



# DETERMINANTS OF THE CHOICE LEASING VS BANK LOAN: EVIDENCE FROM THE FRENCH SME BY KACM

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## ABSTRACT

The question of leasing credit as a substitute or complement of a banking loan has still not been resolved in the financial literature. As a continuation of these arguments, the objective of this article is, on the one hand, to determine the characteristics of firms using leasing credit and on the other hand, to better understand the relationship between leasing and credit rationing.

Firstly, our results suggest that SME use leasing all the more the leasing so when they are young, leveraged, less solvent and that they present an small size and an important failure probability. Thus, leasing pushes back the limits of banking debt for firms that have no access to it. Secondly, our results suggest a strong and significant relationship between credit rationing and the use of leasing. In this framework the latter appears to be a last resort financing.

**Key words:** Leasing, credit rationing, SME, Self organising maps (SOM)

MSC: 91B60

## RESUMEN

La cuestión del leasing (arrendamiento financiero) como sustituto o complemento del crédito bancario no esta resuelta todavía en la esfera financiera.

A continuación de estos argumentos, la meta de este artículo es, por un lado, determinar las características de las empresas que usan el leasing y por otro lado, mejor entender la relación existente entre leasing y racionamiento del crédito.

Primero, nuestros resultados sugieren que las PYMES usan mas el leasing cuando son jóvenes, con deudas, menos solventes, de tamaño pequeño y con una probabilidad alta de quiebra. Por lo tanto el leasing les permite conseguir fondos a las empresas que no tienen acceso al crédito bancario.

Segundo, nuestros resultados sugieren una relación fuerte y significativa entre el racionamiento del crédito y el uso del leasing. En este marco, el leasing parece ser el ultimo remedio para conseguir financiamiento.

**Palabras claves:** leasing (arrendamiento financiero), racionamiento del crédito, SOM

## 1. INTRODUCTION

As Cottrell *et al.* (1996) underline, Kohonen maps have generated many applications in finance. Areas in which they have been set up are numerous: the detection of firms in financial distress, the factors of firms' financial policy. Used as alternative methods to traditional approaches, they can allow us to deal with methodological biases found in empirical analyses. Thus, for example, in the case of the detection of firms in financial distress, the objective is to elaborate, from a population of firms, a function which discriminates between firms in financial distress and the others. Altman (1968) tried to undertake, with variables observed over a certain period before the date at which the observer decides to classify the firm in one category or the other, a function able to better discriminate the two groups of firms (healthy firms and firms in financial distress). The methods used, discriminant analysis and logistic regression, necessitate variables to check a certain number of statistical properties that are not always checked. In this line, the use of Kohonen maps can overcome the methodological biases of the classical analyses in finance.

In the area of corporate finance, the use of the KACM applied to the analysis of financing policies by leasing gave rise to a research paper by Cottrell *et al.* (1996). The authors conclude as to a significant relationship between the financial weakness of the firm and the use of leasing. If this argument has largely been accepted as an explanatory factor of the choice leasing versus banking loan, the study that we develop in this article introduces a complementary approach to this problem: it allows us to introduce a finer analysis of firms' profiles and seeks a direct measurement of the credit rationing in order to give more robustness to

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the relationship between the credit rationing and the using of bank loan. It also deals with other determinants of the choice leasing versus banking loan for the firm.

The article is organized as follows. In the second part, we will identify the explanatory factors of the financing policy by leasing, by focusing on the analysis of theoretical works. In the third part, we will discuss about the presentation of data and the methodology used. Finally, the fourth part will present the results of the empirical study. Finally, in a last section, we conclude and discuss possible perspectives of our study.

## 2. ANALYSIS OF THEORETICAL ARGUMENTS

### 2.1. A first approach: leasing as a substitute for bank loans

The question of substitutability or complementarity of leasing and debt has been studied in details by the financial literature but without reaching a consensus of unanimous reply. According to Myers *et al.* (1976), the use of leasing would be probably accompanied by a lesser utilization of a debt, reducing, in the same proportion, the firm's debt capacity (Levasseur and Quintart, 2000, p. 6-7). The validity of such an argument is based on the perfect substitution hypothesis between leasing and bank debt. Therefore, this perfect substitution hypothesis can be rejected in favour of an imperfect substitution and sometimes in favour a complementarity between banking loans and leasing.

The first argument against a perfect substitution between leasing and debt concerns the substantial costs borne by the (banking) creditor or (credit) lessor in case of corporate bankruptcy. For Krishnan and Moyer (1994), costs created by the bankruptcy of the tenant would be lesser for the lessor than for any other creditor. The quality of ownership allows him to recapture the goods in case of corporate bankruptcy when the contract is not stopped. In fact, it avoids opportunity costs associated with the slowness of the resolution process of the bankruptcy and more rapidly may allow to resale the asset. Thus, Lease *et al.* (1990) show, on the American market, on the one hand, that the resale value in the case of default by the lessee amounts, on average, to 37.8% of the price of its purchase price, and, on the other hand, that 12 months went on between the corporate bankruptcy and the time where the lessor covered its claim by the resale of the asset.

The second argument contradicting perfect substitutability between leasing and debt is based on properties of leasing. By the terms of the contract and rights given to the lessor, leasing has characteristics close both to the secured and unsecured debt. The secured debt, because lessor has a real guarantee in the ownership of asset in the contract; the non-secured debt, because unpaid rents prior before bankruptcy has the rank that a banking loan. In most of cases, the funds are lost by the creditor. The diversity of the debts contracted by the firm, introducing a distortion between creditors in case of bankruptcy, favours the thesis of the imperfect substitution leasing/ classical debt.

Although the perfect or imperfect substitutability between leasing and debt has been accredited by the financial literature, the work of Lewis and Schallheim (1992) has questioned it. In line with De Angelo and Masulis (1980) -according to them, the debt use by a firm is reduced, if it cannot benefit from substantial fiscal gains on amortizations- the authors take into account this fiscal dimension to compare leasing and bank debt. They show that leasing allows the firm to transfer fiscal gains on amortizations to lessor (who is the only one actor to have the possibility of amortizing the good). Furthermore, these gains are retroceded back to the lessee by means of a contractual reduction in dues. In the case of financing by leasing, the lack of fiscal advantage on amortizations favours the additional debt issuing as a fiscal leverage. Leasing and the debt appear then as complements rather than substitutes. Hence a positive relationship between the use of leasing and the level of corporate debt results from this.

The analysis by Lewis and Schallheim (1992) has not generated empirical verification. The only studies corroborating the complementarity thesis made did so undirectedly by comparing the leasing rate and the level of corporate debt. The most prominent controversy was produced by Ang and Peterson (1984) on the American market. This paper was criticized by Smith and Wakeman (1985) and Adedeji and Stapleton (1996). For these authors, the lack of control of debt capacity in the empirical studies generates a bias for the estimation of the leverage debt and of using of leasing. Indeed, according to these authors, if firms use leasing more due to a better debt capacity, then is normal to observe a greater use of external funds.

Afterwards, others complementary analyses corroborated (Finucane, 1988), (Adams and Hardwick, 1998), (Branson, 1995) or not corroborated (Adedeji and Stapleton, 1996), (Beattie *et al.*, 2000) the complementarity thesis between leasing and debt. These empirical studies nevertheless agreed on firms'

characteristics which to use, most often, leasing. They have: more debt (or more important gearing), smaller liquidity and more important risk.

The question of complementarity or substitutability of debt and leasing seems to be unsolved because there is no consensus between theoretical and empirical approaches. Leasing is often analyzed as a last resort solution, especially for very weak firms. Firms' financing preferences nevertheless depend on the characteristics. It allows lessor to gain a clientele of firms with atypical profiles. The reasons for the choice of leasing versus bank loan can therefore be several, which we develop in the following point.

## 2.2. The factors explaining the leasing use

As underlined by Smith and Wakeman (1985, p. 907): "the coexistence of both leased and purchased assets suggests that the net benefits of leasing are uniformly neither positive or negative ". In this line of thought understanding the choice of leasing versus bank loan for the firm, would depend on costs/advantages.

Indeed, from an economic viewpoint, leasing can be analyzed as an operation of investment financing, which has the particularity of dissociating the legal ownership of the good from its economic ownership. Contrary to a classical credit operation, the lessor remains the owner of the asset during the whole duration of the transaction. This security due to asset ownership allows it to recall if there is a payment default by the lessee, so as to resell it or rent it again. The lessor appears, according to Capiiez (1992, p. 38), to be "a creditor who has anticipated all possible changes of its wealth and has beforehand protected himself by the form of the contract in which it retains ownership". A limit in bank credit supply can lead the firm to increase its use of leasing. This argument is presented in the literature by Krishnan and Moyer (1994) who consider leasing as "the last financing resort". According to these authors, when the risk of bankruptcy for the firm increases, the unavailability of bank credit compels the firms in financial distress to turn to leasing, because costs due to the latter.

Although the conservation of the legal ownership is a protection for the lessor -it allows the firm to carry over the risk of obsolescence to the lender-. This advantage will be all the more profitable to the firm, in the case of a new technology is growing up when the contract is negotiated over a relatively short period. The acquisition of the legal ownership being optional in leasing contract, this formula of financing would seem to be completely adapted when the period of use of the good is lower from its economic life duration (Smith and Wakeman, 1995). The firm avoids transaction costs generated by marketing costs useful to resale the good on the secondary market, which would explain a greater resorting to leasing by SME which absorb the financing of expenses in their activity with greater difficulty.

Among the other advantages to leasing, may be added the entire financing of the asset. So we can consider leasing as a flexible means of financing.

Though advantages encourage firms to use leasing, the firm can however limit its use and prefer bank loan, because of an operational mobility loss for the firm. Indeed, a leasing operation involved firm for an irrevocable period. The firm loses then the ability of spreading set if the activity is no longer profitable or if the sector was affected by a circumstantial major economic shock slowing its activity. That is not the case, when the asset is financed by debt. Leasing contracts can not be cancelled without the agreement of the lessor and generates the payment of early termination penalties. This rigidity in the policy of redeployment of the firm may then limit its use. In a empirical paper, Lease *et al.* (1990), show that, of the 137 leasing operations whose the amount is on average \$ 75000, only 46.6% operations come to an end. 31.4% of contracts are stopped before the end. In 19% of cases, the operation led to the firm's bankruptcy.

This cost due to the operational flexibility loss will vary according to the firm. Indeed, the large firm possesses an internal redeployment capacity due to the fact of their more diversified activities, and for specific assets that can be the subject of an alternative use.

As our main objective is to understand financing policies by leasing, the literature allowed us to identify two main reasons in the decision of leasing, deriving from analysis supply and demand: its greater availability compared with classic banking credit and the advantages inherent in the nature of the financing.

The empirical study, proposed in the third section, based on a sample of French firms differs from previous ones, in two points.

The first concerns the methodology employed. The analysis of Cottrell *et al.* (1996) on this subject shows that through the first empirical works seem to confirm viewpoints advanced in the financial literature,

they do not allow to develop a discriminant analysis able to distinguish between firms that use leasing and those that do not. Moreover, by considering the very particular distribution of some ratios, the authors make a comparative analysis of a technique of linear data analysis (multiple correspondence analysis) and a technique of non linear analysis (Kohonen maps). The interest is in the results obtained by the KACM. Indeed, observations by the authors suggest firstly, the existence of subgroups within the population of firms that resort to the leasing, and secondly, a clear association between the resorting to leasing as a financial technique and the financial health of firms. Even if the KACM method presents weak points (The first is that the visualization of the Kohonen map does not allow evaluation of the distance between the units. The second is the quality of the representation), its use can bring progress in the understanding of leasing by the use of Kohonen maps. The use of Kohonen maps favors a roundup of individuals according to their propensity to use leasing utilization, which allows a finer analysis of firms' profiles, and by thus of the reasons associated with the decision.

The second contribution of our study concerns the utilization of a direct measure of the rationing of credit that we associate with the characteristics of firms' groups, which makes our tests and conclusions on the association between credit rationing and the use of leasing by a firm more robust.

The next section will be devoted to the presentation of data and the methodology of the study.

### 3. DATA AND METHODOLOGY

#### 3.1. Sample presentation and variables choice

##### Sample

Our study deals with a sample of 11436 French SME. We used the date from Dun and Bradstreet, for 1999. As we sought accounting data which represent leasing financing, we proceeded in several steps. Firstly, we retained all firms with a staff between 20 and 500 employees. By this, we wanted to select SME by excluding very small firms in order that the information would be less difficult to deal with. From this point, we choose to retain only industrial and services firms using leasing. Indeed, we excluded firms in the financial sector (the accounting treatment of profit for these firms is significantly different than that of other sectors). After applying these criteria 12669 were retained.

The validity of accounting data was validated by using a series of coherence tests. Hence our sample was composed of 11233 firms. Then, we worked from the Dun database.

In this database, we used the following information: number of workers, long term debt, leasing, equity, short term assets, short term liabilities, EBITDA, financial fees, fiscal debt and firm age.

The collection of these data allowed the construction of variables used in empirical tests.

##### Relevant variable choice

In this study, we seek to clarify explanatory factors in the propensity of the firm to finance by leasing. To take into account the intensity of credit lease utilization, we calculated the variable L (Leasing), by calculating the ratio of leasing divided by the long term debt for each observation.

The literature analysis presented in the first section allowed four arguments to be identified allowing to explain the choice of leasing/banking loan for the firm. It concerns the firm's risk level, information asymmetry between lender and borrower, the firm's debt capacity and the dissociation between judicial and economic ownership. We summarize in table 1 for each determinant the financing policy by leasing. The lack of some data and information explains we have limited our investigation to these main four arguments. Table 2 presents the variable measurement used and the expected effects on the propensity of the firm to be financed by leasing.

**Table 1.** Factors of financing policy using leasing.

<b>Theoretical viewpoint</b>	<b>Argument</b>	<b>Chosen Variables</b>
<b>The risk of the borrower</b>	The use of leasing is positively associated with the bankruptcy risk (Krishnan and Moyer, 1994; Cottrell et al., 1996).	- Probability of bankruptcy - Firm's solvability
<b>Informational asymmetry on quality of growth opportunities</b>	Leasing is all the more used when the firms are young and small (Sharpe and Nguyen, 1995).	- Firm size - Age
<b>Limited debt capacity</b>	Firms with real debt capacity should use leasing more frequently (Krishnan and Moyer, 1994).	- Leverage
<b>The separation between judicial and economic ownership</b>	The acquisition of judicial ownership is optional in leasing contract. The firm avoids transaction costs due to retrading the good on the second market. So the small-sized firm would probably use leasing more frequently (Smith and Wakeman, 1995). The loss of the legal ownership leads to loss in flexibility for the firm.	- Firm size

**Table 2.** Explanatory variables and previous effects.

<b>Variable</b>	<b>Ratio</b>	<b>Expected sign</b>
Probability of bankruptcy ( <i>DEF</i> )	EBITDA / Financial expenses	positive
Solvability ( <i>SOL</i> )	Cash flow / financial debt + leasing	negative
Size ( <i>TA</i> )	Log (total workers)	negative
Age ( <i>AGE</i> )	Number of years of life since the firm's creation	negative
Leverage ( <i>LEV</i> )	Long term debt + leasing / equity	positive
<b>Control Variable</b>	<b>Ratio</b>	
Credit rationing ( <i>CR</i> )	Fiscal and corporate debt/going concern debt	In the case of substitution hypothesis, we expect a negative relationship between credit rationing and the amount of leasing

### 3.2. The use of Kohonen algorithm and its advantages

When we try to determine if a non-linear relation exists between some characteristics of the firms and leasing, we cannot use the techniques traditionally used in finance. Indeed, a great proportion of modern finance rests on the simplifying hypotheses; in particular, the normality of variables and the linearity of causality relations (Quintart, 1995).

Our hypothesis of non-linearity led us to focus our attention on self-organized maps (SOM) and more especially on one of the variants called the Kohonen Map (Kohonen, 1982 and 1995). One of the major advantages in its use is its capacity to deal with, in particular, non-linear problems (Quintart, 1995).

Our objective was to determine several groups of homogenous individuals. Secondly, we used non-parametric tests (Wilcoxon and  $\chi^2$ ) to highlight significant differences between our groups.

Many traditional methods assume strong hypotheses; in particular, the assumption of normality. To test this, we examined the distribution of the ratios. As our ratios do not have a normal distribution. Extreme values require the use of qualitative data. This non-normality and the presence of extreme values led us to

cluster our individuals into 4 classes. Hence, we first transformed each character  $X_i$  into 4 categories (very strong, strong, weak, very weak-so, we divided the sample into four classes of equal size) and, secondly, transformed our variables into binary variables.

Thus, we used a specific kind of self-organized map (SOM) called the Kohonen map<sup>3</sup>. The Kohonen algorithm, led to interesting applications in economics and finance, is a well-known unsupervised learning algorithm which produces a map composed of a fixed number of units (table 3, for instance, presents a one-dimensional map, frequently called a string). Each unit has a specific position on the map and is associated with an  $n$ -dimensional vector  $W_i$  (which will define its position in the input space);  $n$  being the number of dimensions of the input space. Moreover, a physical neighborhood relation between the units is defined (fig. 1). Units 1 and 3 are neighbors of Unit 2 and for each unit  $i$ ,  $V_r(i)$  represents the neighborhood with the radius  $r$  centered at  $i$ .

After learning, each unit represents a group of individuals with similar features. The correspondence between the individuals and the units more or less respects the input space topology: individuals with similar features correspond to the same unit or to neighboring units. The final map is said to be a self-organized map that preserves the topology of the input space.

The learning algorithm takes the following form:

- at time 0,  $W_i(0)$  is randomly defined for each unit  $i$ ,
- at time  $t$ , we present a vector  $x(t)$  randomly chosen according to the input density  $f$  and we determine the winning unit  $i^*$ , which minimizes the Euclidean distance between  $x(t)$  and  $W_i(t)$ ,
- we then modify the  $W_i$  in order to move the weights of the winning unit  $i^*$  and its physical neighbors towards  $x(t)$  using the following relations :

$$W_i(t+1) = W_i(t) + [\varepsilon(t) \times (x(t) - W_i(t))] \text{ for } i \in V_{r(t)}(i^*) \quad (\text{Equation 1})$$

$$W_i(t+1) = W_i(t) \text{ for other } i \quad (\text{Equation 2})$$

where  $\varepsilon(t)$  is a small positive adaptation parameter,  $r(t)$  is the radius of  $V_r(t)$ , and,  $\varepsilon(t)$  and  $r(t)$  are progressively decreased during the learning (Note that For stochastic algorithm  $\varepsilon(t)$  must follow the requirements of Robins-Monro (1951).

This is clearly a competitive kind of algorithm (each unit competes to be the closest to the presented individual) which will perform two interesting tasks for data analysis:

- 1) clustering: each unit will be associated with a similar kind of individual, the  $W_i$  vector associated with the unit converging toward the mean profile of the associated individuals.
- 2) reduction in the number of dimensions: the (at least local) proximities between the units will give us an idea of the proximities of clusters of individuals in the input space.

A last remark concerning the neighborhood: it is reduced progressively to finish at value 0 (only the winning unit is displaced). The Kohonen algorithm then turns into a vectorial quantification. To assess the statistical significance of the results obtained with the Kohonen map, we used traditional tests (Wilcoxon, chi-square). If the  $\chi^2$  test is a test of independence that serves to determine if samples come from the same population, the Wilcoxon test is a test on ranks. Its justification is due to the non-normality of data. Tests on ranks are very robust. By arranging the different observations (i.e. by giving them a rank), one identifies the place of every observation in the sample. One substitutes rank for observation. Thus one neutralises problems concerning the accurate measure of the value for every observation. We can also note that the results of rank tests are not altered by the distributions of observations (symmetrical, non-symmetrical...).

The next section presents the results.

#### 4. EMPIRICAL RESULTS

In this section, we present the main results obtained from the firms' sample.

<sup>3</sup> An extensive presentation can be found in Kohonen T., "Self organized formation of topologically correct feature maps", Biological Cybernetics, 43,1982, p. 59 or in Kohonen T., "Self-Organizing Maps", Springer Series in Information Sciences Vol. 30, Springer, Berlin, 1995

#### 4.1. Presentation of results

We show the results obtained for the different variables. We associated the dependent variable to the explanatory variable, by highlighting different levels: VS: very strong, S: strong, W: weak and VW: very weak.

**Table 3.** Probability of the bankruptcy and the use of leasing.

*Theoretical hypothesis: The risk level of the borrower*

LWV DEFS	LW DEFVW	LS DEFW	LVS DEFVS
U1	U2	U3	U4

Legend

LVS, LS, LW, LW: Leasing very strong, strong, weak, very weak.  
 DEFVS, DEFS, DEFW, DEFVW: Probability of bankruptcy very strong, strong, weak, very weak.  
 U1, U2, U3 et U4: Unit 1, Unit 2, Unit 3, Unit 4.

**Table 4.** Debt capacity and the use of leasing.

*Theoretical argument: The risk level of the borrower*

LVS SOLW	LS SOLVS	LW SOLS	LWV SOLVW
U1	U2	U3	U4

Legend

LVS, LS, LW, LW: Leasing very strong, strong, weak, very weak.  
 SOLVS, SOLS, SOLW, SOLVW: Solvability very strong, strong, weak, very weak.  
 U1, U2, U3 et U4: Unit 1, Unit 2, Unit 3, Unit 4.

**Table 5.** Firm size and the use of leasing.

*Theoretical argument:- Informational asymmetry between lender and borrower  
 -separation between judicial and economic ownership*

LS TAW	LWV TAVS	LW TAS	LVS TAVW
U1	U2	U3	U4

Legend

LVS, LS, LW, LW: Leasing very strong, strong, weak, very weak.  
 TAVS, TAS, TAW, TAVW: Size (total assets) very strong, strong, weak, very weak.  
 U1, U2, U3 et U4: Unit 1, Unit 2, Unit 3, Unit 4.

**Table 6.** Firm age and the use of leasing.

*Theoretical argument: Informational asymmetry between borrower and lender*

LVS AGEVW	LW AGEW	LS AGES	LWV AGEVS
U1	U2	U3	U4

Legend

LVS, LS, LW, LW: Leasing very strong, strong, weak, very weak.  
 AGEVS, AGES, AGEW, AGEVW: Age very strong, strong, weak, very weak.  
 U1, U2, U3 et U4: Unit 1, Unit 2, Unit 3, Unit 4.

**Table 7.** Leverage and the use of leasing.

*Theoretical argument: debt capacity of the firm*

LVW LEVWV	LVS LEVVS	LS LEVS	LW LEVW
U1	U2	U3	U4

Legend

LVS, LS, LW, LVW: Leasing very strong, strong, weak, very weak.  
 LEVVS, LEVS, LEVW, LEVWV: Leverage very strong, strong, weak, very weak.  
 U1, U2, U3 et U4: Unit 1, Unit 2, Unit 3, Unit 4.

**4.2. Comments**

Empirical test results highlight significant effects for the different factors explaining the use of leasing. Indeed, firms use leasing all the more so when they are young and are of a small size, leveraged and they have a smaller solvability and when they present a strong likelihood of bankruptcy. These profiles testify a stronger risk of failure. The weakness of bankruptcy costs for the lessor, in the case of default by the firm, justifies then leasing financing for firms in a situation of credit rationing (Krishnan and Moyer, 1994; Sharpe and Nguyen, 1995).

Leasing pushes back the limits of bank debt, for firms that there have no access or no longer access (firms with a high leverage) and would be more often used when the firm can no longer bear the costs associated with the ownership good or can start up a new activity.

We have consequently sought to check if our results were robust, by verifying the association between the extent of these variables and the existence of credit. To do this, we evaluated the degree of credit rationing of the firm by the following ratio: fiscal and corporate debt/ going concern debts.

Delays in the payment of social and corporate debts generally highlight serious cash flow problems, due to credit rationing (De Bodt *et al.*, 1999). The Wilcoxon test shows significant results for the following variables: size, leverage, probability of bankruptcy and solvency. We verify consequently that relationships have their origin in credit rationing. Table 8 summarizes the results.

**Table 8.** Credit rationing intensity and financing policy by leasing: Wilcoxon test.

Variables	Wilcoxon statistics	Interpretation
Size	-2.147**	Credit rationing is positively associated with a small size
Leverage	-16.03***	Credit rationing is positively associated with highly leveraged firms
Solvency	-5.31***	Credit rationing is negatively associated with firms' solvency
Probability of Bankruptcy	-10.1***	Credit rationing is positively associated with the probability of bankruptcy
Age	-1.11	Credit rationing is negatively associated with firms' age

Note: \*, \*\* and \*\*\* significant at the 10%, 5% and 1% threshold.

On the French SME sample, our results suggest that the use of leasing is positively associated with credit rationing. This confirms that the use of leasing is a "last resort solution". Otherwise, the financial literature does not totally explain the motives of credit rationing. Is credit rationing due to too high leverage or informational asymmetry on the borrower? In this context, leasing could be preferred by young firms and start-ups.



## 5. CONCLUSION

We will end this paper with the advantages and the disadvantages of neuron systems and on the scope of the results.

The advantages are numerous compared to classical statistical analyses. On the one hand, they allow problems to be treated for which we have a priori non information. Thus in the framework of the detection of firms in financial distress, it is not necessary to know the distribution of variable probability contrary to the discriminant analysis. Secondly, the neuronal systems discover by themselves relationships between variables which allow us to study non-linear problems. This aspect does not allow us to specify the separation function. Moreover, as compared to classical approaches (such as ACP or ACM), the competitive learning scheme used presents advantages of avoiding the even present linearity assumption and of producing a unique graphical representation of the data. Thirdly, the uncompleted data can be taken into account by the supplementary neuron addition. Fourthly, the stoppage of the iterative process, when the system produces the best results on the validation sample gives robust results. One can consider that the relevant information is integrated in the system. Fifthly, neuronal systems allow working both on qualitative or quantitative variables.

Despite these advantages, several criticism can be addressed to neural networks. These are following. Firstly, it does not exist theory allowing to determine the optimal structure of the system. Especially the determination of the hidden layers number and the number of neurons are, the most often, dependant from the user and its capacity to experiment several architectures. Secondly, neural networks often assimilated to "black boxes" in which it is difficult from to extract relevant relationships among variables. Hence, one can consider that the explanatory system power of neuron systems remains limited, contrary to expert systems that are able to track the path to take the result.

However, the studies presented above show that neural networks give good results in the classification area. To be able to improve the approach by neuronal networks, efforts have to focus on: the construction of the system, the clustering of entry variables and the adjustment of learning parameters that depend greatly on human intervention.

From an empirical viewpoint essentially considering the "financial" dimension, research concerning the financing policy of leasing has the difficulty of taking into account the empirical financial gains obtained by leasing: it analyzes on the one hand, the basis of the apparent cost of the financing source, but also in function of advantages associated with the use of leasing such the financing flexibility, entire financing of the investment or fiscal advantages for the firm. Taking them into account would facilitate the understanding of the choices of corporate financing and would balance our conclusions, by excluding the too systematic association between credit rationing and leasing financing.

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