of a measure of synthesis capable to contextually represent profitability and financial equilibrium, fundamental elements of management economics, through an explanatory approach sub-dividable in four main parts:

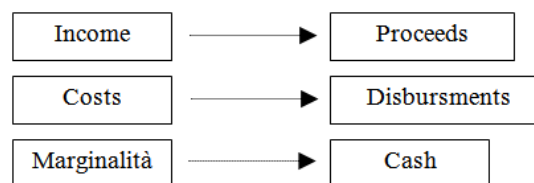
- understanding the presumptions of the model;
- assimilating the basic logic;
- verifying statistical data;
- determining possible applications.

PRESUMPTIONS OF THE MODEL

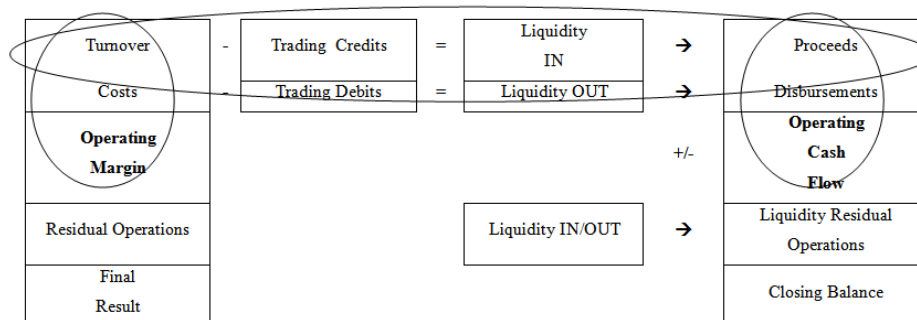
The fundamental assumption of the analysis is the comprehension of the way

in which liquidity is generated or absorbed in conditions of management normality; the concept of normal management goes back to economic activity that recuperates productive resources to then transform them, giving them their inherited value and successively replacing them in the market at a price composed in accordance with capital engaged; thus the concept of management normality excludes those atypical activities like leasing, insurance, finance, credit recovery or rental companies for which the core business is not characterised by the usual mechanisms of purchase and sale.

The traditional company dynamics with effect on liquidity, considering from the type of activity carried out, tend to be the same for all the companies and can be traced back to operating activity and therefore to the cash cycle of sales and payment of purchases in order to then be successfully completed by the effect of encashment and disbursements derived by residual operations. Specifically:



If a single accounting period is considered company liquidity can then be determined:



The second presumption necessary for the comprehension of the model and individualisation of a specific classification of costs; the doctrine and common use has always proposed and applied precise subdivisions, for example in relation to:

mode of attribution:

- direct costs: costs directly attributable to the product/service;
- indirect costs: costs attributable to the product/service via driver mechanisms;

behaviour:

- variable costs: costs proportional to the quantity produced;
- fixed costs: costs that do not depend on sales volume;

effect on liquidity:

- monetary costs: costs with a direct effect on company cash;
- accrued costs: costs attributed to the accounting period they relate to but that do not have an effect on cash.

An ulterior classification is necessary for the approach proposed, related to:

grade of costs financiability:

- financeable costs: or otherwise costs characterised by financial effects but that because of their nature are granted a certain budget proportion on buying economies;
- non financeable costs: those costs that at the moment of their economic sustainability have the same effect from a monetary point of view.

Because of the costs characteristics, the classification proposed can be brought back to a subset of previous distinctions:

- FINANCIABLE COSTS: variable costs → monetary costs;
- NON FINANCIABLE COSTS: fixed costs → monetary costs.

From reading the accounts the subdivision can be applied as follows:

- financeable costs: costs for raw material and services as unique costs of variable nature deriving from the analysis of accounting data and the only users of the doctrine and from the process of calculating suppliers' rotation;
- non financeable costs: costs for personnel, leased assets, expenses different from operational and financial costs; such elements represent costs of a generally fixed nature and that have an immediate impact on company liquidity. According to this logic, amortisations which have exclusive numerary and non monetary effect are excluded from the definition. Further on these costs will be referred to as Fixed Out Cash or Fixed Costs.

DEVELOPMENT OF THE MODEL

The starting point of the analysis is the representation of how operating liquidity is generated within an accounting period, thus:

$$1. \text{Cash} = \text{Net Operating Cash} - \text{Fixed Out Cash}$$

There are two elements of the formula:

- Net Operating Cash equal to:

2. N.O.C. = Turnover – Receivables from Clients – Variable Costs + Payable to Suppliers

and

- Fixed Outcash: or fixed costs.

Note that the formula does not contemplate the impact on budget liquidity since this effect can be quantified indirectly through the occurrence of variable costs; in fact:

- if finished products already in stock are put in the market then the percentage of purchase cost for raw material will be reduced for sales that have maintained their relative cost in prior operations;
- if in fact goods that are already present in stock are utilised in the production process the incidence of raw material will be reduced because of the missing support of relative costs.

The approach thus hypothesised tends to avoid the inference of accounting policies for non real valuation of unsold goods in stock.

Before proceeding it is important to understand that formula (2) can be re-written as a function of turnover since all the important elements considered can be brought back to turnover itself:

- Receivable from Clients: credits granted to clients are calculated as the report between trade credits and daily turnover and therefore reversing the formula and having previously determined the days cycle, trade credits will be equal to daily turnover for the payment days;

$$GG \text{ CLIENTS} = \frac{\text{RECIEVABLES FROM CLIENTS}}{\text{TURNOVER}/360} \rightarrow \text{RECIEVABLES FROM CLIENTS} = \frac{(\text{TURNOVER}/360) \times GG \text{ CLIENTS}}{1}$$

- Variable Costs: can be expressed as a percentage of the same on turnover (Purchase of Raw Material + Cost for Services)/Turnover = β and therefore βR = Variable Costs;
- Payable to Suppliers: can be calculated as the product of daily variable costs and the terms granted by suppliers, such as trading credits;

$$GG \text{ SUPPLIERS} = \frac{\text{DEBTS SUPPLIERS}}{C.V./360} \rightarrow \text{DEBTS SUPPLIERS} = \frac{(\beta R/360) \times GG \text{ SUPPLIERS}}{1}$$

From which:

$$N.o.c. = R - \frac{R}{360} ggclients - R\beta + \frac{R\beta}{360} gg\ sup\ pliers$$

Collecting the components for R is obtained:

$$N.o.c.Coefficient = R(1 - \frac{ggclients}{360} - \beta + \frac{\beta}{360} gg\ sup\ pliers)$$

The elements in brackets represent the angular coefficient of the function of liquidity generated/absorbed by the company turnover. For example: a result equal to 0,35 indicates that for every euro of turnover the earnings, variable costs, encashment and disbursements cycle can generate 35 euro cents in cash.

The formulation constructed this way tends to determine, for example, what are the conditions for which the direct margin can be considered completely cashed within a single accounting period. If we write:

$$N.O.C. = \text{Turnover} - \text{Variable Costs}$$

we obtain:

$$1 - \frac{ggclients}{360} - \beta + \frac{\beta}{360} gg\ sup\ pliers = 1 - \beta$$

carrying out the opportune algebraic simplifications:

$$\begin{aligned} 1 - \frac{ggclients}{360} - \beta + \frac{\beta}{360} gg\ sup\ pliers &= 1 - \beta \\ \frac{ggclients}{360} &= \frac{\beta}{360} gg\ sup\ pliers \end{aligned}$$

thus:

$$\frac{ggclients}{gg\ sup\ pliers} = \beta$$

therefore if the report between client days and suppliers days is equal to the incidence of variable costs the margin will be transformed completely in cash.

Continuing with the model outlay we must be asked when economic management can be considered to be in monetary equilibrium and therefore not have an impact on the financial situation. The answer must be searched for in the development of (1):

$$N.O.C. \geq \text{FIXED OUT CASH}$$

so when:

$$(3) FFEM = \frac{Noc}{FixedOutCash} \geq 1$$

The report between Noc and Fixed Out Cash / Fixed Costs takes the name of Financial Flexibility Economic Management Index and represents the level of Financial Rigidity of Economic Management of a company and can be interpreted as follows:

- if the result is equal to 1: it is a situation of perfect equilibrium in which operations management is capable to supply the financial resources necessary to cover fixed costs without worsening or improving the persisting financial situation; in such situation it is necessary to maintain the sales volume;
- if the result is bigger than 1: it means that the operating cycle is not only capable to guarantee coverage of fixed costs but also to generate monetary surplus which can be used for other company operations;
- if the result is lower than 1: this determines a situation for which operations management does not generate sufficient cash to cover fixed costs and therefore it will be necessary to recuperate financial resources from third parties or via injection of fresh capital by the company;
- finally, if the result is lower than 0: then already capital management is absorbing financial resources.

Now, given that even fixed costs can be expressed as a function of turnover the FFEM formula can be re-written:

$$(4) FFEM = \frac{1 - \frac{ggclients}{360} - \beta + \frac{\beta}{360} ggf\ sup\ pliers}{\%FOC}$$

This formulation tends to comprehend which elements can have a certain effect on the indicator:

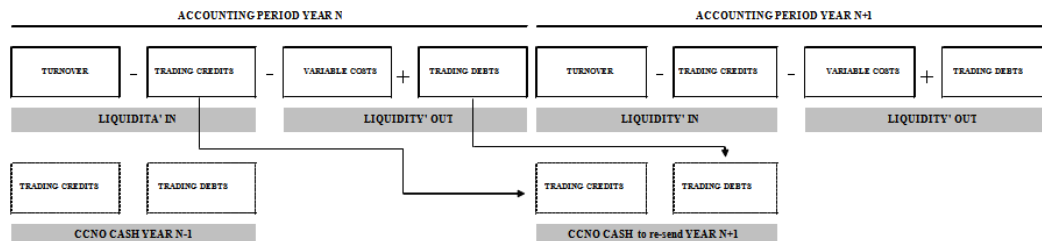
- regarding the numerator there are two factors that can influence the formula: profitability understood as the difference between revenue and variable costs and the capital policies expressed by trade credits and therefore:
 1. $(1 - \beta)$
 2. $-\frac{ggclients}{360} + \frac{\beta}{360} ggf\ sup\ pliers$
- the denominator is instead affected by expenses which are added the increasing negative effect on the indicator and vice versa for the effect on marginality and its cash flows.

Thus the elements that contribute to the final result are:

- client days;
- supplier days;
- variable costs;
- fixed costs;
- and the combinations capable to have the same result can be consequently multiples:

Example 1		Example 2		Example 3		Example 4	
gg clients	60	gg clients	90	gg clients	10	gg clients	150
gg suppliers	120	gg suppliers	60	gg suppliers	150	gg suppliers	239
% CV	65%	% CV	42%	% CV	115%	% CV	65%
% EF	35%	% EF	35%	% EF	26%	% EF	32%
FFEM	1,14	FFEM	1,14	FFEM	1,14	FFEM	1,14

It is necessary to continue with the development of the model but we must also consider the effect on liquidity generated by management of net capital available deriving from the accounting period prior to that in analysis. In fact the index must consider incoming and outgoings deriving from prior management as indicated below:



Therefore liquidity will be calculated as follows:

$$\text{LIQUIDITY GENERATED ACCOUNTING PERIOD N} = \left(\text{TURNOVER} - \text{TRADING CREDITS YEAR N} - \text{VARIABLE COSTS} + \text{TRADING DEBTS YEAR N} - \text{FIXED EXPENSES} \right) + \left(\text{TRADING CREDITS YEAR N-1} - \text{TRADING DEBTS YEAR N-1} \right)$$

The consideration of liquidity deriving from prior year's operation, represents the innovative element of the formulation already proposed by the indicator.

According to this approach the ratios determined in advance must be recalculated.

The NOC Index will be:

(Turnover – Trading Credits – Variable Costs - Suppliers + (Cash Trading Credits Debts Year N-1))/Turnover

While the FFEM Index will be:

$$\frac{\text{Turnover} - \text{Trading Credits} - \text{Variable Costs} + \text{Trading Debts} + (\text{Trading Credits Debts Balance Year N-1})}{\text{Fixed Costs}}$$

If such formulas were to be simplified with regards to turnover it will be necessary to relate the amount of net circulating capital deriving from prior year's operation to the turnover of the year under analysis as shown below:

$$\text{CCNO Amount prior year} = \frac{ggclients}{360} - \frac{\beta}{360} gg \text{ sup pliers}$$

Note that the elements have opposite signs from formula (4) since the credits and debits at year end passing on to the next year will have the opposite effect and will be respectively cashed or paid. Now, since the formula proposed has been written as a function of the current year's turnover, in order to insert the amount from prior year, the effect on liquidity must be considered not anymore with regards to 1 but to 1 plus or minus the variation in the turnover of the two years considered and thus:

$$\frac{\frac{ggclients}{360} - \frac{\beta}{360} gg \text{ sup pliers}}{(1 + \Delta R)}$$

Following this approach the new formulations will be:

$$(5) N.O.C.Index = (1 - \frac{ggclientsN}{360} - \beta + \frac{\beta}{360} gg \text{ sup pliers}N) + (\frac{\frac{ggclientsN-1}{360} - \frac{\beta}{360} gg \text{ sup pliers}N-1}{1 + \Delta TURNOVER})$$

$$(6) FFEM = \frac{(1 - \frac{ggclientsN}{360} - \beta + \frac{\beta}{360} gg \text{ sup pliers}N) + (\frac{\frac{ggclientsN-1}{360} - \frac{\beta}{360} gg \text{ sup pliers}N-1}{1 + \Delta TURNOVER})}{\%EF}$$

In formulas (5) and (6) the financial dynamics are thus represented:

Absolute Values	-	Trading Credits year N	+	Trading Debts year N	+	Trading Credits year N-1	-	Trading Debts year N-1	= variation CCNO
Formula	-	$\frac{ggclientsN}{360}$	+	$\frac{\beta}{360} gg \text{ sup pliers}N$	+	$\frac{ggclientsN-1}{360}$	-	$\frac{\beta}{360} gg \text{ sup pliers}N-1$	= variation CCNO

This allows the simplification of the formula as follows:

$$(7) FFEM = \frac{1 - \beta + \omega}{\%EF}$$

Where w is equal to the variation of Net Circulating Capital on Turnover.

In order to understand the logic presented so far, a numerical example is offered. Accounting data from the following company has been considered:

ASSETS			LIABILITIES			Income Statement				
	YearN-1	YearN		YearN-1	YearN		YearN-1	YearN	Fi%	Fi%
Receivables from Clients	9.375	10.417	Payable to Suppliers	10.991	12.769	Revenue	45.000	50.000	100,00%	100,00%
Stock	16.736	19.306	S. term bank loans	12.342	12.008	Raw Material	32.567	37.568	72,37%	75,14%
Current Assets	26.111	29.722	Current	23.333	24.776	delta stock	-1.345	-2.570	-2,99%	-5,14%
			Liabilities			Consumed	31.222	34.998	69,38%	70,00%
Imm. Immaterial	500	375	ML Term Bank Loans	5.000	4.500	Costs for Services	7.000	8.400	15,56%	16,80%
Imm. Material	5.000	4.400	Consolidated	5.000	4.500	Variable Costs	38.222	43.398	84,94%	86,80%
Fixed Assets	5.500	4.775	Share Capital	2.000	3.278	Contribution Margin	6.778	6.602	15,06%	13,20%
			Yearly Earnings	1.278	1.943	Personnel	1.800	1.800	4,00%	3,60%
			Net Assets	3.278	5.221	Leasing	1.200	700	2,67%	1,40%
Total Assets	31.611	34.497	Total	31.611	34.497	Different Op. Expenses	750	400	1,67%	0,80%
			Liabilities			Immaterial Amm.	125	125	0,28%	0,25%
						Material Amm.	1.100	1.100	2,44%	2,20%
						Total Fixed Costs	4.975	4.125	11,06%	8,25%
						Operating Revenue	1.803	2.477	4,01%	4,95%
						Financial Costs	525	534	1,17%	1,07%
						Yearly Profit	1.278	1.943	2,84%	3,89%

	YearN-1	YearN
gg clients	75	75
gg suppliers	100	100
% CV	87,9%	91,9%
% EF	9,50%	6,87%

The Noc Index on an annual basis will be equal to:

$$\text{Noc Index} = (50.000 - 10.417 - (37.568 + 8.400) + 12.769) / 50.000 = 12,77\%$$

The same can also be calculated as:

$$\text{Noc Index} = 1 - (75/360) - 91,9\% + ((91,9\%/360) \times 100) = 12,77\%$$

Let's now consider Fixed Costs as well:

Personnel:	1.800
Leasing:	700
Other operational costs:	400
Financial Charges:	534
Total Fixed Costs:	3.434

that as a fraction of turnover are equal to 6,87%.

The FFEM on an annual basis will be therefore equal to:

$$\text{FFEM} = \text{NOC}/\text{EF} = 12,77\%/6,87\% = 1,86.$$

The value of FFEM shows that operational management on an annual basis is capable to generate cash inflow necessary to cover the financial requirements determined by fixed costs.

If we also consider the effect of capital deriving by the previous year's operation the new index will be:

$$\text{Noc Index} = ((50.000 - 10.417 - (37.568 + 8.400) + 12.769) + (9.375 - 10.991)) / 50.000 = 9,53\%$$

And therefore FFEM will be equal to 1,39.

Returning to the simplification proposed in (7) the variation of Net Circulating Capital w related to trading credits and debts will therefore be calculated as:

$$(-10.417+12.769+9.375-10.991) = 1,47\%$$

and so FFEM will be equal to:

$$FFEM = \frac{1 - \beta + w}{\%EF} \text{ or otherwise } (1 - 0,919 - 0,0147)/0,0687 = 1,39.$$

The arguments outlayed to the indicator at the level of financial rigidity of economic management can be re-assumed in a financial accounting scheme in order to reconcile the variation of net financial position excluding the effect of unsold stock. The following scheme is proposed:

Current Liquid Assets Statement					
	Year N-1	Year N	Adjustments	Result	Fi%
N.O.C.	Revenue			50.000	100,00%
	Receivables from Clients	10.417		10.417	20,83%
	Raw Material			37.568	75,14%
	Cost for Services			8.400	16,80%
	Payables to Suppliers	12.769		12.769	25,54%
	Pure Operating Liquidity			6.384	12,77%
	Credits/Debts in the prior year			-1.616	-3,23%
	Overall Operating Liquidity Balance			4.768	9,54%
Fixed Costs	Monetary Costs				0,00%
	Personnel			1.800	3,60%
	Leasing			700	1,40%
	Different Operational Costs			400	0,80%
	Financial Costs			534	1,07%
	Total Monetary Costs			3.434	6,87%
	Real Cash Flow			1.334	2,67%
Residual Operations	Variation Fixed Assets				0,00%
	Immaterial Imm.	500	375	125	0,25%
	Material Imm.	5.000	4.400	600	1,20%
			immaterial ammort	125	-0,25%
			material ammort	1.100	-2,20%
	Tot. Variation Fixed Assets			-500	-1,00%
	Changes in Own Equity				0,00%
	Net Assets	3.278	5.221	1.943	3,89%
			Year Profits	-1.943	-3,89%
	Tot. Changes in Own Equity			0	0,00%
	Overall Liquidity Balance			834	1,67%
	Final Check				
	Capital from Thirds	17.342	16.508	834	

Financial Flexibility Index

The final step to complete the synthesis of management economics and to calibrate the FFEM index through a stabilising mechanism developed considering the characteristics of company indebttness, aspect which has not yet been considered and the process that has been decided to be applied is that of an algebraic procedure in order to give emphasis to FFEM given a certain composition of funds and reserves; the concept used has been that of financial autonomy understood as:

$$\left(1 - \frac{PFN}{TotalAssets}\right)$$

The sense of such measurement is the following:

- if the Net Financial Position is equal to Total Assets the company's financial autonomy will be equal to 0 and the capital invested will be composed exclusively by equity of thirds;
- vice versa if the Net Financial Position is zero the grade of financial autonomy will be 100% and the company will exclusively use its own equity for the management of business.

The product between FFEM and the grade of Financial Autonomy takes the name of Financial Flexibility Index and represents the measurement of total synthesis on the risk degree of the business.

For motives of algebraic nature, the formula needs a subdivision in relation to the initial sign of FFEM Index as shown below:

- if it is positive:

$$FFI = \frac{1 - \beta + \omega}{\%EF} x \left(1 - \frac{PFN}{TotalAssets}\right)$$

- if it is negative:

$$FFI = \frac{1 - \beta + \omega}{\%EF} x \left(1 + \frac{PFN}{TotalAssets}\right)$$

The formulation aims to determine an effect on FFEM index given a certain level of total indebttness:

- multiplying by (1- PFN value) the FFEM Index value will be confirmed per company in absence of financial debt or reduced by the quote relative to net financial position. In case there is no debt and in fact there is presence of financial availability, the FFEM index will be improved given the algebraic impact of a negative PFN;
- if the FFEM Index is lower than 0, the negative effect will be raised adding 1 to the financial position on total assets.

Thus when comparing two companies via financial flexibility of economic management, the fact that the first one may be more indebted than the second

one gets worse, with this last adjustment the overall result will be:

- Company 1 FFEM Index equal to 1,5 and pfn/total assets equal to 80% gives a value of 0,3;
- Company 2 FFEM Index equal to 1,5 and pfn/total assets equal to 50% gives a value equal to 0,75.

STATISTICAL SUPPORT

To confirm the significance of the indicator proposed it has been necessary to verify the informative validity considering different aspects of the trend of indicator with regards to the risk degree determined by rating models and the statistical comparison of ratio behaviour with traditional indicators of the accounts. Such verification work has been carried out using a database of about 50 thousand accounts reports that are summarised in a final work scheme while:

- eliminating the accounts in abbreviated form for which it is not possible to distinguish between financial debt and debt of a commercial nature;
- eliminating idle accounts of the company;
- eliminating the accounts with obvious anomalies;
- eliminating the accounts of companies that do not comply with the concept of management normality as indicated earlier;
- thus we obtained a new sample of 34.218 accounts characterised as follows:

geographically:

Geographic Classification of the Sample		
Region	N. of Companies	Frequency
Lombardia	10.513	30,72%
Veneto	4.011	11,72%
Emilia-Romagna	3.809	11,13%
Piemonte	3.063	8,95%
Toscana	2.366	6,91%
Lazio	2.346	6,86%
Campania	1.548	4,52%
Friuli	938	2,74%
Liguria	771	2,25%
Puglia	755	2,21%
Sicilia	751	2,19%
Marche	737	2,15%
Trentino-Alto Adige	685	2,00%
Abruzzo	498	1,46%
Sardegna	494	1,44%
Umbria	372	1,09%
Calabria	319	0,93%
Basilicata	91	0,27%
Molise	88	0,26%
Valle d'Aosta	63	0,18%
Overall Total	34.218	100,00%

by company dimensions:

Classification by Turnover Class of the Sample		
Turnover	N. of Companies	Frequency
0-4999	16.599	48,51%
5000-9999	7.150	20,90%
10000-14999	4.061	11,87%
15000-19999	2.181	6,37%
20000-24999	1.341	3,92%
25000-29999	716	2,09%
30000-34999	455	1,33%
35000-39999	350	1,02%
40000-44999	290	0,85%
45000-49999	223	0,65%
50000-54999	172	0,50%
55000-59999	150	0,44%
60000-64999	118	0,34%
65000-69999	80	0,23%
70000-74999	82	0,24%
75000-79999	74	0,22%
80000-84999	59	0,17%
85000-89999	48	0,14%
90000-94999	42	0,12%
95000-99999	27	0,08%
Total overall	34.218	100,00%

The sample obtained has been processed as indicated below:

- reclassification of accounts: utilising for the balance sheet re-classification according to the degree of liquidity of funds and reserves, for the economic account reclassification according to the degree of rigidity of costs;
- calculation of traditional indicators of the accounts: from the data have been calculated:
 1. Leverage: the ratio of net assets on total assets;
 2. Acid Test: current assets over current liabilities;
 3. Quick Test: current assets less stock over current liabilities;
 4. Fixed assets coverage: net assets plus medium and long term liabilities over fixed assets;
 5. Roi: operating income over invested capital;
 6. Roa: operating income over total assets;
 7. Gross Financial Position over Turnover;
 8. Financial Charges over Turnover;

9. Return on Invested Capital;
 10. Net Financial Position over total assets;
 11. Financial Flexibility Index;
- application of two rating models³;
 - statistical verification of results obtained.

Once classified the classes of credit rating for the two models of risk analysis applied, the first analysis carried out has been that of verifying which could be the ratios of single indicators and verifying the existing correlation with the pre mentioned classes as shown below:

Class Rating 1	N. Companies	FFI Ratio	FFEM Ratio	N.O.C. Ratio	Leverage Ratio	Acid Test Ratio	Quick Test Ratio	Cop Imm Ratio	Poa Ratio	RoI Ratio	FFN / Tot Assets Ratio	PFL / Revenue Ratio	Revenue / CI Ratio	OF / Revenue Ratio
1	3.549	1.61	1.58	0.44	50.88%	29.26	0.03	0.00	14.55%	8.99%	5.66%	0.11	-0.61	0.96%
2	4.908	1.48	1.50	0.37	40.92%	2.86	1.78	0.02	10.42%	36.60%	-0.20%	0.13	4.81	0.88%
3	4.046	1.35	1.49	0.35	28.71%	2.45	1.40	-0.18	8.24%	25.03%	7.01%	0.18	5.65	1.23%
4	5.704	1.32	1.51	0.30	20.95%	2.25	1.15	0.78	7.11%	56.15%	10.12%	0.20	8.68	1.56%
5	7.069	0.80	1.03	0.24	14.03%	2.63	1.14	0.78	5.37%	-0.39%	22.90%	0.32	1.44	2.09%
6	4.354	0.43	0.69	0.17	9.74%	2.37	1.01	0.59	4.10%	22.59%	28.47%	0.40	7.45	2.56%
7	2.529	0.35	0.62	0.17	7.99%	2.26	0.77	0.59	3.26%	16.71%	28.88%	0.44	6.72	2.93%
8	1.991	0.21	0.49	0.10	6.19%	2.75	0.59	0.99	2.34%	8.33%	30.67%	0.57	-0.40	3.65%
9	2.235	-0.04	0.27	-0.34	2.44%	3.85	0.46	0.47	-1.36%	10.93%	36.43%	4.74	-0.61	55.91%
Overall Total	34.218													
Correlation		-0.98	-0.96	-0.70	-0.95	-0.44	-0.68	-0.14	-0.98	-0.12	0.98	0.63	-0.22	0.59

Class Rating 2	N. Companies	FFI Ratio	FFEM Ratio	N.O.C. Ratio	Leverage Ratio	Acid Test Ratio	Quick Test Ratio	Cop Imm Ratio	Poa Ratio	RoI Ratio	FFN / Tot Assets Ratio	PFL / Revenue Ratio	Ricavi / CI Ratio	OF / Ricavi Ratio
1	2.999	1.55	1.47	0.36	30.86%	3.84	2.41	-2.23	22.58%	299.75%	-7.88%	0.04	57.68	0.61%
2	1.561	1.45	1.44	0.32	31.25%	4.03	2.44	-0.78	14.70%	52.32%	-1.75%	0.06	9.70	0.59%
3	2.686	1.39	1.37	0.31	30.20%	3.65	1.93	0.26	11.52%	35.94%	1.98%	0.08	7.95	0.70%
4	4.694	1.15	1.27	0.29	26.30%	2.81	1.71	-0.44	8.12%	22.91%	8.29%	0.12	5.75	0.87%
5	7.509	0.94	1.15	0.25	21.69%	4.16	1.89	0.68	5.19%	10.44%	17.21%	0.18	3.95	1.21%
6	4.818	0.75	1.04	0.25	17.96%	4.11	1.67	1.83	3.44%	5.65%	26.70%	0.32	2.10	2.01%
7	3.241	0.60	0.91	0.22	15.99%	4.29	1.37	2.48	1.79%	-4.63%	29.99%	0.50	0.76	3.07%
8	1.460	0.50	0.79	0.24	14.62%	3.78	1.42	1.33	0.25%	-14.16%	29.96%	0.66	-1.26	4.14%
9	3.237	0.31	0.54	-0.80	12.20%	9.19	1.78	1.06	-1.39%	-196.92%	23.71%	3.77	-49.36	41.97%
Overall Total	34.218													
Correlation		-1.00	-0.98	-0.64	-0.98	0.58	-0.82	0.83	-0.96	-0.82	0.93	0.68	-0.81	0.62

The tables show that the average value per FFI class is strongly correlated to the classes themselves, while for the other indicators it is modified in relation to the quantitative aspects considered by scoring models. To confirm that the average value is a representative of the trend of the indicator itself for the risk degree of the analysed structure, it has been preceded with the Analysis of Variation in one Factor⁴ to test that the averages of indicators calculated could be significantly different in every class. The results obtained have been:

³ The two rating models are distinguished from each other by the methodological approach used to estimate the business risk degree. The first one is founded on the statistical model of logistical regression, the second one on discriminating analysis.

⁴ The Analysis of Variation in one Factor consists in verifying the hypothesis according to which the average values of two or more samples extracted by populations with the same average values, are the same. The interpretation of Test F is that the bigger its value the more the averages calculated inside the groups are significantly diverse. For the calculation of such test has been used the instrument of data analysis present in Excel.

	Rating 1 Test F	Rating 2 Test F
FFI	2.685,69	913,17
OF / Income	43,79	34,26
Income / CI	2,30	89,91
PFL / Income	75,74	67,11
PFN / Tot Assets	1.322,04	1.010,28
ROA	701,42	2.351,12
ROI	1,46	43,37
Fixed Assets Coverage	1,23	6,13
Quick Test	122,54	2,26
Acid Test	33,29	3,64
Leverage	5.549,67	432,40

Tests F have determined that the FFI for both models results to be particularly significant:

- for the first model the value of the indicator is according only to Leverage;
- for the second model the FFI represents values inferior only to Roa and to PFN / Total assets.

The validity of FFI is doubled:

- first of all because the statistical test done confirms very good significant values for both models;
- second because the variables that compose the indicator proposed consider the economics of overall company management and not just aspects of it like for the other ratios.

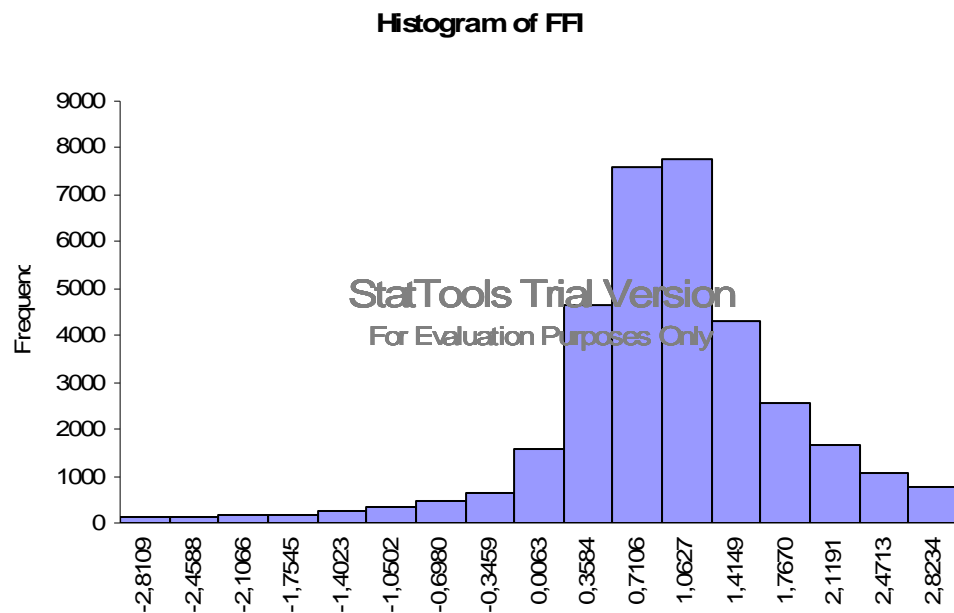
Further on if the behaviour of single indicators is studied through:

- the graphic representation of ratios distribution;
- the application of test on the good will of adaptvity of the single distributions to a normal distribution or a normal distribution accumulated (Test Chi Square and Test Lilliefors⁵).

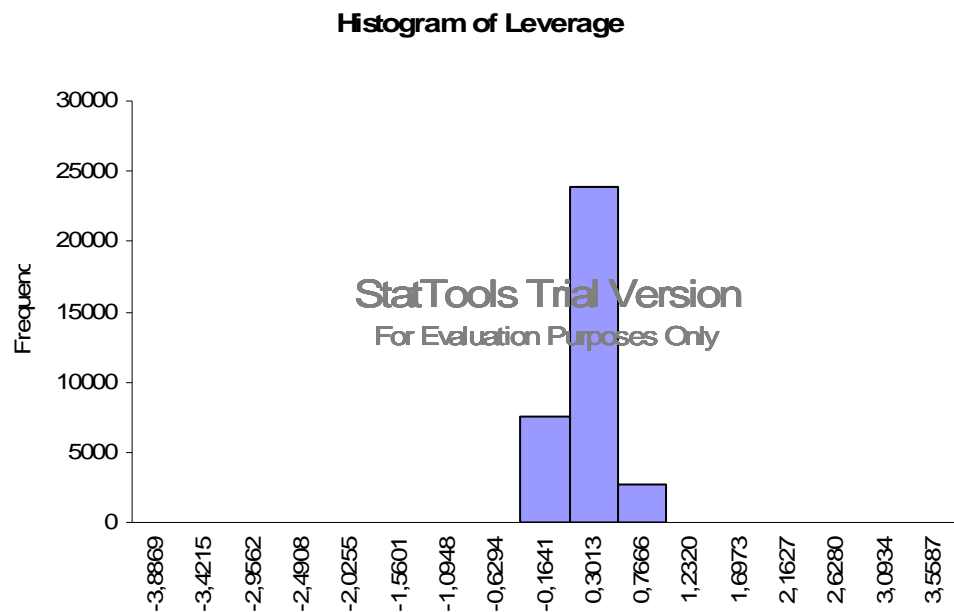
The results obtained by the most significant indicators have been:

⁵Both tests are used to analyze the normality of a distribution and serve to understand if the values assumed from the indicators behave according to normal logic, in other words do not result characterized by abnormal values or concentrated in particular ranges. Test Chi Square measures the adaptation of the distribution analyzed in a normal distribution. Test Lilliefors, derived by the test of Kolmogorov-Smirnov, is founded on the maximum distance between the distribution accumulated observed and that expected. Furthermore the results of both tests tend to go to zero, furthermore the adaptation of the distributions analyzed is good. Both analysis have been done via Stattools 1.1 Professional Edition of Palisade, an Excel component.

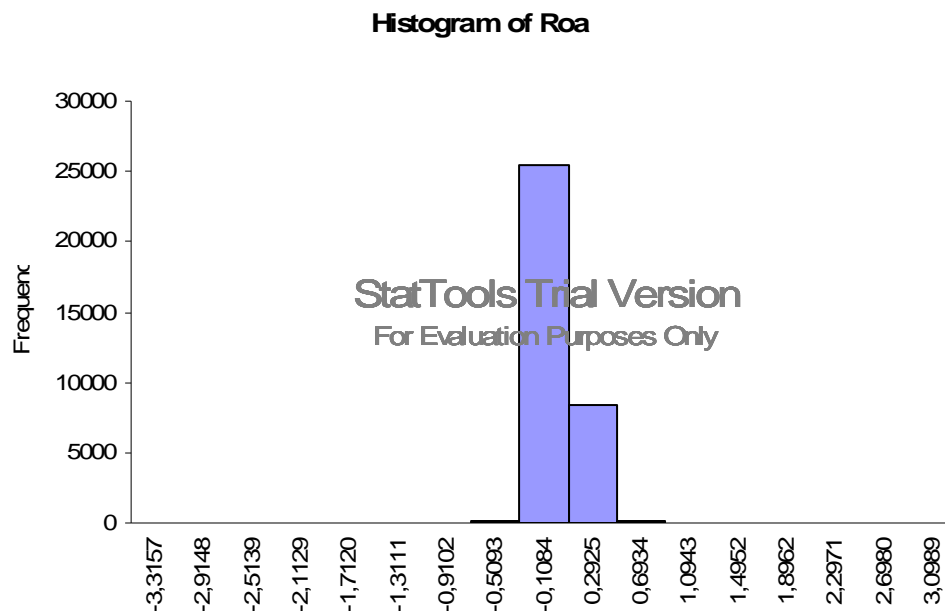
for the FFI:



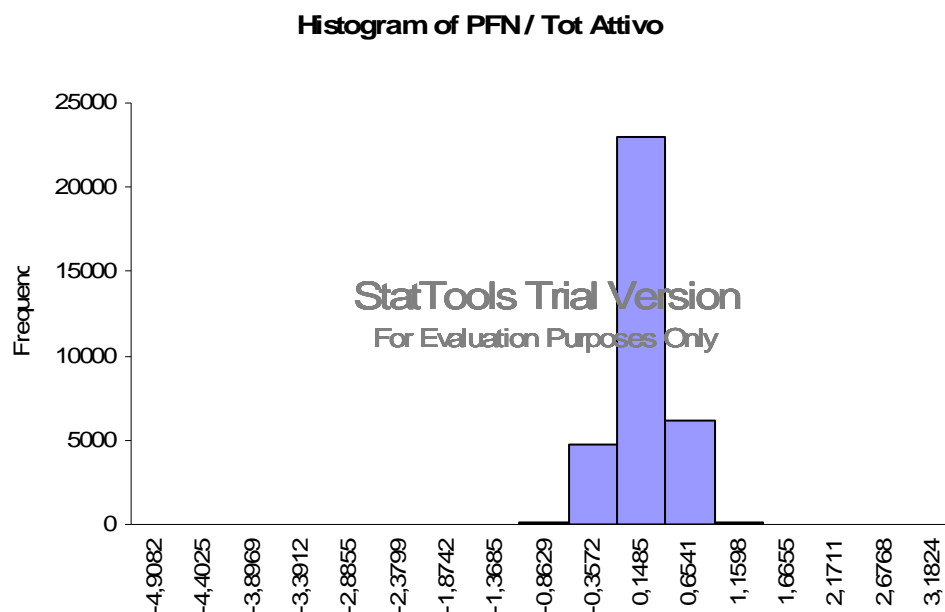
for Leverage:



for ROA:



for PFN/Total Assets:



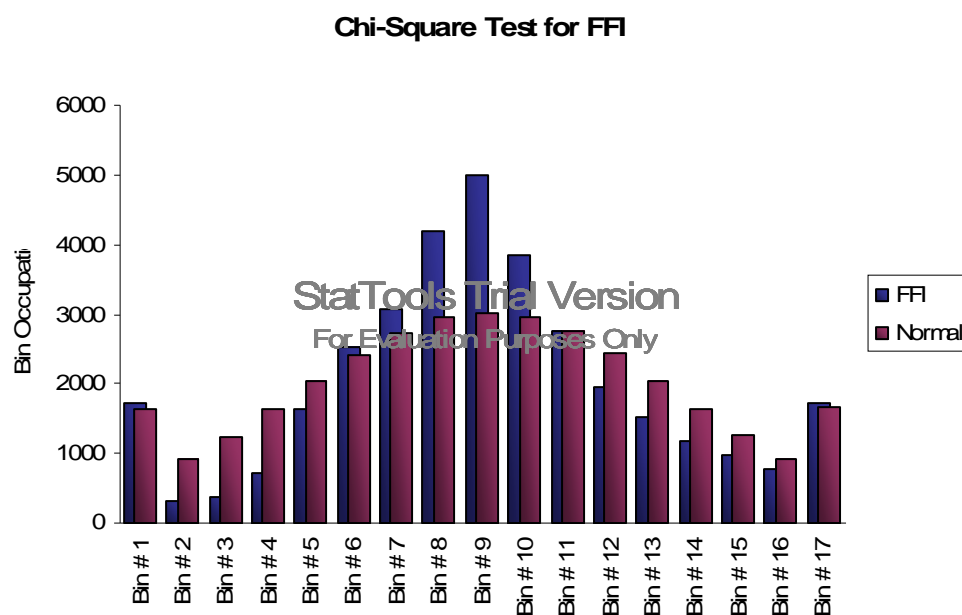
It is obvious that from a graphical point of view, FFI results to be that distributed in the best way.

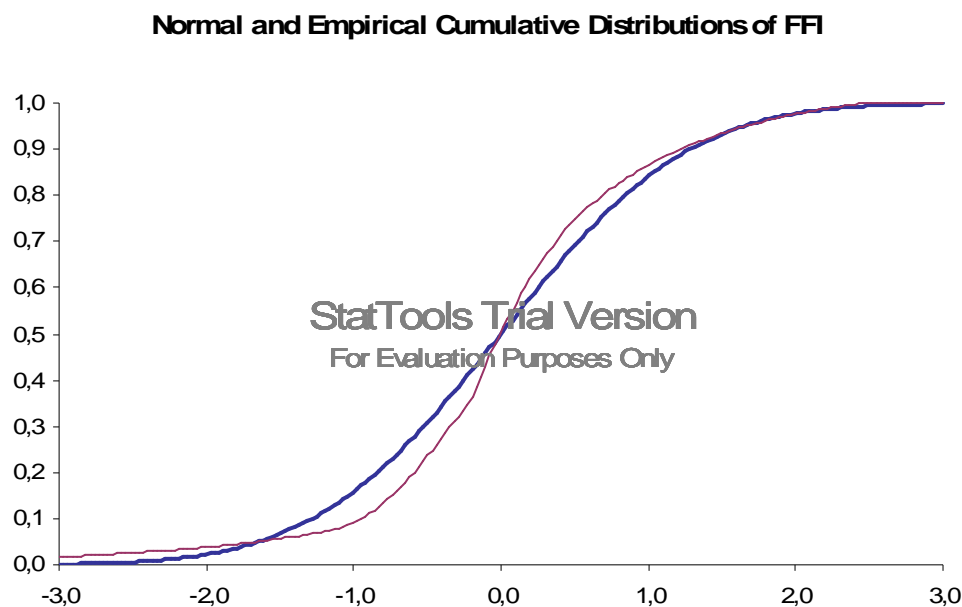
Now, applying the test of good will of adaptation to the single distributions, the values obtained are:

	Test Chi Square	Lilliefors Test
FFI	4.149,18	0,08
OF / Income	2.826.687,54	0,48
Income / CI	1.261.193,43	0,43
PFL / Income	852.175,49	0,47
PFN / Tot Assets	511,54	0,02
ROA	19.428,82	0,16
ROI	1.427.468,19	0,43
Fixed Assets Coverage	381.032,50	0,38
Quick Test	346.611,80	0,44
Acid Test	1.155.980,30	0,47
Leverage	11.657,81	0,12

The values assumed by FFI result to be high only to those obtained by the report of Net Financial Position over Total Assets, but this can also be attributed to the mode of calculation of this last indicator while only in some cases the net financial position is bigger or smaller than total assets.

Graphically the results obtained from FFI have been:





POSSIBLE APPLICATIONS

The logics outlayed aim to effectuate a series of considerations pertaining to different aspects of company management in relation to all the variables that are considered in the indicator. Specifically, the analysis that can be carried out are:

- determination of financial break even turnover;
- calculation of sustainable debt in medium/long term;
- benchmark analysis;
- creation of prospective scenarios via the use of Montecarlo Simulation.

Financial Break Even

One of the fundamental analysis to carry out in FFEM Index is the individualisation of minimum turnover volume that the company must reach to guarantee coverage of fixed costs and therefore secure the financial equilibrium of economic management. Let's consider as an example the company structure represented here below.

Financial Break Even				
	Year N-1	Fi%	Year N	Fi%
Turnover	8.400,00	100,00%	9.500,00	100,00%
Variable Costs	6.790,00	80,83%	7.560,00	79,58%
Personnel	1.000,00	11,90%	1.103,00	11,61%
Matured Leases	300,00	3,57%	250,00	2,63%
Various charges	55,00	0,65%	78,00	0,82%
Financial charges	110,00	1,31%	121,00	1,27%
Total E.F.	1.465,00	17,44%	1.552,00	16,34%
Delta Turnover	13,10%			
gg clients	65	70		
gg suppliers	75	75		
Clients	1.516,67	1.847,22		
Suppliers	1.414,58	1.575,00		
	$1 - \beta$	20,42%		
	ω	-1,79%		
Turnover at Financial Break Even	8.330,60			

Considering its economic and financial characteristics the company is capable to generate cash equal to 19 cents for every euro of turnover. In the presence of fixed costs of 1.552, the minimum volume of sales necessary to guarantee the financial neutrality of economic management is 8.330,60. However, having invoiced 9.500 the company has managed to generate a cash surplus of €217,86.

Sustainable Debt in Medium and Long Term

As previously shown a negative Noc or an FFEM Index lower than 1 indicate that the business needs external financial resources, while positive liquidity creates resources that can be used in other operations. This aims to determine sustainable debt at medium and long term: in fact if we consider the liquidity in excess equal to the rate of re-imbursement of a loan (capital quote + interest quote), it will be possible to calculate the maximum sustainable debt at a certain rate of interest and for a certain time period. As outlined in the following example:

Sustainable Debt in Medium and Long Term				
	Year N-1	Fi%	Year N	Fi%
Turnover	8.400,00	100,00%	9.500,00	100,00%
Variable Costs	6.790,00	80,83%	7.560,00	79,58%
Personnel	1.000,00	11,90%	1.103,00	11,61%
Matured Leases	300,00	3,57%	250,00	2,63%
Different charges	55,00	0,65%	78,00	0,82%
Financial Charges	110,00	1,31%	121,00	1,27%
Total E.F.	1.465,00	17,44%	1.552,00	16,34%
Turnover Change			13,10%	
gg clients	65		70	
gg suppliers	75		75	
Clients	1.516,67		1.847,22	
Suppliers	1.414,58		1.575,00	
$1 - \beta$			20,42%	
ω			-1,79%	
Turnover at Financial Break Even			8.330,60	
Liquidity Surplus			217,86	
Loan Hypothesis				
Years			10	
Rate			7,50%	
Amount			2.178,61	
Sustainable Debt			1.244,92	

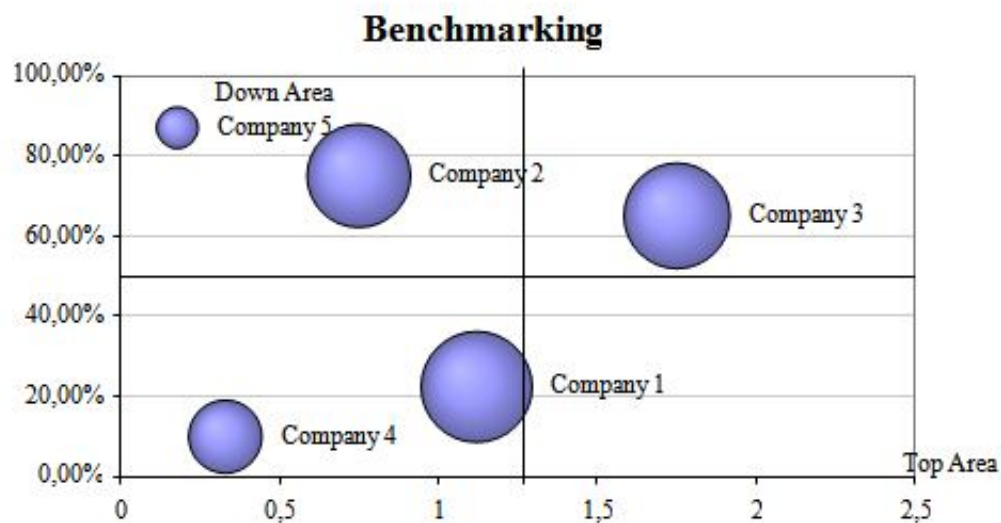
Benchmarking

Another particularly interesting application is that of comparison between company realities, different between them, via the decomposition of the indicator and the related graphic representation. The variables to be considered will be:

- Noc = measure of efficiency of the Sales, Cash, Costs and Expenses Cycle (ordinate);
- % EF = measurement of the financial economic rigidity of the business (excise);
- Financial Autonomy = measure of indebttness level (dimension of the sphere).

In the next example are considered 5 companies with the following characteristics:

Benchmarking			
	NOC Index	% EF	Financial Autonomy
Company 1	1,12	22,33%	75,00%
Company 2	0,75	75,00%	65,43%
Company 3	1,75	65,00%	68,70%
Company 4	0,33	10,00%	33,33%
Company 5	0,18	87,00%	10,75%



The graphic representation shows the points of strength and weakness of every company allowing pointing out for every observation the relative peculiarities in relation to the concept of overall economics. In normal conditions the occurrence of variable costs and fixed costs can vary from 0 to 1 allowing for the possibility to subdivide the graphic representation in 4 squares:

- the square at the base on the right represents the best situation where Noc takes the highest values and the economic structure determines the lowest percentage;
- the square at the top on the left represents the opposite situation and therefore the worst area of positioning;
- the remaining squares express intermediate representations.

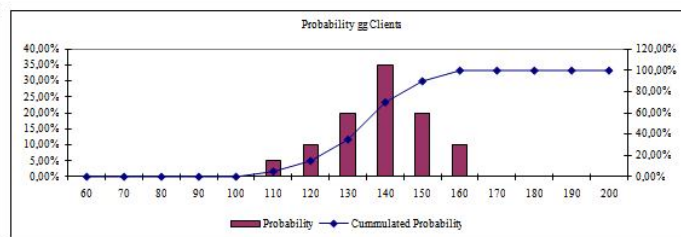
In order to determine in absolute mode the order of the realities analysed must be preceded with the calculation of overall indicator and therefore the relative rank. In this example the result is the following:

	FFI
Company 1	3,76
Company 3	1,85
Company 4	1,10
Company 2	0,65
Company 5	0,02

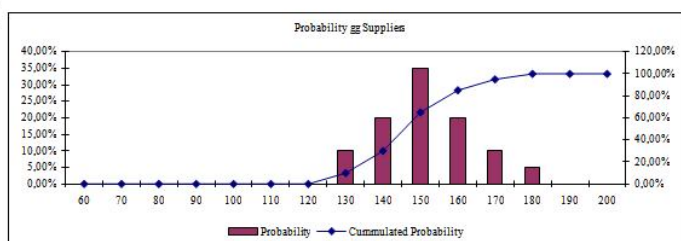
An ulterior application that proposes the determination of Noc Index and FFEM in conditions of uncertainty through the Montecarlo simulation to determine the minimum value, the maximum value and the most probable value for the coefficient of liquidity and for the FFEM index. We start with the calculation of probability correlatable to elements that concur to the calculation of the indicator which are:

- client days;
- supplier days;
- percentage of variable costs;
- turnover trend.

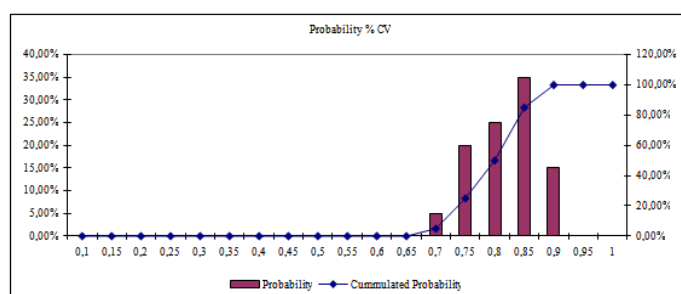
gg clients	Probability	Cummulated Probability	gg clients
60	0,00%	0,00%	60
70	0,00%	0,00%	70
80	0,00%	0,00%	80
90	0,00%	0,00%	90
100	0,00%	0,00%	100
110	5,00%	5,00%	110
120	10,00%	15,00%	120
130	20,00%	35,00%	130
140	35,00%	70,00%	140
150	20,00%	90,00%	150
160	10,00%	100,00%	160
170	0,00%	100,00%	170
180	0,00%	100,00%	180
190	0,00%	100,00%	190
200	0,00%	100,00%	200
100,00%			



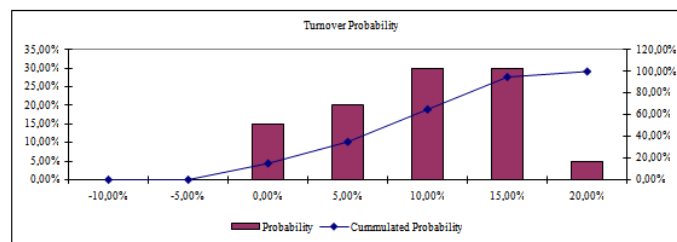
gg suppliers	Probability	Cummulated Probabil	gg suppliers
60	0,00%	0,00%	60
70	0,00%	0,00%	70
80	0,00%	0,00%	80
90	0,00%	0,00%	90
100	0,00%	0,00%	100
110	0,00%	0,00%	110
120	0,00%	0,00%	120
130	10,00%	10,00%	130
140	20,00%	30,00%	140
150	35,00%	65,00%	150
160	20,00%	85,00%	160
170	10,00%	95,00%	170
180	5,00%	100,00%	180
190	0,00%	100,00%	190
200	0,00%	100,00%	200
100,00%			



% cv	Probability	Cummulated Probabil	% cv
0,1	0,00%	0,00%	0,1
0,15	0,00%	0,00%	0,15
0,2	0,00%	0,00%	0,2
0,25	0,00%	0,00%	0,25
0,3	0,00%	0,00%	0,3
0,35	0,00%	0,00%	0,35
0,4	0,00%	0,00%	0,4
0,45	0,00%	0,00%	0,45
0,5	0,00%	0,00%	0,5
0,55	0,00%	0,00%	0,55
0,6	0,00%	0,00%	0,6
0,65	0,00%	0,00%	0,65
0,7	5,00%	5,00%	0,7
0,75	20,00%	25,00%	0,75
0,8	25,00%	50,00%	0,8
0,85	35,00%	85,00%	0,85
0,9	15,00%	100,00%	0,9
0,95	0,00%	100,00%	0,95
1	0,00%	100,00%	1
100,00%			



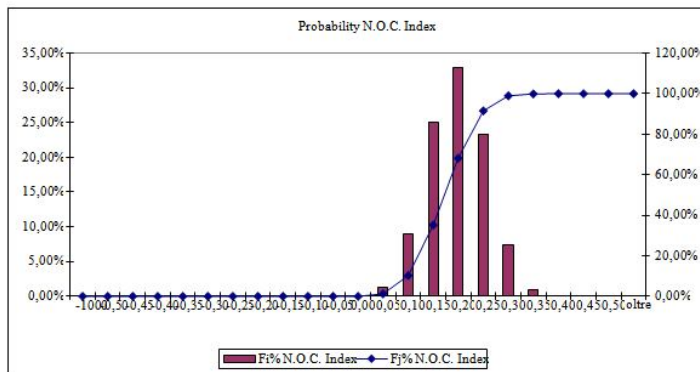
Turnover	Probability	Cumulaed Probability	Turnover
-10,00%	0,00%	0,00%	0,10
-5,00%	0,00%	0,00%	0,05
0,00%	15,00%	15,00%	-
5,00%	20,00%	35,00%	0,05
10,00%	30,00%	65,00%	0,10
15,00%	30,00%	95,00%	0,15
20,00%	5,00%	100,00%	0,20
100,00%			



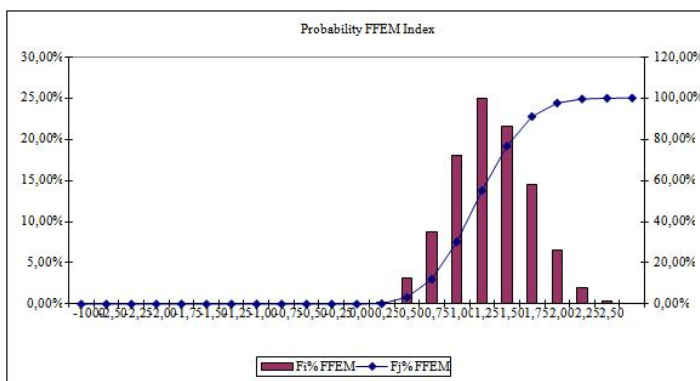
From the point of view of probability the Fixed Out Cash are excluded as they are more easily quantifiable then other variables.

Once the probability has been determined, the result obtained through ten thousand iterations aims to quantify the values researched by Noc Index and FFEM:

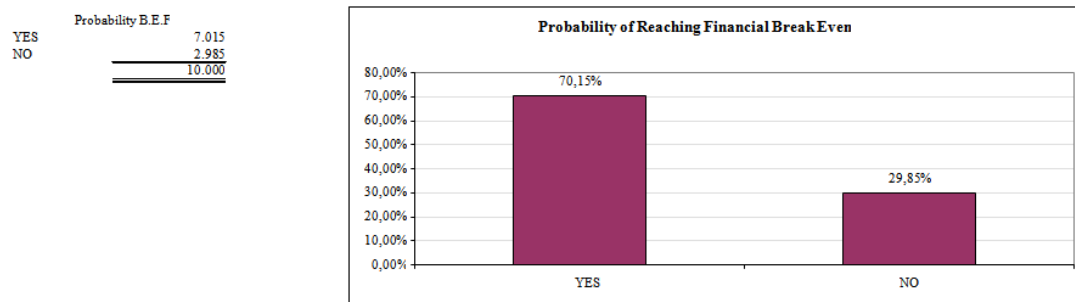
Scale	Fi%N.O.C. Index	Fi%N.O.C. Index	Fj%N.O.C. Index
-1000	0	0,00%	0,00%
-500	0	0,00%	0,00%
-450	0	0,00%	0,00%
-400	0	0,00%	0,00%
-350	0	0,00%	0,00%
-300	0	0,00%	0,00%
-250	0	0,00%	0,00%
-200	0	0,00%	0,00%
-150	0	0,00%	0,00%
-100	0	0,00%	0,00%
-050	0	0,00%	0,00%
000	0	0,00%	0,00%
005	127	1,27%	1,27%
010	894	8,94%	10,21%
015	2505	25,05%	35,26%
020	3290	32,90%	68,16%
025	2332	23,32%	91,48%
030	742	7,42%	98,90%
035	100	1,00%	99,90%
040	10	0,10%	100,00%
045	0	0,00%	100,00%
050	0	0,00%	100,00%
oltre	0	0,00%	100,00%
10.000,00			



Scale	Fi%FFEM	Fi%FFEM	Fj%FFEM
-1000	0	0,00%	0,00%
-2,50	0	0,00%	0,00%
-2,25	0	0,00%	0,00%
-2,00	0	0,00%	0,00%
-1,75	0	0,00%	0,00%
-1,50	0	0,00%	0,00%
-1,25	0	0,00%	0,00%
-1,00	0	0,00%	0,00%
-0,75	0	0,00%	0,00%
-0,50	0	0,00%	0,00%
-0,25	0	0,00%	0,00%
0,00	0	0,00%	0,00%
0,25	19	0,19%	0,19%
0,50	311	3,11%	3,30%
0,75	877	8,77%	12,07%
1,00	1805	18,05%	30,12%
1,25	2501	25,01%	55,13%
1,50	2150	21,50%	76,63%
1,75	1442	14,42%	91,05%
2,00	651	6,51%	97,56%
2,25	196	1,96%	99,52%
2,50	42	0,42%	99,94%
oltre	6	0,06%	100,00%
10.000,00			



The simulation carried out aims, except for determining the probability of the economic structure, to reach at least the turnover level of financial break even.



The synthesis offered by the business quality indicator, determined an ulterior inherent application to the predictive capacity of situations of company insolvency. In this case, the sample is composed of:

- 6080 observations of solvent companies
- 821 observations of insolvent companies

Calculating the average and the standard deviations for these two categories, it was possible to determine the Cut Off value of the index, over which one should be able to find all the useful observations under all defaults. The result achieved calculated using the Roc Curve allowed us to determine the degree of accuracy of the indicator equivalent to 86%, a percentage superior with respect to all the other indicators offering a value of about 55-60%.

CONCLUSIONS

The presumptions that have brought about the development of the Financial Flexibility Index have been those of searching to synthesize a representative measure of management economics, considering also the possibility to understand and simulate the effects of single variables that can determine and affect the durability in the market of a generic company structure understood as a mix of economic and financial relationships.

BIBLIOGRAPHY

- [1] Bergamin Barbato M. (1991), Pianificazione e controllo in un'ottica strategica, UTET, Torino
- [2] Brunetti G., Coda V., Fagotto F. (1990), Analisi delle previsioni, simulazioni economico-finanziarie d'impresa, ETAS Libri, Milano.
- [3] De Laurentis G. (2001), Rating interni e risk management, Bancaria Editrice, Roma.
- [4] Altman E.I. (1968), Financial Ratios. Discriminant Analysis and the prediction of Corporate Bankruptcy, in Journal of Finance, settembre.

- [5] Altman E.I., Marco G., Varetto M. (1994), Corporate Di stress Diagnosis, Comparisons Using Linear Discriminant Analysis and Neural Networks (the Italian Experience), in Journal of Banking & Finance, n.18
- [6] Pavarani E. (2002), Analisi finanziaria, McGraw-Hill.
- [7] Massari M. (1998), Finanza aziendale: valutazione, McGraw-Hill.
- [8] Guatri L. (1998), Trattato sulla valutazione delle aziende, Egea, Milano.
- [9] Guatri L. (1991), La teoria della creazione del valore, Egea, Milano.
- [10] Damodaran A. (1996), Manuale di valutazione aziendale, McGraw-Hill, Milano.
- [11] Damodaran A. (1999), Applied Corporate Finance: a user's manual, John Wiley & Sons.
- [12] Barontini R. (2000), La valutazione del rischio di credito. I modelli di previsione delle insolvenze, Il Mulino.
- [13] Black A., Wright P., Bachman J.E. (1999), La ricerca del valore nell'impresa. Analisi e gestione dei fattori di successo della performance, Franco Angeli.
- [14] Cattaneo M. (1973), Analisi Finanziaria e di bilancio: teoria e tecnica nella concessione del credito, ETAS Kompass libri.
- [15] Pavarani E. (2006), L'equilibrio finanziario – Criteri e metodologie nella logica di Basilea 2, McGraw-Hill, Milano.
- [16] Pavarani E. Tagliavini G. (2006); Pianificazione Finanziaria – La gestione della solvibilità e del valore, McGraw-Hill, Milano.
- [17] Tagliavini G. (2005), Guida ad excel per la finanza aziendale – L'utilizzo del foglio elettronico nei principali problemi di analisi, Alphatest.