

FRENCH MANUFACTURING FIRMS AND THE CAPITAL GAP SINCE 1985 : A CREDIT RATIONING APPROACH ¹

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	SINCE THE SLOWDOWN IN THE ECONOMY THAT BEGAN IN 1990, RESEARCH HAS SHOWN THAT FIRMS' SENSITIVITY TO CHANGES IN THE ECONOMIC CLIMATE VARIES ACCORDING TO THEIR SIZE. THIS IS THE MAIN CONCLUSION THAT CAN BE DRAWN FROM THE STUDIES OF THE PRODUCTIVE SECTOR PUBLISHED ANNUALLY BY THE BANQUE DE FRANCE, AND FROM THE STUDY BY AUGORY, AVOUY-DOVI, BUSQUE AND QUERON (1996) OF TRENDS IN THE MACROECONOMIC SITUATION OF SMALL AND MEDIUM-SIZED INDUSTRIAL FIRMS BETWEEN 1985 AND 1992.	

“There is a clear distinction between small and medium-sized industrial firms and large industrial firms in terms not only of output and investment but also of job creation and/or destruction. In relation to the business cycle, the behaviour of small and medium-sized industrial firms appears cyclical and similar to that of non-financial firms, while a certain dissymmetry is apparent in large industrial firms’ reactions to the different stages of the cycle” (Augory, Avouy-Dovi, Busque and Quéron, 1996, p.33).

Two sets of arguments may be advanced to explain the particular sensitivity of small and medium-sized industrial firms. The first is based on real determinants: firms of this type are more sensitive to cyclical shifts because their productive structures have less inertia and are therefore more flexible. The second is based on financial determinants, within which two particular approaches can be identified.

- Researchers seeking to identify the existence of a “credit channel” emphasise the special position of small and medium-sized enterprises (Gertler, Gilchrist, 1993, 1994; Hubbard, 1995). According to this view, SMEs bear the brunt of real or monetary shocks affecting the economy because capital markets operate imperfectly. This research reveals the emergence of a “flight to quality”, reflected by a reduction in the amount of bank lending to SMEs (Oliner, Rudebusch, 1995). However, researchers have not managed to identify whether this effect is due to changes in the behaviour of lenders or of borrowers.

- Researchers focusing specifically on SMEs point to the existence of a “small business capital gap”, generally identified by two features (Garvin, 1971). First, the cost of access to capital is higher for small businesses. Bardos (1991) has found this to be the case for small French firms on the credit market. Second, small businesses are reputed to suffer from a chronic shortage of long-term capital, whether in the form of share issues or bank

loans. The corollary to this is high levels of short-term debt, which may explain why small businesses are more sensitive to economic shocks. Tamari (1980) shows that this is a permanent feature of the economic landscape of all the industrialised countries. Research carried out by the Banque de France has underlined the importance of short-term debt for small businesses (Beau, 1991; Boissonade, Tournier, 1996). An analysis of firms' capital structure according to size over the period 1990-1993 revealed significant differences in financial behaviour, especially for firms with more than 2 000 employees (Cieply, Paraque, 1996). Firms with less than 2,000 employees carried more debt. Among these firms, which are highly sensitive to the cost of borrowing, cash flow was a more important factor in obtaining loans. Likewise, as debt is the sole source of capital, small firms (unlike large firms) are not able to compensate for an increase in the working capital requirement or a fall in turnover by borrowing more. Moreover, as their accumulation rate tends to be higher than that of large firms, their financing requirements are correspondingly greater (Paraque, 1994, 1996). These features have led some economists and politicians to argue that the financial system is biased against small businesses and to justify the existence of financial institutions that specialise in lending to them². To the best of our knowledge, however, no research has yet shown that supply effects predominate over demand effects in determining the financial characteristics of firms in general and small businesses in particular. It is this question that we seek to address in this study, based on accounting and tax data collected by the Banque de France's Balance Sheet Data Centre³.

In Section I we describe the theoretical determinants of a firm's financial structure and identify the various relationships that may be said to characterise the corporate borrowing market.

In Section II we describe the specifications of the model used.

In Section III we identify supply and demand effects and explain our methodological options in the light of the subject of our research and the data processing tools at our disposal.

In Section IV we describe the results of our research and compare them with other indicators such as insolvency rates, Banque de France credit ratings, size and the existence of financial links between firms.

In Section V we describe the economic and financial characteristics of firms according to the form of credit rationing and raise some questions as to their situation with regard to changes in the monetary environment.

1. THE DETERMINANTS OF FIRMS' FINANCIAL STRUCTURES AND THE NATURE OF CREDIT RATIONING

1.1 A number of different determinants

A considerable amount of research into the determinants of firms' financial structures has been carried out since Modigliani and Miller (1958) advanced the idea that methods of raising capital did not affect firms' investment decisions. A distinction may be made between two categories of research.

² This is the view taken by Bolton (1972), Wilson (1979) and Middleton et al. (1995) in the UK; by Garvin (1971) in the USA; by Holmes, Kent (1991) in Australia; and, in France, by the Courbot report (1973) to the Economic and Social Committee, the "Credit Risk" report (CNC, 1995) and, more recently, in the introduction by Lagayette (1996) to the brochure describing the CDC's initiatives in favour of small businesses.

³ See the description of samples in Annex 1.

According to the *theory of capital structure* (Harris, Raviv, 1991), a firm's financial structure expresses the rational preference of its manager or managers in an environment characterised both by the diverging interests of economic actors (managers, owners, manager-owners and creditors) and by the existence of information asymmetries between these actors. From this standpoint, the firm's indebtedness is seen as a mechanism that limits conflicts between the manager and the owners or between the owner-manager and the shareholders (if any). This is because debt limits the volume of the firm's idle resources (Jensen's free cash flow theory, 1986) and displaces the decision whether to continue operating outside the firm. Debt is also a discipline because of the risk of default, limiting the incentive for managers to consume the company's cash flow themselves. Furthermore, it serves as an indicator of the firm's quality to outsiders (Ross, 1977) and thus makes it possible at least partially to solve conflicts between the manager(s) and the shareholder(s). But firms cannot contract unlimited amounts of debt. They have an incentive to limit the level of debt *of their own accord*, first because of the emergence of conflicts between shareholders and creditors, and second because there are other less costly ways of sending signals, such as dividend distribution policy. Within this theoretical framework, the financial structure reflects the borrower's strategy. The firm seeks *an optimal debt level* in an environment characterised by information asymmetries. This debt level corresponds to the firm's *expressed demand for debt*.

According to the *credit rationing theory*⁴, a firm's financial structure reflects the lenders' strategy of maximising profits. Lenders' and borrowers' strategies converge only in very exceptional cases. Situations can therefore exist in which demand for capital exceeds supply. In their study of credit rationing, Stiglitz and Weiss (1981) show that the appearance of such a situation on the credit market is due to phenomena of adverse selection⁵ and moral hazard⁶ that do not allow changes in interest rates to restore the market equilibrium. Lenders, being unable to influence price levels effectively, influence quantity instead and limit the amount of credit rationally and independently of the regulatory context. Williamson (1986) confirms the existence of credit rationing, though using rather different arguments. In Williamson's view, on a market where information is imperfect, lenders face opportunistic behaviour by borrowers⁷. Lenders seek to limit this behaviour by means of monitoring, but they are not always able to do so in an economically viable manner. Once the costs of monitoring exceed the expected benefits, lenders prefer to limit the supply of credit to firms. Credit is said to be rationed because excess unsatisfied demand remains. For lenders, a firm's optimal debt level corresponds to its *maximum debt capacity*.

The optimal debt level according to the capital structure theory is not a priori equal to the maximum debt level according to the credit rationing theory, inasmuch as the objectives of lenders and borrowers do not coincide. Ultimately, therefore, a firm's financial structure is not determined by a single factor but may result, simultaneously or alternatively, from the borrower's strategy (capital structure theory) and/or from the lender's strategy (credit rationing theory). Ang and Peterson (1986) suggest eliminating this multiplicity of determinants by representing the individual decisions of the lender and the borrower in a disequilibrium model.

⁴ For an exposition of this theory, see Levratto (1992).

⁵ *Adverse selection* results from the existence of information asymmetries before loans are contracted (*ex ante* information asymmetries). It is difficult for lenders to discriminate between firms efficiently. Interest rates are not good regulators on this market. A rise in interest rates causes the least risky borrowers to leave the market, so that ultimately only the worst risks remain available to lenders on the credit market (Stiglitz, Weiss, 1981).

⁶ *Moral hazard* results from the existence of information asymmetries during the lifetime of a loan. Once a loan has been granted, the borrower can choose a riskier project than the one on the basis of which the loan was obtained. This leads to *asset substitution*, a phenomenon perfectly described by Jensen and Meckling (1976) and Stiglitz and Weiss (1981).

⁷ Information asymmetries may show up *ex post*. In this case lenders are unable to make a precise evaluation of the yield of the projects carried out by borrowers, who may understate their real income in order to minimise their repayments (Williamson, 1986).

1.2 The representation of the credit market in a disequilibrium model

The representation of the credit market in a disequilibrium model has been the subject of a number of macroeconomic studies (Levratto, 1992) which have sought to identify the existence of credit rationing and to estimate the amount. Ang and Peterson (1986) apply this approach to individual data in order to analyse the behaviour of 170 firms on the US credit market in three specific years: 1971, 1974 and 1977. The aim of their research is to determine, for each firm and at each date, the probability that the firm's debt level corresponds to its own optimisation strategy. The authors found first, that the capital structure theory, and hence demand, played a greater role in determining debt rates across the entire sample⁸; and second, that pressures on the corporate bond market increased in 1974 and 1977.

Our approach, though drawing substantially on Ang and Peterson's work, diverges from it on two points.

First, in this study we consider firms' overall debt behaviour, whatever the source of the debt. The debt level thus includes both debt securities and bank debt, though other forms of credit (commercial, fiscal, social, etc.) are excluded from the debt ratio under consideration.

Second, we consider both a firm's demand for long-term debt and the supply of credit available to it, unlike Ang and Peterson, who studied the supply of and demand for debt securities by a single agent, the firm j , which may be both a lender and a borrower on the debt market.

In our study, the credit market is described as follows.

– L_j^D is the debt level demanded by firm j at time t . L_j^D corresponds to firm j 's optimal debt ratio. L_j^D allows firm j to maximise its value during the year t once the existence of information asymmetries and agency conflicts have been taken into account. The vector x_j represents all the determinants of the demand for financing. Supposing a linear relationship between L_j^D and x_j , then $L_j^D = \beta_j x_j + \mu_j$ [1].

– L_j^S is the debt level offered by the lender to firm j at time t . L_j^S corresponds to the firm's *maximum debt capacity* calculated by the lender. L_j^S allows the bank to maximise its profits from the firm. The vector y_j represents the factors entering into the lender's decision to grant firm j a loan at time t . Supposing a linear relationship between L_j^S et y_j , then $L_j^S = \gamma_j' y_j + \omega_j$ [2].

– L_j^D is equal to L_j^S only in exceptional cases, when only the minimum of the quantities offered and demanded are observed (Quandt, 1988). Consequently, equations [1] and [2] are supplemented by the equation $L_j^* = \min(L_j^D, L_j^S)$ [3] where L_j^* is the debt level of firm j at time t .

Then three configurations may be distinguished.

1. If $L_j^* = L_j^D = L_j^S$. The actual debt rate corresponds to both the optimal debt rate determined by the firm and the firm's maximum debt capacity determined by the lender.

⁸ The debt rate used by the authors is the ratio of long-term debt to long-term debt plus equity.

2. If $L^*_j = L^D_j$, the debt rate is the optimal debt rate determined by the firm. The firm's financial structure is thus defined by demand. L^S_j is greater than L^D_j and consequently there is more credit available to the firm from lenders than the firm demands. Firms with these characteristics may be said to be in a situation of *credit rationing by demand* inasmuch as their financial structures are determined by the demand side of the market, ie, the borrowers.

3. If $L^*_j = L^S_j$, the debt rate is the firm's maximum debt capacity as determined by the lender. L^S_j is less than L^D_j . There is unsatisfied demand for credit from the firm on the market. Firms with these characteristics may be said to be in a situation of *credit rationing by supply* inasmuch as their financial structures are determined by the supply side of the market, ie, the lenders.

The last two situations therefore correspond to situations of disequilibrium on the credit market. The possible configurations of the credit market are shown in the following table:

Credit configuration			Nature of constraint
Equilibrium	$L^*_j = L^D_j = L^S_j$	Equilibrium	###
Disequilibrium I	$L^*_j = L^D_j$	Credit rationing by demand	The lender is rationed
Disequilibrium II	$L^*_j = L^S_j$	Credit rationing by supply	The borrower is rationed

1.3 The notion of credit rationing

Although our approach is taken within the framework of an equilibrium rationing approach (Levratto, 1992), the terminology of credit rationing needs to be used with care. It is relatively easy to justify the assumption that firms seek an optimal debt rate (though not so easy to calculate that rate). It is more difficult to estimate the relevance of maximum debt capacity without information about the lenders, as is the case when working solely with corporate accounting data. The optimal debt rate is the rate which makes it possible to maximise the firm's value, if it is listed, or its financial profitability through leverage, if it is not listed. In the latter case, the optimal debt rate is a factor in maximising profit. The definition of maximum debt capacity, on the other hand, is constrained by supply, since it includes the lender's profitability imperatives alongside the relationship between banks and firms. However, we determine its function on the basis of the assessment of the borrower's economic and financial situation that the lender might make on the basis of his own constraints, which we do not know. In other words, credit rationing by supply is difficult to identify in the absence of information on the lender's own financial situation and his own methods for assessing the borrower. Likewise, including in the case of credit rationing by demand, it is difficult to assess the extent to which the optimal debt level pursued by the firm already incorporates the state of the final market (real demand) and of the credit market. The firm might have internalised the rationing of credit (the maximum debt capacity determined by the lender), which would mean abandoning projects for which the optimal debt level was higher than the maximum level defined by the lender. The projects selected would thus be those for which capital could be raised under market conditions. In this context, credit rationing is a relative concept. In conditions of credit rationing by demand, a firm might not

have expressed part of its demand because of its perception of the conditions of supply. It is for that reason that we have sought to construct a *notional* demand for and supply of capital by introducing indicators relating to the agent's environment (economic activity for firms, monetary environment for lenders) alongside the indicators suggested by information theory.

2. THE DEMAND FOR AND SUPPLY OF CREDIT

The dependent variable chosen in this study is the debt rate, which provides a synthetic representation of the firm's financial structure. Like all our ratios, it is calculated according to the Banque de France's methods of financial analysis. Consisting of the ratio of *long-term debt plus short-term borrowings to invested capital* (**BK7**)⁹, it is an indicator of the firm's total debt.

2.1 Individual demand for credit: the firm's choice of an optimal debt structure

In this section we shall identify the factors that encourage firms to contract debt and the factors that encourage them to limit their financial dependence of their own accord. We shall also take into account the firm's financial environment likely to reflect its sensitivity to lenders' constraints. Ratios are chosen by trying to identify the "cognitive process or processes on the basis of which agents determine their financing requirements and capacity" (Levratto, 1992, p.37) or make their decisions whether or not to grant loans.

2.1.1 Factors that encourage firms to contract debt

Firms seek to contract debt in two cases.

First, when firms perceive an improvement in their prospects they anticipate an increase in their financing requirement, which leads to an increase in their debt. This factor may be materialised by the **turnover variation rate (BM1)**.

The credit demand function also includes an indicator relating to the firm's financial environment, which enters into agents' expectations of future activity. Bernanke (1990) and Bernanke and Blinder (1992) have shown that the interest rate spread contains information about future activity. Rational agents' expectations of a positive shock on real activity is reflected in an increase in the spread between long-term and short-term interest rates. We have used the spread between the overnight rate and the long-term rate to materialise this link between debt and real activity. The firm's demand for credit is a negative function of the overnight rate minus long-term rate spread (or a positive function of the long-term minus overnight rate spread)¹⁰.

Second, when a firm wishes to issue new shares or needs to bring in outside shareholders, which is typically the case when small businesses are expanding, debt is a way of both imposing discipline and sending signals. Indebtedness is therefore a positive function of the problems it solves.

⁹ Invested capital consists of internal financing (shareholders' equity + accumulated depreciation + reserves) plus financial debt (including discounted bills, commercial paper and leasing). In an earlier study (Paranque, Cieply, 1996) we showed that the following debt ratios moved in parallel:

- external contributions (loans + short-term bank borrowings + group and shareholder loans) to invested capital,
- external contributions rate,
- debt to invested capital,
- debt rate.

¹⁰ Statistics compiled and made available by the Monetary and Economic Series department of the Banque de France.

In the literature on the subject, the problem of disincentives to optimal investment¹¹ is assumed to be particularly acute among firms with strong growth opportunities which may either embark on over-risky projects or choose not to exercise a growth option. Ang and Peterson use an indicator of the degree of rigidity of the productive system, which can be approximated by the ratio of **plant and equipment to invested capital (BM7)** : if it is low, the firm might need to increase its productive potential. Titman and Wessels (1988) use the ratio of total asset growth to total assets, materialised by the **extended accumulation rate¹² (BB5)** as proxy for firms' growth opportunities.

These two ratios are intended to express the firm's capacity to take advantage of growth opportunities and are likely to indicate a risk of under-optimal investment.

2.1.2 Factors that encourage firms to reduce their demand for credit

A firm may be encouraged to limit its recourse to debt *of its own accord* for several reasons.

First, the firm may wish to indicate its self-discipline. The firm's manager has an alternative to debt in order to solve the agency problems he encounters in his relations with shareholders: he can send them a signal through his dividend policy. The message is generally considered to be effective because it cannot easily be imitated by a poor firm which does not have the necessary cash flow to pay dividends¹³. The idea is that dividends are a signal of the firm's future cash flow in a context of information asymmetries. Outside investors, assuming them to have rational expectations, can anticipate a firm's future results. Information asymmetries are reduced as a consequence. Dividend announcements are thus perceived as good news by potential shareholders. For listed shares, dividend distributions are reflected in a rise in the share price. Dividend policy thus replaces debt policy as an indicator of the firm's quality. Indebtedness is thus a decreasing function of dividend distribution, materialised by the ratio of **dividends to shareholders' equity (BB12)**.

Second, the managers and/or shareholders may, of their own accord, wish to reduce the risk of bankruptcy because of the costs they would have to bear. Controlling this risk involves demonstrating the economic viability of projects and presenting guarantees, but it also means agreeing to let the lender monitor the firm more closely or demand a risk premium, the cost of which may ultimately be passed on to the cost of borrowing proposed to the firm.

- The level of insolvency risk is materialised by the ratio of **interest charges to overall cash flow (BM11)** and of **working capital requirement to invested capital (BM4)¹⁴**.
- The cost of borrowing indicator is the **average cost of borrowing (BT2)** borne by the firm for both long-term loans and short-term borrowings, expressed by the ratio of interest charges to debt.

In order to manage all the constraints mentioned above, the firm may prefer to finance itself from cash flow (Myers, 1984 and Myers, Maljuf, 1984). A preference for self-financing is one of the precepts of hierarchical financing theory. Titman and Wessels (1988) suggest using profitability to take this factor into account, since profitability is an indicator of the availability of internal financing. We have used the ratio of **net self-financing capacity to**

¹¹ This policy of under-optimal investment is based either on a strategy of *underinvestment* linked in particular to the entrepreneur's personal use of assets to the detriment of the firm (Jensen, Meckling, 1976), or on a strategy of *overinvestment* linked to excessive risk-taking by the borrower in projects of uncertain profitability which risk causing a substantial discounting of the firm's shares (Jensen, 1986).

¹² The ratio of total investment plus variation in working capital requirement to invested capital.

¹³ Quintart and Zisswiller (1985) and Cobbaut (1991) provide a review of the literature on the subject.

¹⁴ These ratios are particularly relevant for the detection of insolvency (Bardos, 1991).

internal financing (BB11) as a proxy for profitability, since it is an estimation of net financial profitability for the shareholder before dividends. This ratio may be expected to dampen the firm's demand for debt.

Public offerings of shares are also an alternative source of financing that may dampen demand for debt among firms that are able to consider them. This factor is materialised by the ratio of **net increase in capital to invested capital (BJ4)**, which may also be expected to have a negative influence on indebtedness.

The ratios included in the credit demand function are shown in the table below.

Table 1

FIRMS' DEMAND FOR CREDIT IN INFORMATION THEORY:
CHOICE OF REPRESENTATIVE ACCOUNTING VARIABLES *

Ratios	Factors favouring demand		Factors limiting demand	
	Risk of under- optimal investment	Economic environment	Risk of insolvency	Alternative financing
BM7	Plant and equipment to invested capital	x		
BB5	Extended accumulation rate	x		
BM1	Turnover variation rate		x	
BB12	Dividends to shareholders' equity (rate of shareholder remuneration)			
BT2	Average cost of borrowing		x	
BM11	Interest charges to overall cash flow		x	
BM4	Working capital requirement to invested capital		x	
BB11	Net self-financing capacity to internal financing (net financial profitability)			x
BJ4	Net increase in capital to invested capital			x
Spread	Overnight rate to 10-year govt. bond rate		x	

* the sign expresses the influence of the ratio on demand for debt.

2.2 Individual supply of credit: the exogenous limits on a firm's debt

A firm's debt policy may be limited by the profit maximisation strategies of lenders in general and banks in particular. Whereas in the previous case firms set their own limits on debt, credit rationing theory says that lenders may limit their offer of financing to firms, which then show a lower level of debt than their desired level ex ante. However, lenders and agents can deploy screening, monitoring and signalling devices that help to reduce credit rationing. The capital supply model includes an environmental factor that is intended to set an exogenous limit on lenders' capacity to distribute credit.

2.2.1 Factors limiting a lender's supply of credit

Lenders regularly monitor the activity of borrowers in order to pick up any early signs of future insolvency risk. The **turnover variation rate (BM1)** is an indicator of trends on the firm's markets and of the pressures that are liable to feed through into financing requirements. The ratio of **working capital requirement to invested capital (BM4)** materialises the risk of financial distress and the ratio of **annual loan repayments to overall cash flow (BB7)** shows the importance of repayment of the firm. A negative link may be expected between these ratios and the supply of credit.

Banks also limit their supply of credit if the borrower displays a significant level of moral hazard or opportunism, ie, if the firm's investment policy is less than optimal from the lender's point of view. This risk is materialised by the ratio, used earlier, of **productive plant**

and equipment to invested capital (BM7) and the turnover variation rate (BM1). The lender's risk limitation strategy may then conflict with the firm's debt strategy.

2.2.2 Factors favouring a lender's supply of credit

Faced with this divergence of interests lenders and borrowers, rather than doing nothing, deploy screening and monitoring devices (for lenders) and signalling devices (for firms).

2.2.2.1 Action by lenders

Lenders, and banks in particular, **screen applicants for loans** by offering them various combinations of interest rates and guarantees (Bester, 1985). Firms thus have access to credit under different conditions that reveal the banks' assessment of their situation. Firms offered credit at high rates of interest but with low levels of guarantee may be regarded as high-risk. Conversely, those offered credit at low rates of interest but with high levels of guarantee may be regarded as low-risk. They are able to provide substantial guarantees in return for lower interest rates or the ability to negotiate the combination of interest rates and guarantees. These factors are materialised in our model by the **cost of debt (BT2)** and, as indicators of the level of guarantees that borrowers may provide to the lender, the two ratios of **participating interests to invested capital (BJ3)** and **plant and equipment to invested capital (BM7)**. These ratios are assumed to have opposite signs in the supply function.

2.2.2.2 Action by borrowers

Firms do not remain passive when faced with information asymmetries. They send signals to lenders which may transmit different messages. Managers may signal a firm's quality by taking an equity interest in it, a form of financial commitment that excludes loans and advances (Leland, Pyle, 1977), but this information is not available. Firms may also signal their capacity to generate profits and cash. The ratio of **self-financing to internal financing (BB10)** is an indicator of a firm's capacity to repay since it measures the firm's gross profitability after payment of dividends. Dividend policy may also be a significant element of information. The ratio of **dividends to shareholders' equity (BB12)** reflects the level of shareholder remuneration and the firm's capacity if necessary to raise new equity, ie, to consolidate its financial position. Conversely, when a firm is controlled by its managers this ratio is also an indicator of the extent to which they draw on the firm's profits in order to increase their level of personal satisfaction, albeit perhaps to the detriment of the firm's level of utility. Lastly, the existence of links between the borrower and another source of capital, better informed than the lender under consideration, also gives the lender a signal as to the quality of the firm (Cieply, 1995; Hancké, Cieply, 1996). **Group or shareholder loans (BT4)** may, via the firm's balance sheet, transmit this information from a well-informed lender to a less well-informed one. The same goes for **net increase in capital (BJ4)**, though with a caveat according to the type of lender. A capital increase may be seen either as a sign of confidence in the quality of planned investments (good news) or as a sign that shareholders are looking to share the risks with newcomers (bad news).

2.2.3 Influence of the financial environment on the lender's supply of credit

The model includes an indicator of lenders' refinancing conditions, intended to materialise the financial constraints upon them. For the supply of credit as a whole we have used the **overnight rate (Tjj)**, which is the current price of a credit institution's financial resources. The sign of the link between the overnight rate and the supply of credit is expected to be $\frac{\partial S}{\partial T_{jj}} < 0$. AS the cost of refinancing rises, screening becomes tougher and the supply of credit is reduced.

To sum up, the ratios used in the model are as follows:

Table 2

THE LENDER'S SUPPLY OF CREDIT IN INFORMATION THEORY:
CHOICE OF REPRESENTATIVE ACCOUNTING VARIABLES

Ratios	Factors limiting supply			Factors favouring demand		Financial and monetary environment
	Risk of insolvency	Moral hazard	Adverse selection	Screening	Signalling	
BB7 Debt burden	x					
BM7 Plant and equipment to invested capital		x		x		
BJ3 Participating interests to invested capital				x		
BT2 Average cost of debt				x		
BM1 Turnover variation rate	x	x	x			
BM4 Working capital requirement to invested capital	x					
BB10 Self-financing to internal financing (gross financial profitability)					x	
BB12 Dividends to shareholders' equity (rate of shareholder remuneration)					x	
BJ4 Net increase in capital to invested capital					x	
Tjj Overnight rate						x
BT4 Group and shareholder loans to external financing					x	

*

* *

Each variable is thus an indicator of the firm's financing policy which, combined with other indicators, will enable us to define whether credit is rationed by demand or by supply. The aim is not to study the sign of the coefficient resulting from regressions but to grasp a firm's economic and financial situation from its debt level (and not the variation in its debt level), with the help of indicators that are likely to shed light on the factors that determine whether credit is rationed by demand or by supply.

SUMMARY OF VARIABLES AND THEIR LABELS ¹⁵

$X_D = \{1, BM1, BM4, BM7, BB12, BT2, BJ4, BM11, BB11, BB5, ECTAUX\}$ optimal debt rate

$X_O = \{1, BM1, BM4, BM7, BB12, BT2, BJ4, BJ3, BB7, BB10, BT4, TAJJ\}$ maximum debt rate

Where:

BB7	<i>Debt burden (interest charges + annual loan repayments / overall cash flow)</i>
BM1	<i>Turnover variation rate</i>
BM4	<i>Working capital requirement / invested capital</i>
BB11	<i>Net self-financing capacity / internal financing</i>
BM7	<i>Plant and equipment / invested capital</i>
BB12	<i>Dividends / shareholders' equity</i>
BB5	<i>Extended accumulation rate ¹⁶</i>
BT2	<i>Average cost of debt</i>
BB10	<i>Self-financing / internal financing</i>
BT4	<i>Group and shareholder loans / external financing</i>
BJ3	<i>Participating interests / invested capital</i>
BJ4	<i>Net increase in capital / invested capital</i>
BM11	<i>Interest charges / overall cash flow</i>
TAJJ	<i>Annualised overnight rate ¹⁷</i>
ECTAUX	<i>Spread between overnight rate and 10-year government bond rate</i>

3. THE METHOD

The purpose of this research is first, to try and identify which of the three configurations described above (credit rationing by demand, equilibrium, credit rationing by supply) is most prevalent on the French credit market, and second, to identify the proportion of small firms in the category of firms subject to credit rationing by supply. The aim is to discover whether small firms are over-represented in that category, which would confirm the existence of a small business capital gap.

We have taken a three-stage approach to this question.

First, the debt rate is regressed on the offer vector and on the demand vector¹⁸ and we compare the overall quality of each regression.

Second, after two regressions we obtain an estimated value that lies within 5% of the actual value. For the supply function, we estimate maximum debt capacity. For the demand function, we estimate the optimal debt rate. In order to determine which side of the line a firm falls, we compare the two estimated values according to the corresponding functions. If, for a given firm, the estimated optimal debt rate is lower than the estimated maximum debt capacity, credit is assumed to be rationed by demand. Credit is assumed to be rationed by supply if the opposite is the case and to be in equilibrium when there is no statistical difference between the estimated values. The dominant situation at each date is determined by comparing the proportion of firms in each of the three configurations.

Third, the hypothesis that small firms are subject to greater credit rationing is tested by measuring the frequency of each size of firm in the credit rationing by supply configuration

¹⁵ The debt rate in each case is a function of variables. In other words, each vector uses the effects of links between variables and not the variable per se, in isolation. The sense or meaning derives from the combination of variables: they constitute a "system".

¹⁶ Total investment + variation in working capital requirement to invested capital

¹⁷ The overnight rate is the annual rolling average of the month-to-month overnight rate: like the spread, it is assigned to each firm at its value at the date of the firm's accounts closing.

¹⁸ We use the PROC REG procedure available under SAS and evaluate this quality using adjusted R squared. Multicollinearity and homoskedasticity are tested using the SPEC, VIF and COLLINOINT options.

(contribution of these firms to the chi-squared of the configuration) in order to see whether small firms are over-represented.

The use of the least squares method is open to criticism. Quandt (1988) has shown that the method could produce biased results, because of the existence of a conditional link between the regression carried out and the configuration postulated a priori. This conditional link may indeed lead to a correlation between the error and the explanatory variables, which breaches one of the assumptions of the least squares method.

In view of these criticisms, Quandt (1988) recommends using the maximum likelihood method to identify the form of credit rationing, if any. However, it is not sufficient merely to replace the least squares method with the maximum likelihood method, which would do nothing to solve the problem of the conditional link. Rather, we have sought to optimise a likelihood function including the two functions under consideration and all the possible segmentations of the sample. This enables us to eliminate the conditional link between the results and the assumed domination of one particular configuration. However, applying this method is a complex business (Legendre, Mihoubt, 1990) since all possible segmentations of the sample need to be tested.

Given the computational difficulties and the fact that there is no available software for applying the maximum likelihood method to continuous individual data, we have decided for the time being to take an approach based on the least squares method. In order to verify that there are no contradictions and to judge the relevance of the identified credit configuration, we cross the results with two indicators constructed independently of the supply of credit. These two indicators are the Banque de France credit rating¹⁹ and the incidence of insolvency, bankruptcy, involuntary liquidation or court-supervised rehabilitation proceedings in the year for which the credit configuration is determined. Banque de France credit ratings are assigned after an interview with the chief executive and are based both on accounting data and on qualitative information about the firm's economic situation and growth prospects. Insolvency is often due to a cash shortage or cash flow crisis or to the loss of a major customer. The likelihood of occurrence rises when firms have high levels of debt and hence also of debt service.

¹⁹ The credit rating is assigned after an interview between the firm's chief executive or his representative and the director of the branch of the Banque de France on which the company depends. Leaving aside qualitative factors, a **3 credit rating** is assigned to a company that meets the following conditions:

- the firm's financial position and profitability, assessed in the light of recent financial statements, warrant a favourable opinion,
- the managers, shareholders and affiliates or firms with which the company concerned has close links give no grounds for special attention or reservations,
- payments are made at sufficiently regular intervals not to warrant any change in the payment rating.

A **3 credit rating** is particularly important to all those for whom it is intended, especially institutions governed by the Banking Act, since franc-denominated loans with a maximum residual maturity of two years that such institutions grant to firms with a 3 rating are eligible for Banque de France intervention on the money markets.

A **4 credit rating** is assigned to firms for which the Banque de France is in possession of recent financial statements and whose situation warrants special attention.

A **5 credit rating** is assigned to firms whose situation warrants reservations, or after the appointment of a temporary administrator for example.

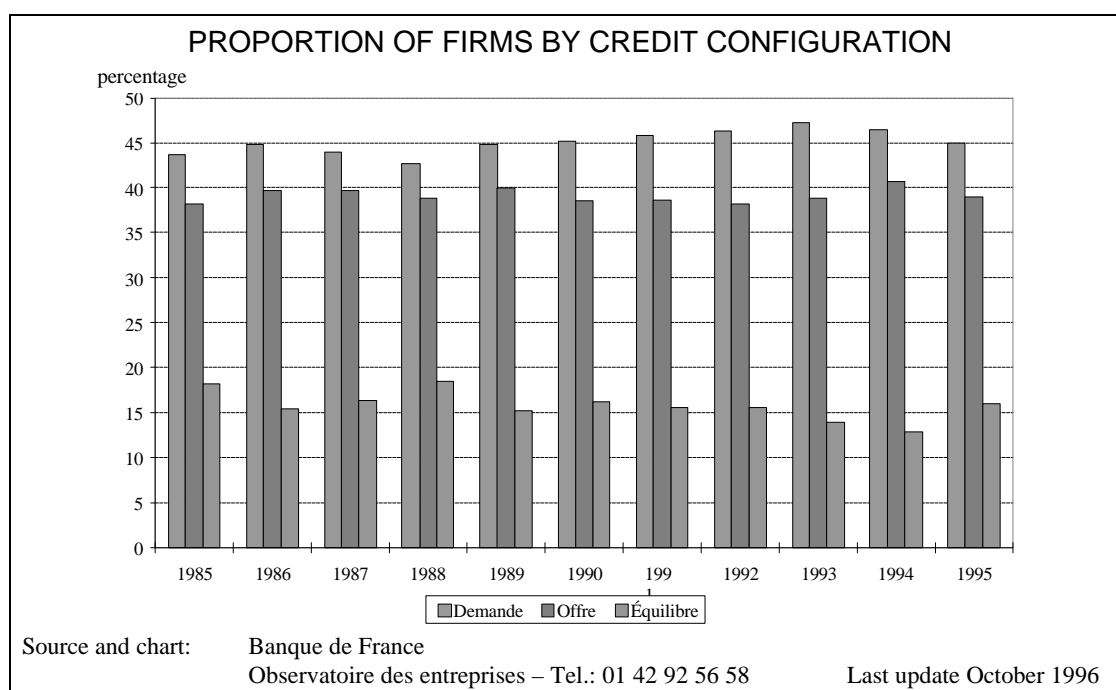
A **6 credit rating** is assigned to firms whose situation warrants serious reservations.

4. THE PROPORTION OF FIRMS SUBJECT TO CREDIT RATIONING BY SUPPLY HAS BEEN STABLE SINCE 1985

4.1 Credit rationing by demand is more frequent

Initial results of regressions carried out on the debt rate according to what we have termed the demand and supply functions show that over the last ten years the proportion of industrial firms in the credit rationing by demand configuration has been higher than the proportion of firms in the credit rationing by supply configuration. The adjusted R-squared of the demand function²⁰ is continuously higher. Thus, for a relatively stable proportion of firms, the supply of credit seems to be rationed by demand in a constant fashion²¹.

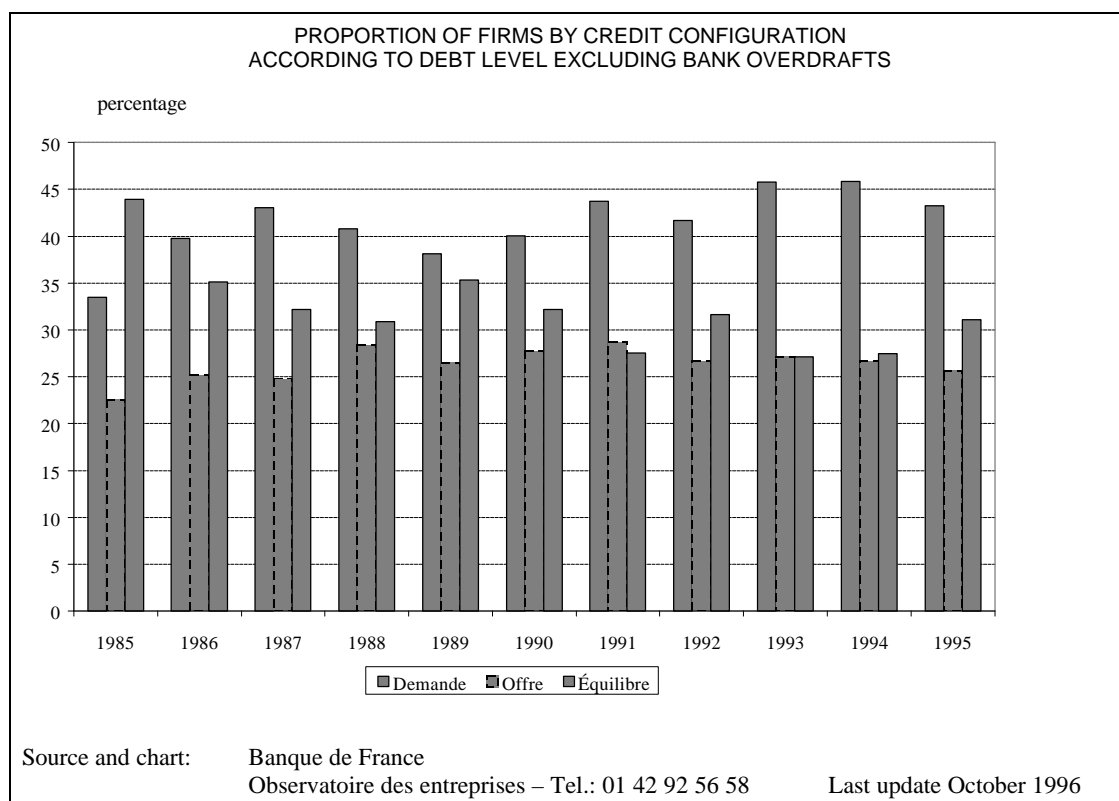
The proportion of firms subject to credit rationing by supply never falls below 38% of the sample (1993) and may rise to over 40% (1994). Taking as an indicator the ratio of *loans to invested capital* (**BK9**), which is an indicator of a firm's long-term debt, the proportion of firms subject to credit rationing by supply falls and the proportion of firms in equilibrium rises. This result appears to be consistent over the long term²².



²⁰ See Annex 2.

²¹ The nature of this constraint remains to be determined, however, especially if ultimately it does not also reflect greater screening by lenders of the investment projects submitted to them.

²² For the supply of long-term credit we have used the spread between **Tjj** and **TMBO**.



CREDIT CONFIGURATION ACCORDING TO DEBT INDICATOR *

Credit status %	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Demand (1)	40,8 (44,725)	44,3 (18,938)	55,4 (142,4)	50,3 (96,878)	51,1 (219,52)	53,0 (226,27)	55,8 (192,78)	59,1 (431,44)	65,0 (462,56)	60,1 (278,47)	55,9 (222,21)
Supply (2)	41,3 (378,18)	43,4 (430,65)	44,9 (588,35)	47,6 (514,24)	47,5 (736,36)	50,4 (854,36)	50,6 (811,94)	51,6 (1 147,1)	53,0 (1 158,1)	47,8 (924,53)	48,2 (946,64)
Equilibrium (3)	50,4 (10,883)	49,1 (5,5924)	37,7 (13,935)	37,2 (24,203)	42,2 (22,27)	38,1 (21,038)	31,9 (13,427)	40,2 (46,754)	36,3 (52,738)	33,5 (22,673)	40,1 (48,874)
Chi-squared	822,920	1 036,063	1 422,374	1 233,446	1 841,549	2 080,737	1 964,494	2 962,908	3 051,44	2 335,21	2 311,82

Source and table: Banque de France
Observatoire des entreprises – Tel.: 01 42 92 56 58 Last update October 1996

* Proportion of firms by credit configuration according to debt rate (BK7) in the same configuration according to the long-term debt rate (BK9). The figure in brackets is the contribution of each one to the chi-squared of the whole. Percentage in relation to the total number of firms having the credit configuration defined according to the long-term debt rate.

Interpretation: in 1985, 40.8% of firms in the credit rationing by demand configuration were also in the same position as regards the long-term debt rate.

The proportion of firms subject to credit rationing by supply as regards both total debt and long-term debt increases steadily over the review period, rising from 41.3% in 1985 to 48.2% in 1995 and peaking at 53% in 1993. At the same time, the proportion of firms in the credit rationing by demand configuration according to both indicators also increases, while the proportion of firms in equilibrium falls until 1989 and then fluctuates considerably until 1995. In view of the credit rationing to which some firms may have been subject, it would be instructive to be able to determine, for those firms which were not subject to credit rationing, whether this was a result of an independent choice, ie, as an expression of their own objectives, or whether, perceiving and/or anticipating such rationing, they changed their strategy and hence their optimum debt level. Unfortunately, the lack of any qualitative data on such behaviour means that we cannot explore the question in more depth.

STABILITY OF THE PROPORTION OF FIRMS SUBJECT TO CREDIT RATIONING BY SUPPLY IN 1995

(percentage)	Subject to credit rationing by supply in 1995
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	1989	1990	1991	1992	1993	1994	
Present	51,9	58,2	65,0	71,2	75,4	89,4	
Demand	30,7	27,5	26,3	24,5	21,3	14,3	
Supply	54,4	55,8	58,0	61,2	65,6	70,6	
Equilibrium	37,8	41,2	39,3	39,0	39,3	37,5	
Source and table:	Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58					Last update November 1996	

Interpretation: 54.4 % of firms subject to credit rationing by supply in 1989 were also subject to credit rationing by supply in 1995.

Over half of the firms that were subject to credit rationing by supply in 1995 had already been in that position at least once since 1989. More than a third had been in equilibrium at least once. Of the 10% of firms present in 1995 since 1989, 36.2% had been continuously subject to credit rationing by supply and 45.5% had continuously been in the demand configuration. More specifically, 81.2% of firms in the credit rationing by supply configuration in 1995 had been in that situation from 1989 to 1994.

A similar level of stability is found with firms in the demand configuration, but not with firms in a state of equilibrium.

4.2 A firm's credit configuration appears to be consistent with the appearance of difficulties and its credit rating

The relevance of a firm's credit configuration is highlighted when the configuration is compared with a variable indicating difficulties (insolvency) during the year after the year under consideration²³. A firm with a high level of debt may be assumed to be exposed to a higher risk of insolvency, because it is especially sensitive to a cash shortage or cash-flow crisis or the effects of a decline in activity. Insolvency is thus an assessment of the risk that expectations will not be fulfilled and hence of the restriction on the firm's ability to meet its commitments.

CREDIT RATIONING BY SUPPLY AND INSOLVENCY IN N + 1 *

Credit rationing by supply	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Frequency of insolvent firms in the configuration (a)	40,7* (2,874/ 1,322)	41,8 (5,338/ 1,5479)	44,4 (10,707/ 5,6197)	41,0 (2,728/ 1,401)	44,0 (9,201/ 4,887)	41,7 (9,575/ 3,0818)	45,7 (25,789/ 13,521)	46,9 (32,177/ 16,175)	52,2 (33,364/ 19,103)	56,8 (26,624/ 12,297)	55,2 (10,24/ 5,5609)
Source and table:	Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58								Last update October 1996		

* Frequency higher than the observed frequency across the entire sample

(a) The figures in brackets are the total chi-squared and contribution to the sub-population

Interpretation: 40.7% of insolvent firms in 1986 were subject to credit rationing in 1985.

From 1993-94, there is some loss of quality in the identification of insolvent firms, linked to the preparation of the corresponding files in 1996. Given the length of bankruptcy and liquidation procedures coupled with publication times and the time it takes to compile the samples for review, some fall-off in quality is more or less inevitable towards the end of the review period. However, this bias does not call into question the conclusions that may be drawn regarding the proportion of insolvent firms that were subject to credit rationing in the previous year.

Insolvency levels in the year n + 1 provide a fairly good reflection of cyclical fluctuations in year n. Thus, insolvency levels rose after the stock market crash of 1987, at the end of the growth cycle and the beginning of the slowdown in the economy in 1989 and 1991

²³ We are grateful to Mireille Bardos who gave us these informations.

and following the recession in 1993. There is a particularly strong link between credit rationing by supply, ie, a situation where the lender deems the debt rate to be at its maximum, and the appearance of difficulties in the following year.

The robustness of the credit configuration indicator is further borne out by the credit rating of firms as at February 1996. In 1995, firms subject to credit rationing were less frequently rated 3 (35.5%, whereas they accounted for 39.9% of the sample), but firms with more than 100 employees were more frequently rated 3 than smaller firms (this corresponds to the overall hierarchy). Thus, the size effect persists within each configuration. In contrast, firms in the credit rationing by demand configuration are more frequently rated 3 (49.7%, whereas they accounted for 45.4% of the sample). The credit rating of firms in equilibrium was distributed evenly in line with the proportion of the total sample that they represent (14.7%).

4.3 Very small and, above all, large firms seem to be more frequently subject to credit rationing

This general finding can be refined by analysing firms' credit configuration according to size. The following tables show the proportion of firms subject to credit rationing by size, first according to the total debt rate, then according to the long-term debt rate.

PROPORTION OF FIRMS BY SIZE ²⁴ LIKELY TO BE SUBJECT TO CREDIT RATIONING
(total debt rate)

year	size	All	≤ 20 employees	21 - 100	101 - 500	501 - 2 000	> 2 000
1985		38,2 * (56,968)	<u>47,2</u> ** (18,591)	37,5 (0,3666)	<u>35,6</u> (3,3121)	35,0 (1,4017)	44,0 (1,2476)
1986		39,7 (67,51)	<u>48,2</u> (21,036)	38,2 (2,2562)	37,7 (2,1828)	37,7 (0,5457)	<u>52,6</u> (5,6228)
1987		39,7 (58,003)	<u>45,2</u> (10,029)	38,0 (3,5844)	39,0 (0,2991)	41,5 (0,4352)	<u>52,0</u> (4,7852)
1988		38,9 (65,463)	<u>42,9</u> (6,6417)	<u>36,7</u> (6,1097)	39,2 (0,0635)	41,4 (0,9305)	<u>58,6</u> (13,443)
1989		39,9 (55,521)	41,1 (0,6231)	<u>38,6</u> (2,5414)	40,6 (0,3496)	42,4 (0,9139)	<u>57,6</u> (9,8056)
1990		38,5 (77,055)	<u>41,8</u> (5,5442)	<u>36,1</u> (9,5403)	39,0 (0,1747)	<u>48,1</u> (13,898)	<u>54,4</u> (7,4278)
1991		38,7 (82,700)	40,7 (2,4671)	<u>36,5</u> (7,7488)	38,9 (0,0635)	<u>48,5</u> (15,548)	<u>62,0</u> (15,278)
1992		38,2 (41,911)	39,3 (0,7998)	37,6 (0,6935)	37,0 (1,1379)	<u>43,1</u> (3,9596)	<u>55,6</u> (8,4985)
1993		38,1 (71,348)	<u>42,6</u> (9,1374)	<u>36,9</u> (5,9102)	37,6 (0,9875)	<u>45,1</u> (5,7413)	<u>59,8</u> (12,157)
1994		40,6 (82,799)	<u>43,4</u> (5,562)	<u>38,1</u> (11,356)	42,4 (2,1338)	<u>46,9</u> (5,2569)	<u>57,0</u> (7,0686)
1995		39,9 (125,986)	41,8 (2,259)	<u>37,0</u> (13,687)	42,0 (2,9902)	<u>52,9</u> (21,899)	<u>58,4</u> (8,6272)
Source and table:		Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58				Last update October 1996	

* The figure in brackets is the chi-squared, significantly different from zero at the 5% threshold.

** Underlining indicates significant frequency (contribution to chi-squared) of size (larger or smaller) in relation to the frequency of all firms in the sample having that credit status. The likelihood of a firm having a particular credit configuration was checked by comparing the adjusted value of R-squared for a given size according to credit configuration and for a given configuration according to size.

A significant link between credit configuration and size emerges over the review period. Certain categories of firm appear to be more often subject to credit rationing than others. These categories are very small businesses (20 employees or less), except in 1989, 1992 and 1995, very large firms (over 2,000 employees) and, from 1990, large firms (500 to

²⁴ The results for the class ≤ 20 employees should be treated with caution in view of the low coverage rate for this category of firms (approx. 8%).

2,000 employees). Moreover, a majority of firms with over 2,000 employees are subject to credit rationing, unlike small businesses. We may assume, therefore:

– that very small business have a problem of access to capital and that lenders find it difficult to judge their growth prospects. The rationing thus stems mainly from the banks;

– that very large firms are more sensitive to developments on financial markets and to investors' expectations. This may, in a rather specific form, reflect the gap between the world of industry and the world of finance and hence suggest a latent risk of under-optimal investment. From 1990 in particular, the economic slowdown had an adverse effect on investors' expectations. The rationing thus stems mainly from the markets.

This finding may come as a surprise, given that the debt rate of very large firms is on average lower than that of smaller firms. This apparent contradiction is resolved when it is remembered that our configurations are notional (ie, virtual) ones. In other words, very large firms can (or could) be more frequently subject to credit rationing even though their debt rate is lower than that of smaller firms with the same configuration and higher than that of similar firms having a different configuration. Thus, the same hierarchy by size exists within each configuration.

PROPORTION OF FIRMS BY SIZE SUBJECT TO CREDIT RATIONING AS REGARDS LONG-TERM DEBT
(Debt excluding bank overdrafts)

year	size	All	≤ 20 employees	21 - 100	101 - 500	501 - 2 000	> 2 000
1985		22,6 (238,248)	<u>38,1</u> ** (92,105)	24,3 (3,8)	<u>14,9</u> (49,231)	16,2 (9,7)	19,9 (0,4588)
1986		25,1 (259,493)	<u>41,1</u> (118,07)	25,6 (0,437)	<u>17,3</u> (57,369)	20,2 (5,6169)	29,3 (0,9314)
1987		24,8 (219,212)	<u>39,1</u> (109,1)	24,6 (0,0631)	<u>17,7</u> (49,835)	22,1 (1,5978)	31,5 (2,3101)
1988		28,4 (120,283)	<u>38,4</u> (55,087)	28,3 (0,0036)	<u>23,1</u> (25,87)	25,5 (1,6845)	29,6 (0,0758)
1989		26,5 (104,043)	<u>34,9</u> (46,761)	25,6 (1,9541)	<u>22,7</u> (15,412)	26,6 (0,0025)	36,0 (4,2286)
1990		27,7 (86,533)	<u>34,3</u> (31,747)	26,5 (3,583)	<u>24,4</u> (11,4)	<u>33,7</u> (7,6093)	32,5 (0,9205)
1991		28,7 (105,598)	<u>35,8</u> (40,143)	27,2 (5,6594)	<u>24,9</u> (14,645)	<u>36,4</u> (12,947)	<u>30,6</u> (0,1278)
1992		26,7 (136,041)	<u>34,3</u> (55,409)	25,0 (6,9177)	<u>22,5</u> (18,659)	31,3 (5,0452)	33,3 (1,7959)
1993		27,1 (145,318)	<u>35,5</u> (65,396)	25,5 (6,3074)	<u>21,8</u> (26,695)	31,1 (3,2468)	33,6 (1,6714)
1994		26,6 (143,889)	<u>34,4</u> (67,537)	<u>24,0</u> (18,493)	23,7 (8,8975)	31,3 (4,5071)	36,5 (3,8735)
1995		26,1 (100,915)	<u>32,4</u> (38,785)	<u>24,0</u> (11,184)	23,7 (5,5151)	31,3 (5,3787)	35,6 (3,5073)
Source and table:		Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58				Last update October 1996	

As regards the long-term debt rate, only very small firms are more frequently subject to credit rationing. The existence of a small business capital gap thus seems to be confirmed for long-term debt for this category of firm. The distribution of very large firms is more or less even according to credit configuration, the proportion subject to rationing being between 20 and 30 points less (depending on the year) in relation to the result calculated according to the total debt rate. This variation according to the indicator used is apparent for all sizes of firms but the amplitude is less great. Moreover, whereas for very large firms the direction of the movement is from credit rationing by supply towards equilibrium or credit rationing by demand, for the other categories the relative proportion of firms in equilibrium increases.

These results are reasonably consistent with the underlying pattern predicted by theory, since in a context of globalisation large firms offer more credible long-term growth prospects than other firms. Furthermore, the fact that smaller firms generally obtain financing

through intermediaries encourages them to optimise their financial structure in line with their financial and economic environment.

Firms with between 21 and 500 employees, and in particular those with between 21 and 100 employees, are less frequently in the demand configuration. This result is also found with reference to the long-term debt rate, though with less intensity at the top end of the range of firms in the category. This could confirm the idea of a hierarchy in financing, with such firms preferring to meet their financing requirement out of their own resources before contracting debt.

4.4 Credit rationing appears to be tighter when financial links exist

In 1995, according to the survey carried out in 1996, approximately 70% of manufacturing firms in the sample had financial links with each other²⁵ and 2% were listed on the stock exchange²⁶. Of the companies having financial links, only 2.8% were listed (though 96.3% of listed companies had financial links).

FINANCIAL LINKS AND SIZE

(percentage) (*)	1995					
	All	≤ 20	20-100	101-500	501-2000	>2000
Existence of financial links	69,2 (1 433,816)	47,5 (174,14)	66,4 (7,601)	91,5 (178,46)	99,1 (67,369)	100 (13,829)
Listed	2,0 (1 046,22)	0,2 (43,578)	0,3 (98,791)	4,7 (88,69)	14,9 (434,5)	28,7 (359,98)
Source and table: Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58 Last update October 1996						

(*) In relation to the total. The figure in brackets is the chi-squared (significant at the 5% threshold) or the contribution to chi-squared.

Interpretation: 69.2% of firms have financial links; this proportion is 47.5% for firms with 20 employees or less.

The frequency of financial links increases with size, with a significant break occurring at the 100 employee threshold²⁷. This distribution is amplified for credit rationing by supply in particular. The same is true of a stock market listing, though with a threshold of 2,000 employees, which confirms the theory that this threshold is a useful yardstick for the probability of a firm being listed (Cieply, Paranque, 1996). For 57.6% of firms, at least 10% of the capital was held by another company (legal entity) or the state, representing 83.2% of all firms having financial links. The proportion was 38.6% for very small businesses, 52.8% in the 20-100 employee range, 80.6% in the 100-500 range, 93.3% in the 500-2000 range and 96% for very large firms.

Among the firms having financial links, another firm or the state owned more than 10% of the capital of 97.8% of them (corresponding to 57.6% of all the firms in the sample); more than 25% of the capital of 91.4% of them (corresponding to 53.7% of all the firms in the sample); more than 50% of 78.9% of them (corresponding to 46.4% of all the firms in the sample); and more than 95% of 53.3% of them (corresponding to 31.3% of all the firms in the sample). Analysis by type of shareholder shows that at least 10% of the capital is held:

- in 0.1% of cases by the state,

²⁵ At September 1996, firms owned exclusively by individuals were not included. We are grateful to É. Kremp and C. Truy for their help to use those informations.

²⁶ By comparison with DAFSA data on financial links.

²⁷ We have not considered the question of what, from an economic standpoint, constitutes a financial link. However, the various hierarchies between financial links or stock market listing and size or credit status, or, for credit rationing, between financial links or stock market listing and size, are borne out at the thresholds of 10%, 25%, 50% and 95% of the capital held by another legal entity or the state.

- in 0.3% of cases by the employees (there were no differences according to size category for this type of shareholder structure),
- in 0.8% of cases by the public (listed securities),
- in 11.1% of cases by a bank,
- in 27.3% of cases by a private individual,
- in 39.3% of cases by a holding company,
- in 54.5% of cases by another firm.

TYPE OF SHAREHOLDER BY SIZE

At least 10% of capital owned by*	All	≤20 employees	21-100 employees	101-500 employees	501-2000 employees	> 2000 employees
State	0,1 (375,653)	0	0	0	0,2 (0,5657)	6,2 (368,29)
Public (stock market)	0,8 (114,457)	0,2 (4,9952)	0,4 (9,3926)	1,0 (1,0214)	3,3 (34,422)	8,3 (63,668)
Bank	11,1 (13,532)	9,2 (3,2733)	11,1 (0,0005)	12,8 (4,9123)	1,1 (3,8905)	11,3 (0,0045)
Private individual	27,25 (449,479)	43,7 (100,85)	58,96 (35,256)	15,94 (94,549)	6,31 (78,794)	5,1 (17,377)
Holding company	39,3 (110,490)	27,8 (34,655)	38,2 (1,1765)	43,8 (10,158)	50,1 (14,458)	55,7 (6,5763)
Firm	54,5 (61,832)	65,1 (20,696)	54,2 (0,0892)	51,3 (3,896)	50,9 (1,1815)	43,3 (2,247)
Source and table: Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58 Last update October 1996						

* Chi-squared in brackets.

Within firms having less than 20 employees, the blocking minority most often belongs to at least one private individual or firm. It is rare for such firms to be owned by a bank or a holding company. The situation is symmetrical among firms with more than 100 employees. Banks have shareholdings above all in companies with 100 to 500 employees. Beyond that point, shares are mainly traded on stock markets. These findings contradict the generally accepted parallel between a company's size and its degree of independence and highlight a difference in the type of control exercised over a firm according to the number of employees.

FINANCIAL LINKS, INSOLVENCY, STOCK EXCHANGE LISTING AND CREDIT RATING

(*)	1995	
	3 rating	Insolvency
Fijanc` D	0_*Dv`dä€ 6 (14.420/1.208))	0.2 (5.982/1.837)
Listed	2.3 (15.061/4.3181)	NA*
Source and table: Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58 Last update October 1996		

The figures in brackets are the chi-squared significant at the 5% threshold and the contribution to the sub-population

* not applicable.

The frequency of 3 ratings is higher than the average for the sample among firms having financial links (likewise, the frequency of 4, 5 and 6 ratings is lower when at least 10% of the capital is owned by another company or by the state) and/or listed on the stock market (respectively 69.2% and 2%). This is doubtless due to the guarantor role that the firms having the links may play, but is also attributable to the profitability imperative that direct contact with the financial markets exerts on these firms' approach to their financial situation (Paranque, 1996), causing them to strengthen their financial independence. The incidence of insolvency was less frequent in 1995 among firms having financial links than for the sample as a whole.

CREDIT RATIONING AND FINANCIAL LINKS *

	All	1995

		Demand	Supply	Equilibrium
Financial links	69,3/45,2 (61,01)	65,6/42,9 (10,278)	72,3/41,7 (6,5087)	72,0/15,4 (2,0019)
Listed	2,0/39,9 (14,00)	1,5/34,8 (5,84)	2,2/43,8 (0,934)	2,9/21,3 (6,9498)
Source and table: Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58 Last update October 1996				

* The figure in brackets is the chi-squared significant at the 5% threshold and the contribution to the sub-population

Interpretation:

- 65.6% of firms in the demand configuration have financial links / 42.9% of firms with financial links are in the demand configuration; the corresponding figures for the sample as a whole are 69.2% and 45.2% respectively.
- 2.2% of firms in the supply configuration are listed on the stock exchange / 43.8% of listed firms are in the supply configuration; the corresponding figures for the sample as a whole are 2.0% and 39.9% respectively.

Firms in the credit rationing by supply configuration more often have financial links (72.3% of cases) than do other firms (the contrary is less true), a finding that needs to be seen in a group context, especially as regards prices between sister companies and cash management. The existence of cross-guarantees also needs to be taken into account.

Listed firms are more frequently in equilibrium than other firms, which seems consistent with our initial theoretical assumptions and strengthens the relevance of independent assessment of credit status. Preserving the symmetry, firms in equilibrium are more often listed than other firms. Firms in the demand configuration are less often listed.

Ultimately, the proportion of firms in the demand configuration is broadly higher. It falls when financial links exist, the firms in this case tending to be in the supply configuration or in equilibrium. This observed change doubtless corresponds to specific methods of financing linked to the possible existence of special financial relations between linked firms. Listed firms are broadly speaking in equilibrium.

5. CREDIT RATIONING IS APPLIED ABOVE ALL IN THE SHORT TERM

In this section, we shall look in greater detail at the years 1994-1995 in the light of the fragility of the recovery in investment. Financing requirements, substantial in the short term, are linked above all to the financing of operations, while capital investment seems generally to be financed from cash flow. In these circumstances, firms appear to be rationed in the short term without commercial credit playing a substitution role. At the same time, the monetary environment reflects agents' uncertainty as to the stability of prevailing conditions for raising capital rather than their inflationary expectations.

5.1 A firm's working capital requirement determines its demand for credit

Over the period 1985-1995, there is little correlation between differences in firms' levels of activity and their credit configuration since there is no significant difference in the rate of turnover variation between the three configurations we have identified.

Firms subject to credit rationing by supply have significantly higher debt rates than firms in the demand configuration. Within each configuration, large firms have lower debt rates than small businesses. Within the small business category, firms in the supply configuration have higher debt rates than those in the other configurations. This distribution is not found among large firms. However, three points need to be made:

– first, the debt rate excluding bank overdrafts (ie, the long-term debt rate) is less high in the first case than in the second,

– second, the proportion of bank loans in total debt is higher for firms in the demand configuration, while the proportion of bank overdrafts is higher for firms in the supply configuration;

– third, the average cost of debt, calculated as the ratio of interest charges to financial debt, is lower for firms in the demand configuration than for firms in the supply configuration, except in 1985 and 1995 when it was similar.

There does not appear to be any stable link between credit configuration and the overnight rate or spread²⁸.

Two other points are worth noting:

– the proportion of debt securities in total debt was higher among firms in equilibrium than in firms in the demand configuration, though there was no difference between firms in the demand configuration and firms in the supply configuration;

– there was no difference in the level of participating loans across the three configurations.

The low level of financial autonomy of firms subject to credit rationing may be caused by a lack of equity, but the link between high debt levels and low equity levels is difficult to pin down. The link may reflect high profitability coinciding with sustained investment in the productive potential. This is generally the case among small businesses compared with large firms (Paranque, 1994, 1996) and low equity levels reflect a hierarchy in the sources of financing: cash flow, debt, equity.

With regard to credit configuration, the situation appears to differ from that which is found when the size criterion is applied. Whatever the indicator used, profitability is lower among firms subject to credit rationing by supply than in the other cases. At the same time, the strict accumulation rate of companies in the supply configuration is significantly lower than that of firms in the demand configuration²⁹ (there is a 6-point gap). This finding suggests that lenders' supply of credit is rationed by firms which initially finance their investment out of cash flow. It would confirm two points: first, the short-term/long-term dichotomy between configurations as regards debt rates; and second, the relevance of the theory outlined in the introduction that firms, lacking prospects and in a tight financial environment, have internalised the constraints of their financial partners and submit only vital and profitable investment projects³⁰ for which they are almost certain to obtain financing.

The observed short-term/long-term dichotomy reflects the existence of mainly short-term financing needs. True of firms subject to credit rationing by supply in 1995, it seems to be a stable feature. This characteristic of firms according to the term of debt seems to be

²⁸ The overnight rate is sometimes higher in the credit rationing configuration than in the case of unrestricted access to credit, during phases of expansion or contraction (1986, 1988, 1991, 1993, 1994), and sometimes lower, during cyclical upturns or downturns (1987, 1990, 1992, 1995), except in 1985 and 1989 when it was similar in both cases.

In 1985 and 1986 the spread was negative, but more so in the case of unrestricted access to credit than in the case of credit rationing. From 1987 to 1989, then in 1991 and 1995, there was no significant difference. When the spread was positive, it was greater for companies subject to credit rationing in 1992 even though it was narrower than for companies with unrestricted access to credit in 1993. In 1990 it was negative and narrower for firms subject to credit rationing, unlike in 1994 when it was greatest.

²⁹ From 1989 to 1995, the extended accumulation rate (total investment plus changes in working capital requirement to invested capital) was lower under credit rationing conditions. This finding can be explained by a lower level of investment in the productive potential that is either compounded by a negative variation in the working capital requirement or that more than offsets an increase in the working capital requirement.

³⁰ This finding may also correspond to hierarchical financing.

relatively clear-cut, since of the firms continuously subject to credit rationing since 1989, less than a fifth are rationed in both the medium and the long term (cf. above).

A firm's credit configuration seems to be influenced by the nature of the link with the economic and financial environment, reflecting situations of dependency or domination between firms. Thus, taking the overall debt rate, rationing is applied to the short-term financing resulting from the working capital requirements of firms in the supply configuration, which are greater than those of other firms. The period covered by the working capital requirement is greater for firms in the supply configuration (80.4 days) than for other firms (68.8 days for firms in equilibrium and 61.3 days for firms in the demand configuration). A closer look at one element of the working capital requirement shows that the level of intercompany credit³¹ is higher for firms rationed by supply (10.2 days) than for firms in equilibrium (9.1 days) or firms in the demand configuration (9.5 days). This gap is not due to some assumed substitution (or supplementing) of financial debt by supplier credit. Payment times for trade payables are similar across the three configurations. By contrast, customer payment times are 83.6 days for firms subject to credit rationing and approx. 80 days in other cases. Likewise, for 16% of firms in the supply configuration in both 1994 and 1995 there was no difference in the level of intercompany credit or its components compared with companies in the other two configurations. A substitution effect might have been expected, whereby a reduction in the debt rate would allow firms to move from one configuration to another and hence be matched by a rise in the level of commercial credit, but this was not the case.

On the contrary, the firms which from the lenders' standpoint have a maximum debt level are those which finance their customers the most. Consequently, credit rationing by supply also reflects an economic constraint linked to the nature of relations with customers and the degree of dependence on them. This indicates a relationship of domination reinforced by low stock turnover, which is 64.2 days for firms in the supply configuration compared with 57.4 days for firms in equilibrium and 49.2 days for firms in the demand configuration.

Analysis by size shows that in conditions of credit rationing by supply the level of intercompany credit is higher among firms with 20 - 500 employees and similar among other firms. It is apparent initially that large firms benefit from this form of financing (CNC, 1996) and that consequently there is no effect of substitution for bank credit for small firms that carry higher levels of debt. Closer examination of the components of this balance shows first, that customer payment times are shorter among firms with over 500 employees than among smaller firms, and second that supplier payment times are longer among small businesses (less than 100 employees) than among other firms. The latter finding suggests that longer supplier payment times are a supplementary source of financing for very small businesses which are more often subject to credit rationing. However, such an analysis must be treated with caution, because the finding may also reflect specific business factors linked to longer production cycles, as in the case of one-off orders for particular products, for example (Salais and Storper, 1993).

CREDIT RATIONING BY SUPPLY IN 1995 IN RELATION TO CREDIT RATIONING BY DEMAND

Days	≤ 20	21-100	101-500	501-2 000	> 2 000
Customer lags	<	>	>	NS	NS
Supplier lags	NS*	NS	>	NS	NS
Intercompany credit	<	>	>	NS	NS
Source and table:	Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58			Last update November 1996	

* difference is not significant

³¹ Including downpayments from clients and to suppliers.

To gain a fuller understanding of financing methods, we would have to be able to reconstitute the commercial links between firms in order to determine, for a given firm subject to credit rationing, the credit configuration of its clients. If its clients proved to be in the demand or equilibrium configuration, this would support the hypothesis of a substitution effect between financing methods. Such support is not forthcoming at the moment, for lack of information.

5.2 Are firms more sensitive to changes in rates than to changes in spreads?

Before comparing the credit configuration with changes in interest rates, let us recapitulate the main features of the period under review, which followed a series of reforms that profoundly changed France's financial landscape.

1983 : Opening up of firms' investment possibilities: bonds with share options, investment certificates, participating shares, creation of a second stock market accessible to small firms.

1984 : Abolition of credit restrictions and new Banking Act giving banks greater freedom of action.

1985 : Creation of certificates of deposit, negotiable debt securities open to banks, followed by commercial paper and other negotiable instruments.

1985 : Creation of a financial futures market (MATIF).

1986 : Relaxation of exchange controls³².

Three main sub-periods can be identified:

– 1985 to 1989: a period of recovery and economic growth. The financial reforms of 1984-86 had a considerable impact on financing methods, especially for large firms. However, the fragility of the financial system was highlighted by the crash of October 1987, the effects of which are still being felt;

– 1990 to 1993: a period of slowdown and recession, hitting small businesses first (bankruptcies reached record levels), though large firms and the banking system were also affected;

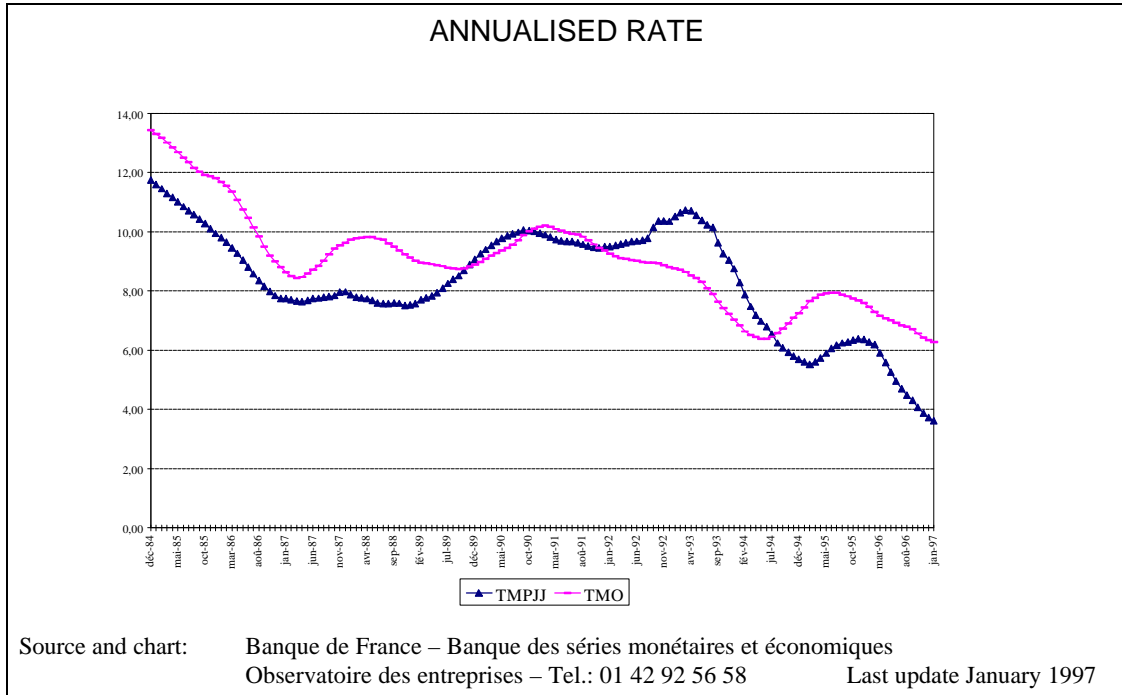
– since 1994: despite considerable public assistance the recovery has been timid and hesitant, with low levels of investment reflecting a broader uncertainty about economic and monetary prospects.

During these years, financial deregulation and fresh growth suggested a lasting recovery made possible by a better allocation of resources, better possibilities for risk management and a greater variety of financing methods (Aglietta, 1995). However, high real interest rates until 1990, financial crisis (the 1987 crash, the peso crisis in 1994) and the bankruptcy or quasi-bankruptcy of some large groups (eg. Metallgesellschaft in 1994), the property crisis and the difficulties of French banks all led to increased short-term pressures and tighter solvency requirements. Against this background, despite lower real interest rates, banks and consequently firms as well developed two priorities: financial consolidation and short-term profitability (Léonard, 1997). This had two consequences: the postponement or shelving of investment projects, and a drop in the accumulation rate, thus ensuring the profitability of invested capital. The combination of these factors led to a fall in investment and a rise in internal financing from 1991 (Aglietta, 1995). Under these circumstances, a firm's credit configuration may be assumed to express a different state of affairs depending on

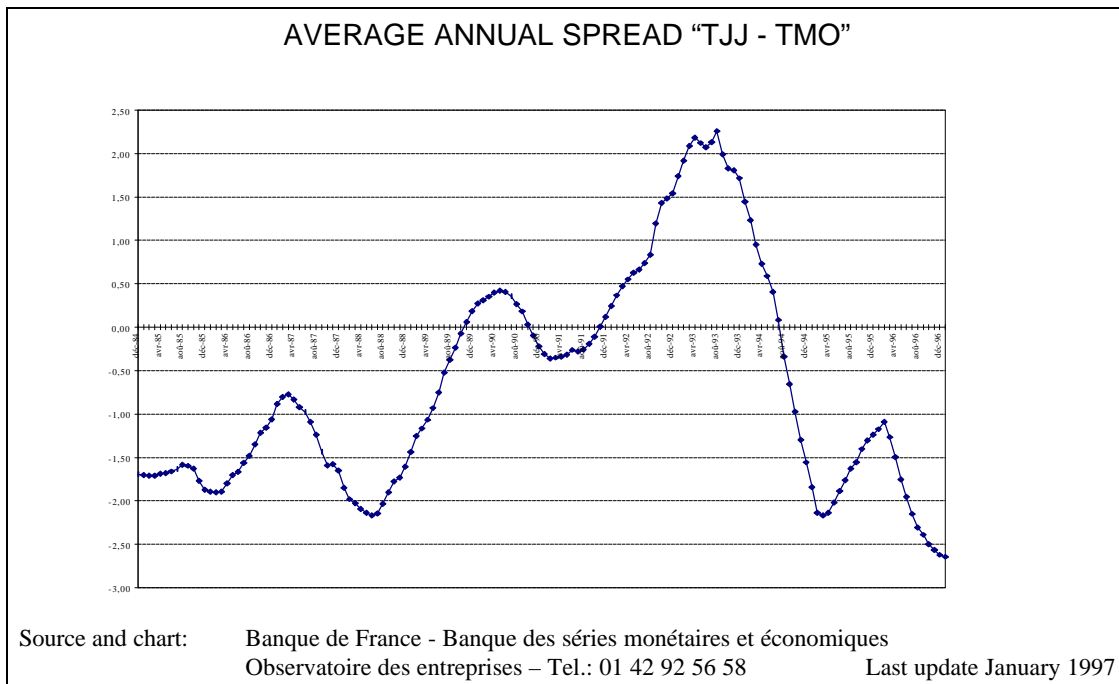
³² Taken from Jullien, Paraque (1995).

whether it is identified before or after 1990/91. In the first case, lenders chose only those investments whose profitability was compatible with real interest rates (ie, with long-term inflationary expectations). In the second case, lenders gave priority to investments that were profitable in the short term.

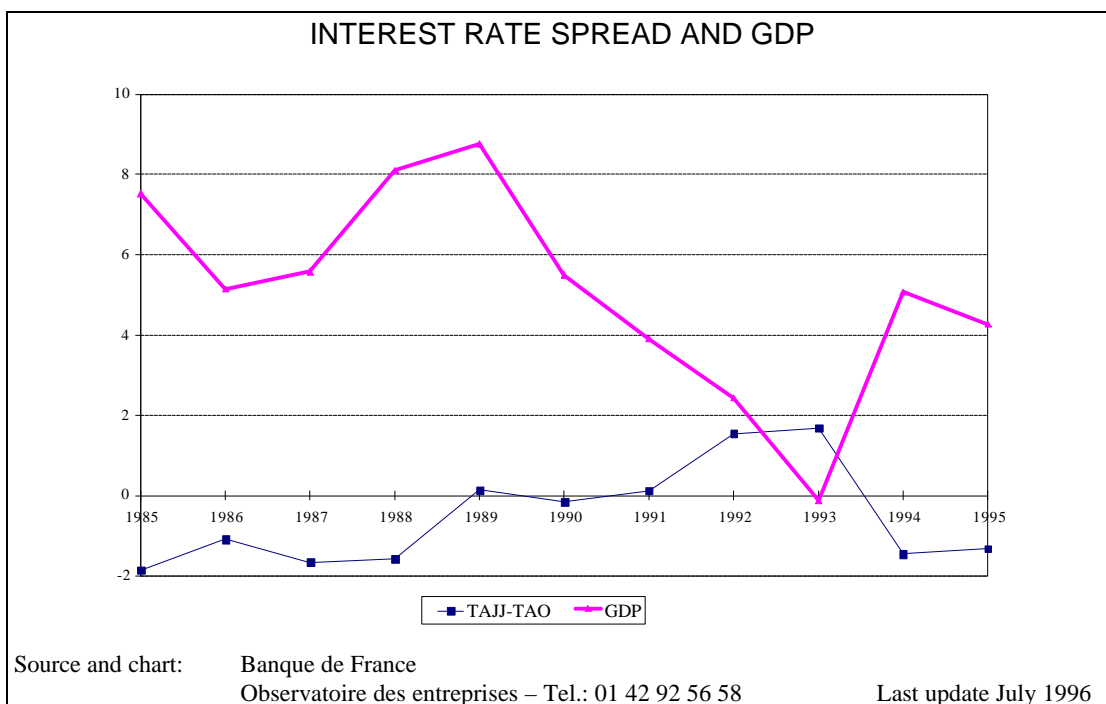
The monetary environment is materialised by the interest rate spread³³. Until mid-1989, the overnight rate was lower than the long rate. From 1991, the overnight rate exceeded the long rate.



³³ Average overnight rate to average rate for 10-year government bonds.



TJJ = Overnight rate
 TMO = 10-year government bond rate



A comparison of spreads with changes in GDP³⁴ shows a symmetry which is contradicted only in 1988, 1989 and 1990, when markets were uncertain about future growth trends. The interest spread reached its maximum positive level in 1993 with the recession.

Five points should be noted:

³⁴ which is well reflected in the samples (see description in Annex 1).

– the fall in interest rates between 1985 and 1987 was matched by an increase in the proportion of firms subject to credit rationing;

– between 1989 and 1991, the rise in rates and the inversion of the trend match a decline in the number of firms subject to credit rationing and an increase in the number of firms in the demand configuration;

– from 1993 to 1994, the fall in interest rates coincides with a stabilisation of the number of firms in the demand configuration and an increase in the number of firms in the supply configuration;

– in 1995, despite the fact that the spread is again negative, interest rate changes are matched by a decline both in the number of firms in the demand and supply configurations and an increase in the number of firms in equilibrium;

– focusing on the long-term debt rate, as expected the proportion of firms in the demand configuration increases from 1989, at the beginning of a period of high uncertainty, as reflected by the positive interest rate spread. The proportion does not begin to decrease again until 1995, matched by a corresponding increase in the proportion of firms in equilibrium.

It would appear from this that firms are more sensitive to the direction of interest rate trends than to whether the spread is positive or negative and the degree of uncertainty it is supposed to reflect. In 1985-1987 and 1993-1995 interest rates fell and the proportion of firms in the supply configuration increased. The same movement was observed with a negative spread in one case and a positive spread in the other. The fact that credit configuration does not depend on whether the spread is positive or negative may be linked to the varying importance of uncertainty about the ability to control the solvency constraint. From a macroeconomic standpoint, the rise in long rates and/or a negative spread express the expectation that inflation will rise, and hence a situation that is favourable to borrowers. From the firm's standpoint, however, the rise might be thought to indicate an expectation of greater difficulties in meeting financing requirements at lower cost (compounded by a positive spread) and hence a risk of insolvency. This would suggest a certain mismatch between market expectations and firms' investment decisions, with firms finding themselves facing the dual difficulty of determining real demand at a time of market uncertainty about future yields, which strengthens the trend towards short-term profitability as a criterion for granting loans³⁵.

Altogether, there seems to be a link between credit configuration and the monetary environment. Which one influences which remains to be determined, and this causal link will be the subject of further research.

CONCLUSION

An earlier study (Cieply, Paraque, 1996) revealed the existence of a size effect in the determination of the financial structures of French firms over the period 1990-1993. However, this effect only appeared clearly above the 2000 employee threshold and was not sufficient to identify the dominant factors explaining the financial structures observed.

We therefore turned to a model that included the determinants of the demand for and supply of financial debt. The main findings of this research are:

– the importance of credit rationing by demand over the period as a whole and across the population of firms;

³⁵ "Uncertainty as to yields coupled with the long end of the term structure tend formally to create, through the action of futures and interest rate options in particular, a short-term horizon for reversible commitments, at which point criteria of short-term profitability apply. [...] Thus, the higher a firm's debt to equity ratio, the higher the required yield on shares and the higher the overall cost of capital. In other words, variations in the financial markets' assessment of shares and debt securities have a direct impact on the required yield on shares and on the overall cost of capital" (Léonard, 1995).

- the absence of any effect of substitution of debt to suppliers for debt to financial institutions, perhaps due to a lack of information about the customers of firms subject to credit rationing by supply;
- the high frequency of firms with financial links subject to credit rationing by supply, which doubtless corresponds to specific methods for managing cash balances and the production cycle;
- the fact that listed firms are more often in equilibrium than other firms.

The hypothesis of a small business capital gap seems verified for the smallest businesses, especially as regards long-term debt. However, this finding is not entirely clear-cut. We have sought here to construct notional supply of and demand for credit. We have no information about either lenders' offer of credit to firms, or about firms' real demand for credit. It may be that the real values are in fact different from the notional values. Firms may ration themselves in view of their own expectations of growth on their markets and their perception of the financial and monetary environment. They may already have screened their investment projects and defined a strategy likely to allow them to assume the solvency constraint and meet the standards of financial independence.

Lastly, the prevalence of each configuration seems to depend more on the movement of interest rates than on their spread.

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THE SAMPLE

11 samples spanning two years were constituted from 1985 to 1995. Only results for year n were used, year n-1 being used to calculate variations.

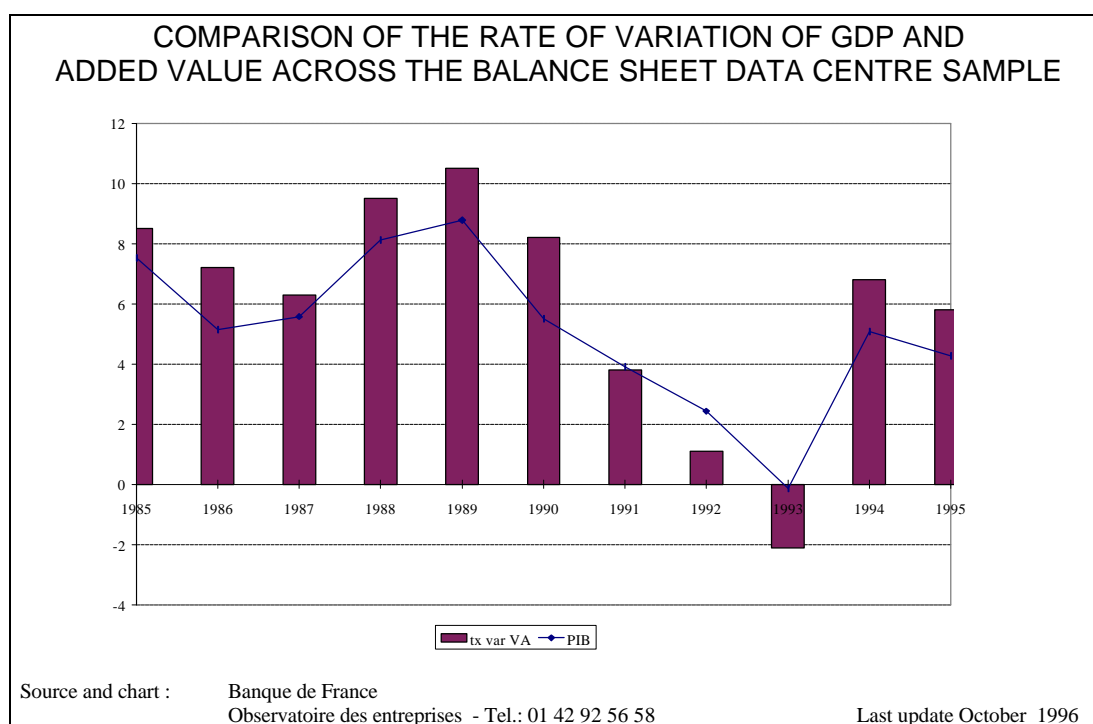
The coverage rate (TC), calculated in relation to the number of salaried employees appearing in the comprehensive register of firms taxable on trading profits, was stable over the period, as was the structure of the sample (S). Small businesses were under-represented in relation to their real weight in the economy.

% of Employees	1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995	
	TC	S	TC	S	TC	S	TC	S	TC	S	TC	S	TC	S	TC	S	TC	S	TC	S	TC	S
ALL	47,8	100,0	51,1	100,0	52,7	100,0	55,6	100,0	55,3	100,0	54,4	100,0	57,9	100,0	56,5	100,0	51,1	100,0	54,3	100,0	NA	100,0
Firms with more than 500 employees	68,9	70,8	70,4	65,3	73,0	63,3	75,4	61,3	74,0	59,0	71,4	57,5	78,4	57,5	76,4	56,8	75,9	57,1	72,5	53,4	NA	54,3
Comprehensive sample	-	49,3	-	47,0	-	45,7	-	45,2	-	44,1	-	43,8	-	42,3	-	42,0	-	41,4	-	40,5	-	NA

percentage

Sources and table: Banque de France
Observatoire des entreprises - Tel. : 01 42 92 56 58
Last update February 1997

TC : coverage rate; S : structure, NA : not available



The variation in value added, calculated for each sample, follows the trend in GDP, though it is amplified during periods of trend reversal. The recovery in 1987 in particular shows up across the sample with a one-year lag.

The sample includes firms tracked by the Balance Sheet Data Centre for at least two consecutive years. The firms are drawn from manufacturing industry including farming and agribusiness. The sample was segmented according to the number of salaried employees. Ultimately, only segmentations into 4 and 5 classes of size were used. The threshold of 500 employees to distinguish between SMBs and large firms is insufficient, as earlier research has

shown. The thresholds are therefore: less than 20 employees and/or 20 - 100 employees, 100 - 500 employees, 500 - 2000 employees, and over 2000 employees.

The data were initially checked to eliminate data entry errors. Firms with negative output, payroll, balance sheet total, plant and equipment or employers' contributions were then stripped out. Firms with negative or zero invested capital were also removed.

The distribution of each ratio was then checked so as to identify and adjust extreme values. These values were reduced to a limit defined ratio by ratio over the entire sample 1989-1993. The purpose of this work was to preserve the maximum amount of information on the specific cases that these extreme, though not aberrant, values might represent.

Likewise, we verified cases where the numerator and denominator were simultaneously negative. In such a case, the arithmetical properties affect the sign and the economic correlation of the ratio with the ratios that have the same variable as their numerator or denominator. Certain ratios for which the denominator or numerator were negative were also adjusted. For arithmetical reasons, a negative individual ratio, by the action of its denominator, will exert a downward influence on the sample average in the same way as another whose numerator is low in relation to the denominator. From an economic standpoint, however, the nature of the firm's situation is different. For example, the ratio of interest charges to total gross operating profit may be negative because of its denominator, and therefore reduce the average and hence the amplitude of the solvency constraint in the same way as a firm with low interest charges and high total gross operating profit. In order to avoid this situation, the upper value of the limit mentioned earlier is assigned to a firm with a negative denominator for the ratio in question.

REGRESSION ON THE DEMAND VECTOR ³⁶

	Coefficient (F *)	1985	1986	1987	1988	1989	1990
BM1	Turnover variation rate	0,1563 (220,61)	0,1814 (374,86)	0,1863 (402,72)	0,1458 (308,71)	0,199 (571,30)	0,1803 (528,18)
BM4	Working capital requirement / invested capital	NS	0,0178 (4,75)	NS	0,0853 (41,44)	NS	0,0621 (29,20)
BB11	Net self-financing capacity / shareholders' equity	-0,0301 (67,94)	-0,0437 (168,28)	-0,0545 (233,76)	-0,0519 (199,09)	-0,0412 (141,17)	-0,0363 (122,40)
BM7	Plant and equipment / invested capital	NS	NS	0,0591 (51,03)	0,1451 (125,4)	0,0941 (140,41)	0,1373 (146,44)
BB5	Extended accumulation rate	-0,3664 (2 297,58)	-0,3307 (2 045,24)	-0,361 (2 708,23)	-0,3203 (1 469,28)	-0,3688 (3 017,18)	-0,3206 (1 963,89)
BT2	Average cost of debt	-0,4657 (643,31)	-0,5138 (842,72)	-0,5234 (828,25)	-0,5386 (798,24)	-0,5385 (859,59)	-0,524 (972,77)
BJ4	Net increase in capital / invested capital	NS	NS	0,196 (11,14)	0,2785 (20,72)	-0,4758 (94,71)	0,2086 (18,82)
BM11	Interest charges / overall cash flow	0,0174 (51,28)	0,0198 (78,39)	0,0093 (16,81)	0,0233 (88,73)	0,027 (131,98)	0,0212 (96,64)
BB12	Dividends / shareholders' equity	-0,3247 (68,95)	-0,2773 (62,38)	-0,2519 (76,74)	-0,1202 (20,91)	-0,1763 (58,64)	-0,1787 (77,64)
ECTAUX	Interest rate spread	7,4007 (4,25)	NS	NS	2,0012 (8,78)	NS	NS
Constant		51,4579 (59,35)	37,2969 (6 455,24)	35,6208 (4 094,87)	30,4976 (377,35)	33,3103 (3 673,65)	29,4242 (812,10)
Number of observations		6 394	8 178	9 063	10 170	11 166	11 928
Adjusted R ²		0,4013	0,3855	0,3647	0,3339	0,3590	0,3337

	Coefficient (F *)	1991	1992	1993	1994	1995
BM1	Turnover variation rate	0,1655 (441,41)	0,1706 (406,93)	0,1609 (394,44)	0,1161 (284,69)	0,1278 (296,28)
BM4	Working capital requirement / invested capital	0,07 (38,48)	0,0308 (6,68)	NS	-0,1355 (1 283,29)	-0,1283 (703,17)
BB11	Net self-financing capacity / shareholders' equity	-0,0414 (189,73)	-0,0364 (151,74)	-0,0471 (312,67)	-0,0455 (263,10)	-0,311 (118,27)
BM7	Plant and equipment / invested capital	0,1719 (251,91)	0,1506 (181,41)	0,0571 (72,09)	NS	NS
BB5	Extended accumulation rate	-0,3224 (2 048,89)	-0,3597 (2 330,21)	-0,3541 (3 737,86)	-0,3617 (3 584,08)	-0,3421 (3 070,2)
BT2	Average cost of debt	-0,5017 (1 055,47)	-0,5007 (968,33)	-0,4747 (1 155,76)	-0,4576 (1 193,22)	-0,4265 (1 155,34)
BJ4	Net increase in capital / invested capital	0,1473 (9,36)	0,4254 (93,79)	0,1759 (23,16)	NS	NS
BM11	Interest charges / overall cash flow	0,0152 (61,82)	0,0121 (45,21)	NS	0,0062 (15,01)	0,0065 (16,03)
BB12	Dividends / shareholders' equity	-0,1424 (52,18)	-0,1085 (28,93)	-0,1418 (68,95)	-0,159 (94,94)	-0,1540 (97,37)
ECTAUX	Interest rate spread	NS	NS	NS	0,9927 (9,59)	-3,968 (14,85)
Constant		25,9386 (718,71)	26,7822 (710,99)	30,6345 (4 585,36)	36,671 (4 455,76)	28,773 (433,96)
Number of observations			12 893	12 099	13 496	12 190
Adjusted R ²			0,3475	0,3498	0,3634	0,3275
Source and table:	Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58					Last update October 1996

* significantly different from zero at the 5% threshold

³⁶ We have used the PROC REG procedure available under SAS and evaluate this quality using adjusted R-squared. Multicollinearity and homoskedasticity are tested using the SPEC, VIF and COLLINOINT options.

REGRESSION ON THE SUPPLY VECTOR

	Coefficient (F *)	1985	1986	1987	1988	1989	1990
BM1	Turnover variation rate	0,0648 (34,98)	0,0905 (84,33)	0,088 (79,39)	0,0643 (55,45)	0,1095 (159,07)	0,1051 (169,44)
BM4	Working capital requirement / invested capital	0,3221 (573,53)	0,2706 (562,57)	0,3186 (662,13)	0,3463 (814,20)	0,3418 (906,49)	0,3384 (1 009,54)
BM7	Plant and equipment / invested capital	0,1943 (172,12)	0,134 (112,10)	0,2437 (325,41)	0,3005 (520,42)	0,3113 (622,54)	0,31 (720,42)
BB12	Dividends / shareholders' equity	-0,3232 (62,49)	0,3588 (97,63)	-0,2779 (83,31)	-0,1437 (28,66)	-0,1520 (41,0)	-0,1316 (39,86)
BB10	Self-financing / internal financing	0,1688 (185,62)	0,1409 (155,05)	0,1108 (90,25)	0,1876 (259,48)	0,2008 (339,12)	0,167 (1 444,19)
BT4	Group and shareholder loans / external financing	-0,2939 (928,67)	-0,2991 (1 319,01)	-0,2821 (1 092,83)	-0,2732 (1 037,50)	-0,2787 (1 220,89)	-0,2863 (1 444,19)
BJ3	Participating interests / invested capital	0,1148 (7,5)	NS	0,2109 (34,84)	0,147 (19,33)	0,2756 (88,77)	0,2671 (105,54)
BJ4	Net increase in capital / invested capital	-0,2174 (13,02)	NS	NS	0,2278 (13,36)	-0,6402 (164,74)	NS
BB7	Debt burden	0,0527 (945,99)	0,0523 (1 110,04)	0,0466 (844,52)	0,0595 (1 330,65)	0,064 (1 680,09)	0,055 (1 444,73)
BT2	Average cost of debt	-0,2492 (160,80)	-0,288 (247,37)	-0,3133 (241,85)	-0,3268 (272,84)	-0,2846 (217,82)	-0,2481 (200,72)
TAJJ	Overnight rate	NS	NS	-7,8118 (20,07)	6,9068 (25,65)	NS	-4,073 (5,75)
Constant		12,0029 (84,45)	17,335 (263,29)	71,6162 (26,7)	-49,056 (22,24)	NS	42,7746 (6,4)
Number of observations		6 394	8 178	9 064	10 170	11 166	11 929
Adjusted R ²		0,3557	0,3448	0,3033	0,3137	0,3317	0,3177

	Coefficient (F *)	1991	1992	1993	1994	1995	
BM1	Turnover variation rate	0,1079 (173,96)	0,127 (200,04)	0,1023 (131,04)	0,0745 (99,36)	0,0751 (92,45)	
BM4	Working capital requirement / invested capital	0,3512 (1 025,13)	0,3693 (1 052,10)	0,2862 (711,57)	NS	0,0425 (26,5)	
BM7	Plant and equipment / invested capital	0,3546 (1 004,83)	0,4102 (1 291,81)	0,2802 (668,35)	0,1723 (1 134,35)	0,1583 (272,06)	
BB12	Dividends / shareholders' equity	-0,1127 (30,20)	-0,1057 (24,52)	-0,1351 (52,39)	-0,199 (123,50)	-0,120 (51,35)	
BB10	Self-financing / internal financing	0,1242 (157,35)	0,1069 (108,04)	0,1188 (134,51)	0,0735 (53,32)	0,157 (256,68)	
BT4	Group and shareholder loans / external financing	-0,2585 (1 312,96)	-0,2527 (998,57)	-0,2124 (985,18)	-0,2003 (993,76)	-0,1971 (1 098,11)	
BJ3	Participating interests / invested capital	0,2336 (92,52)	0,356 (203,45)	0,2297 (93,92)	0,1015 (23,44)	0,0608 (7,15)	
BJ4	Net increase in capital / invested capital	NS	0,3679 (63,68)	0,1282 (10,74)	NS	NS	
BB7	Debt burden	0,0465 (1 204,81)	0,0418 (1 046,81)	0,034 (871,62)	0,0347 (878,72)	0,038 (1 089,23)	
BT2	Average cost of debt	-0,2798 (294,33)	-0,2979 (299,11)	-0,2942 (369,51)	-0,332 (511,28)	-0,2913 (466,96)	
TAJJ	Overnight rate	11,0312 (12,82)	NS	NS	3,8834 (21,56)	-3,332 (11,85)	
Constant		-104,989 (12,77)	-4,8251 (23,26)	3,8564 (16,81)	NS	35,353 (33,25)	
Number of observations		12,596	12 893	12 099	13 496	12 191	
Adjusted R ²		0,3053	0,2891	0,2667	0,2625	0,2681	
Source and table:	Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58					Last update October 1996	

* significantly different from zero at the 5% threshold

CREDIT RATIONING BY DEMAND

REGRESSION ON THE DEMAND VECTOR ³⁷

	Coefficient (a) (standard dev.)	1985	1986	1987	1988	1989	1990
BM1	Turnover variation rate	0,175 (0,018)	0,178 (0,015)	0,158 (0,0138)	0,2096 (0,013)	0,2146 (0,0122)	0,2045 (0,012)
BM4	Working capital requirement / invested capital	0,15 (0,028)	0,1581 (0,022)	0,1789 (0,0215)	0,2418 (0,0207)	0,1179 (0,0198)	0,1732 (0,0184)
BB11	Net self-financing capacity / shareholders' equity	NS	NS	NS	-0,0198 (0,0057)	-0,0079**** (0,0054)	-0,007**** (0,0052)
BM7	Plant and equipment / invested capital	0,1127 (0,0264)	0,1494 (0,0240)	0,2026 (0,0188)	0,264 (0,0193)	0,1886 (0,018)	0,2478 (0,0167)
BB5	Extended accumulation rate	-0,1643 (0,0194)	-0,1464 (0,0157)	-0,1476 (0,0151)	-0,1329 (0,0149)	-0,208 (0,0144)	-0,1362 (0,0134)
BT2	Average cost of debt	-0,4723 (0,0266)	-0,5078 (0,025)	-0,5385 (0,0245)	-0,5941 (0,0254)	-0,6167 (0,0242)	-0,5809 (0,022)
BJ4	Net increase in capital / invested capital	NS	NS	0,46 (0,097)	0,2421** (0,0946)	0,3857 (0,0889)	0,3639 (0,08)
BM11	Interest charges / overall cash flow	0,024 (0,003)	0,0263 (0,003)	0,0188 (0,003)	0,0275 (0,003)	0,0206 (0,0028)	0,0264 (0,0026)
BB12	Dividends / shareholders' equity	-0,56 (0,0729)	-0,492 (0,065)	-0,3768 (0,046)	-0,2643 (0,0411)	-0,1948 (0,0352)	-0,1475 (0,029)
ECTAUX	Interest rate spread	7,7779**** (5,9253)	-2,915*** (1,6279)	NS	NS	-1,477**** (1,1066)	3,154** (1,3175)
Constant		40,83 (11,494)	20,875 (2,6472)	20,7117 (1,8586)	15,7322 (1,8941)	25,6592 (1,8535)	19,7096 (1,7096)
Number of observations		2 795	3 666	3 982	4 336	5 002	5 392
Adjusted R ²		0,2703	0,2447	0,2588	0,2897	0,2803	0,2707
F		130,374	149,407	174,731	197,443	195,768	201,129

	Coefficient (a) (standard dev.)	1991	1992	1993	1994	1995
BM1	Turnover variation rate	0,1672 (0,0119)	0,1747 (0,0118)	0,1601 (0,0108)	0,1129 (0,0092)	0,1328 (0,011)
BM4	Working capital requirement / invested capital	0,212 (0,0175)	0,1825 (0,0178)	0,1563 (0,016)	0,1671 (0,014)	0,1591 (0,0158)
BB11	Net self-financing capacity / shareholders' equity	-0,0123** (0,0040)	-0,0139 (0,0048)	NS	NS	-0,01** (0,0045)
BM7	Plant and equipment / invested capital	0,3056 (0,0159)	0,3047 (0,016)	0,2095 (0,015)	0,2404 (0,0138)	0,22 (0,0155)
BB5	Extended accumulation rate	-0,115 (0,0128)	-0,096 (0,013)	-0,0938 (0,0126)	-0,0179**** (0,0123)	-0,09 (0,0134)
BT2	Average cost of debt	-0,5162 (0,0197)	-0,47 (0,02)	-0,4553 (0,0171)	-0,411 (0,0162)	-0,425 (0,0169)
BJ4	Net increase in capital / invested capital	0,2826 (0,0797)	0,28 (0,0674)	0,2992 (0,0559)	0,044*** (0,0256)	0,1465** (0,0643)
BM11	Interest charges / overall cash flow	0,0258 (0,0023)	0,0215 (0,0021)	0,0152 (0,0017)	0,0222 (0,0017)	0,013 (0,002)
BB12	Dividends / shareholders' equity	-0,1706 (0,0297)	-0,11 (0,0298)	-0,128 (0,024)	-0,1332 (0,0223)	-0,136 (0,0229)
ECTAUX	Interest rate spread	-1,3377**** (0,907)	-1,3198*** (0,689)	NS	0,836** (0,3714)	-3,7716 (1,4)
Constant		12,9279 (1,5875)	12,0788 (1,9237)	14,0728 (1,4198)	7,8432 (1,421)	5,9817** (2,353)
Number of observations		5 770	5 963	5 717	6 284	5 515
Adjusted R ²		0,274	0,2443	0,247	0,2199	0,23
F		218,707	192,706	235,428	197,753	165,638
Source and table:	Banque de France		Observatoire des entreprises – Tel.: 01 42 92 56 58		Last update December 1996	

(a) significant at the 1% threshold except where specified: ** significant at the 5% threshold
 *** significant at the 10% threshold **** significant at the 20% threshold

³⁷ The low value of the adjusted R-squared in relation to the value obtained for all firms is doubtless attributable to the firms assigned equilibrium status because of a non-significant difference between estimates of the optimal debt rate and maximum debt rate and because of the difficulty of identifying an optimal rate from accounting data only without qualitative information concerning entrepreneurs' expectations, for example.

CREDIT RATIONING BY SUPPLY

REGRESSION ON THE SUPPLY VECTOR

	Coefficient (a) (standard dev.)	1985	1986	1987	1988	1989	1990
BM1	Turnover variation rate	0,035** (0,0151)	0,044 (0,0138)	0,0466 (0,016)	NS	0,0817 (0,01329)	0,0526 (0,0120)
BM4	Working capital requirement / invested capital	0,2653 (0,0187)	0,1251 (0,0181)	0,2146 (0,0198)	0,2253 (0,0198)	0,217 (0,0174)	0,1925 (0,0172)
BM7	Plant and equipment / invested capital	0,1667 (0,02)	-0,0312**** (0,02)	0,1243 (0,0223)	0,1772 (0,023)	0,109 (0,0196)	0,1234 (0,0188)
BB12	Dividends / shareholders' equity	-0,143** (0,0633)	-0,1114** (0,0477)	-0,0863*** (0,4964)	NS	-0,1384 (0,0382)	-0,1433 (0,0341)
BB10	Self-financing / internal financing	0,1571 (0,0171)	0,130 (0,0146)	0,101 (0,0166)	0,1149 (0,0189)	0,0596 (0,0162)	0,0486 (0,0153)
BT4	Group and shareholder loans / external financing	-0,4447 (0,0116)	-0,481 (0,0096)	-0,4469 (0,0116)	-0,4224 (0,0118)	-0,4093 (0,0102)	-0,4408 (0,01)
BJ3	Participating interests / invested capital	0,0897**** (0,0567)	-0,2032 (0,044)	0,1911 (0,0568)	NS	0,092** (0,0453)	0,090*** (0,05)
BJ4	Net increase in capital / invested capital	-0,2711 (0,0933)	NS	NS	0,9679 (0,1337)	-1,5418 (0,0768)	NS
BB7	Debt burden	0,0787 (0,0031)	0,0744 (0,0026)	0,0777 (0,0031)	0,0842 (0,0035)	0,0872 (0,003)	0,0704 (0,003)
BT2	Average cost of debt	-0,092 (0,03)	-0,0955 (0,0257)	-0,1495 (0,0332)	-0,1554 (0,0339)	-0,0391**** (0,03102)	-0,0405**** (0,0285)
TAJJ	Overnight rate	NS	NS	-13,6597 (3,2142)	11,6264 (2,7373)	NS	-9,792 (2,9742)
Constant		32,1078 (10,8619)	48,7829 (11,0279)	132,6856 (25,5214)	-68,5562 (20,7365)	21,4785 (1,715)	120,8807 (29,6529)
Number of observations		2 440	3 245	3 601	3 951	4 456	4 597
Adjusted R ²		0,5671	0,5836	0,4651	0,4247	0,4868	0,4558
F		291,5	455,581	314,08	365,545	423,607	385,867

	Coefficient (a) (standard dev.)	1991	1992	1993	1994	1995
BM1	Turnover variation rate	0,0709 (0,0137)	0,0856 (0,016)	0,0668 (0,0146)	0,0535 (0,0126)	0,0373 (0,0124)
BM4	Working capital requirement / invested capital	0,261 (0,0184)	0,3083 (0,0202)	0,1774 (0,0172)	-0,1431 (0,0123)	-0,1374 (0,0061)
BM7	Plant and equipment / invested capital	0,274 (0,0197)	0,3571 (0,0199)	0,147 (0,017)	0,0259**** (0,0173)	NS
BB12	Dividends / shareholders' equity	-0,0936** (0,037)	-0,0996 (0,0378)	-0,1095 (0,0302)	-0,2186 (0,0293)	-0,069** (0,0268)
BB10	Self-financing / internal financing	0,045 (0,0155)	0,0786 (0,061)	0,0917 (0,0144)	0,0208**** (0,0293)	0,108 (0,0144)
BT4	Group and shareholder loans / external financing	-0,4248 (0,0103)	-0,3905 (0,0197)	-0,3928 (0,0093)	-0,4 (0,009)	-0,3693 (0,008)
BJ3	Participating interests / invested capital	0,1934 (0,0486)	0,2748 (0,0567)	0,052**** (0,0396)	-0,1211 (0,0365)	-0,1683 (0,0282)
BJ4	Net increase in capital / invested capital	NS	1,1067 (0,1022)	0,1565** (0,064)	-0,0973**** (0,0677)	NS
BB7	Debt burden	0,0569 (0,0027)	0,0623 (0,0027)	0,0503 (0,0022)	0,0445 (0,0023)	0,0511 (0,0024)
BT2	Average cost of debt	-0,0415**** (0,0289)	-0,184 (0,0325)	-0,1574 (0,0254)	-0,1776 (0,0248)	-0,1118 (0,0219)
TAJJ	Overnight rate	19,3445 (5,8105)	NS	NS	7,2655 (1,4926)	-4,577** (1,963)
Constant		-170,4337 (55,3408)	7,1016 (1,8053)	22,5232 (1,5794)	NS	66,1728 (12,3939)
Number of observations		4 868	4 927	4 696	5 484	4 869
Adjusted R ²		0,4145	0,416	0,4318	0,451	0,467
F		345,498	351,852	357,829	410,457	474,964
Source and table:	Banque de France Observatoire des entreprises – Tel.: 01 42 92 56 58 Last update December 1996					

(a) significant at the 1% threshold except where specified:

** significant at the 5% threshold

*** significant at the 10% threshold

**** significant at the 20% threshold