Credit policy to encourage industrial restructuring

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Abstract

The present analysis focuses on groups of firms, which are homogenous with respect to their probability of default. The groups of firms are not formed into some network through cooperation or for some reasons of labour division, they are statistical bodies. A firm representative of a group has characteristic summarizing the multiple attributes of firms that compose its group. A multitude of latent characteristics that determine the entry of a firm into a group explains why such a representative firm can act in response to different stimuli, concerning the credit conditions. The paper provides the analytical definition of credit policy for avoiding systemic risk and for industrial restructuring. It contains the results of econometric estimations of intensity of links between some financial variables and default dynamics of representative firms. The estimations are performed using French industrial firms' database.

1. Intoduction

For a long time the relation between credits allocated to firms and production of goods was analysed at the macroeconomic aggregate level (Trakhtenberg (1939), Minsky (1963), Kindleberger (1996), Aglietta et Rebérioux (2004)). These studies show a very strong correlation between them, but its intensity and causal relationships vary according to phases of the business cycle. Recently, some analyses have been performed at the level of individual firm or at the level of a credit portfolio concerning different firms. More than 850 works are devoted to credit risk analysis in the last three years. Among the most known publications we can mention Danielsson, Embrechts and al. (2001), and Altman, Saunders (2001).

In this paper, classes of firms are constructed by using a rating based on their observable homogenous characteristics. The intensity of impact of each characteristic in the general one-dimensional rating of a firm reflects an importance that researcher attributes to this characteristic in his analysis of industrial risk. This one-dimensional score represents the temporal quality of firm. The homogenous classes of firms are derived by discretizing the quantitative scores. For that the researcher fixes some thresholds, which disjoin firms in function of some chosen criteria. In this paper, the firms are scored and classified accordingly to default probability. The average values of characteristics of firms in each class express the characteristic of representative agent.

The rating agencies report regularly summary statistics of the firms' rating histories under the form of transition matrices providing the migration probabilities between given rating classes for different years and sectors of economic activity. The history of statistical analysis of rating migration is developed in Lando (2004). Along these lines, French industrial firms' scorings give a dynamic picture of insolvency and of risk transition. These observed migration probabilities are used as leading indicators for recession and growth trends. The cyclicality of ratings to economic cycle was considered in Lucas & Lonski (1992).

Since the creditor grants credits to firms according to their score and the performance of a firm depends, ceteris paribus, on condition of financial viability of enterprise, I analyse here the credit policy, which would avoid the representative firms' default. Conversely, in some contextual situations, a selective bankruptcy can be realised in order to initiate the necessary restructuring.

Bankruptcy principles and financial regulation are presented in Section 2. In Section 3, the datasets are discussed and some typical evolution of risk probabilities is reported. The data of firms' migration

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through the classes of risk are often analysed in the literature by means of an ordered qualitative model with observable or unobservable factors. This model is reviewed in Section 4. In Section 5 the dynamics of up-grade and down-grade migration probabilities data are compared with the evolution of the GNP. Some results of causality analysis of links between risk of default and some financial variables are described. Finally, in Section 6 schemas of control methodology are agreed. I argue in this paper for a policy contingent to the economic environment. For example, the goal of the control may be the growth-promoting financial policy with flexible restructuring of industrial framework.

2. The bankruptcy laws and the financial regulation

Operating firm must be solvent. According to accounting principles, it means that the firm can serve and refund all its debt's becoming due. Insolvency is the situation when the firm's debt is greater than its asset value including: stocks, accorded credits, real estates, machines and other assets. In a situation of insolvency bankruptcy occurs. It is the pattern for resolving disbursement problems of firm owners.

Moreover, bankruptcy, as an institution of regulation, implicates some general economic issues of capitalism such as the production of wealth (analysing by whom the wealth has been produced, in conformity with which objectives) and the outcome sharing. For example, the bankruptcy regulation is needed in Russia since the economic liberalisation and the massive privatisation in 1992. Before, the unique owner - the State - was not faced with the problem of firms' insolvency, because he valorised them throughout the criteria of national usefulness and the mechanism of equalization of assets among firms. The restructuring, moving or dismantling occurred without unemployment and without revenue losses for individuals.[2]

Historically, bankruptcy consists in three stages:

1) to withdraw publicly the bankrupt from operating;
2) to gather all information about creditors and to estimate assets;
3) to settle the investors' failure (they lose for this reason their property rights), to sale assets in order to indemnify the creditors, to quash the marginal debts and to arrange the firm's liquidation.

Two principal forms of bankruptcy procedures exist: an asset sale and a structural bargaining. The sale of the firm's assets is usually supervised by a trustee, or a receiver. Such procedures and supervision are not as evident as it seems from the old capitalist world. For example, the Russian government postponed decisions of restructuring the industrial sector after the privatisations in earlier 1990. It did not force insolvent firms into bankruptcy, even when it was their largest creditor. As a result the country was facing an increase of firm insolvency with a huge accumulation of unpaid debts.

The governments of all countries, particularly at the regional level, often interfere in bankruptcy proceedings to prevent job-losses. For example, the bankruptcy law in France give to the court, through an administrator, the power to accept a restructuring plan without the approval of creditors (or workers) if it guarantees employment and repayments of creditors. After all, the lack of a credible threat of bankruptcy has also meant that managers did not seek to avoid insolvency. Moreover, the entrepreneur observing insolvency can seek at short run to realise some very risky activity. Therefore bankruptcy legislation traditionally (since 17 century) seeks to regulate the enter/exit rules of operating in order to protect the public interest (or total efficiency) from excessively risky firms.

Recognising that large-scale initiation of legal proceedings of bankruptcy as asset sale is impossible; one seeks for other solutions.

In the case of structured bargaining the claimants are encouraged to bargain about the future of the firm. Indeed it can be liquidated or restructured, and in both cases the rules should be negotiated and determined. Some problems arise in connection with structured bargaining procedure, since it follows two objectives at the same time that are: the task to decide for the firm future and who should get what in the event of a restructuring of claims.

The bankruptcy reforms are in progress in many countries in order to make the procedures more transparent and efficient (see Hart, 1995). Thus, the goal of an appropriate bankruptcy law is to reduce

[2] I will not discuss the overall economic efficiency of Soviet mechanism of reproduction and accumulation.

the systemic risk and overall financial instability. But the regulation of financial system, with the prudential rules is another way.

Bankruptcy of an individual financial institution or micro-prudential accident is a consequence of disruption of one or more indicators of the institution's health, such as: capital adequacy, asset quality, management soundness, earnings, liquidity, and sensitivity to risk. The widespread financial distress may come from the failure of individual institutions and the spread through different contagion mechanisms (Gourieroux & Peaucelle (1996)) to the financial system in general. The objective of a macro-prudential approach of regulation is to limit the risk of financial distress with its significant losses in terms of GDP. The strengthening of the macro-prudential mechanism needs a closer cooperation between supervisory authorities and central banks, that why new rules of macro-prudential regulation have been elaborated by Basle Capital Accord (Basel II).

3. Available data for default analysis

The first internationally accepted standard (Basel I) was developed in 1988. This and following rules are introduced by the regulator (Central bank governors and the heads of bank supervisory authorities in the Group of Ten countries G10) to control the risk, in particular to define the capital required to hedge a risky credit portfolio [the so-called Value-at-Risk that is the maximum expected loss over a given horizon period at a given level of confidence]. The objective of the Basle Capital Accord II (2003-2004) is to allow banks to manage their risks with a dynamic approach of capital adequacy. The implementation of this regulation required a careful analysis of firm default risk and of its expected evolution. Since 2006 the new Basel Committee risk-based requirements for the largest bank will be based on internal and external ratings of the probability of default of the borrowers.

The rating agencies as Standard & Poor's (S&P), Moody's, Fitch, or some central banks, as the Banque de France (BdF), have been led to improve the quality of their proprietary rating data bases. Typically, they make public summary statistics of the rating histories under the form of transition matrices providing the migration probabilities between given rating classes for different years and economic sectors. These statistics are dynamic measures of degrees of creditworthiness among operating firms. The definition of the rating and the population of firms differ according to the rating agencies. For instance, the main rating agencies obtain information about the situation (balance sheet) of the firms, generally when they are issuing bonds. This explains why their data bases concern large firms, mainly US companies, even if the proportion of European and Japanese firms represented in the bases has grown rapidly at the end of the eighties. The number of rated firms is around 10 000, with a proportion of missing data (alternative NR : not rated) between 10 and 20 %. These data are reliable since 1985 approximately, providing 17 years of observed transitions matrices. They use a rating with ten classes from the highest rating [AAA for S&P for instance] to the worst one D corresponding to default.

The data collected by the French Central Bank (BdF) are of another type. They include the balance sheets of French firms, with sales larger than 762 000 Euros, or those with debts 5 times beyond the threshold of registration at Central of banking risks (the threshold since 1997 is 76 224 Euros). Thus, the data are covering about 185 000 firms per year, 85% of workforces and 90% of distributed bank credits.

In the French Central Bank definition, the contribution of economic ratios on the indicator of a firm financial situation depends on the sector. For example, for Industry eight economic ratios contribute to the score value. The score indicates the health of firms in report with the management ratios, such as: provider deadline, tax and social security creditor; rate of return and return on sales: rate of added value; solvency: burden of financial charges; debt: leasing liabilities, capital-debt ratio; and current liabilities: liquidity, bad or doubtful debt. The information included in the balance sheet is transformed into a quantitative score representing the risk level of defaulting.[3] Than the scores are discretized to get qualitative ratings with eleven classes of risk (average probability of default at the horizon of three years), noted D, 1, ..., 10. The alternative "D" corresponds to default and the alternative "10" indicates a safe financial situation (analogue of the AAA of the rating agencies). The

[3] For example, in the article by Bardos & ali (2004) the risk level of default is revealed by a principal component analysis.

default in the French Central Bank rating signifies that the enterprise is under bankruptcy procedure. For example, in 2001 among industrial firms in France 20.4% of firms had a high probability of default, 8.4% of firms were neutral, and 71.2% were healthy firms. Example of transition matrix reported by the Banque de France is given below.

Table 1. Migration probabilities "Industry", between 1999 and 2000 (in %)

	10	9	8	7	6	5	4	3	2	1	D	NS
10	72,38	15,91	1,34	1,51	0,46	0,17	0,41	0,24	0,05	0	0,05	7,49
9	12,47	57,58	13,56	5,75	0,92	0,59	0,72	0,98	0,1	0,06	0,09	7,17
8	1,28	26,67	35,74	23,35	1,77	0,66	1,12	2,04	0,43	0,05	0,17	6,72
7	0,39	4,88	16,16	50,57	8,71	2,94	2,13	4,21	1,21	0,54	0,48	7,79
6	0,26	1,9	3,01	33,61	23,3	10	6,96	6,76	2,24	1,42	1,45	9,09
5	0,26	1,94	2,51	17,21	20,92	16,16	14,07	9,94	3,71	1,94	1,78	9,57
4	0,25	2,04	3,05	12,98	12,53	12,83	17,52	14,56	4,68	4,18	2,85	12,53
3	0,08	1,62	3,05	13,64	9,3	5,89	11,61	21,11	7,11	6,21	4,34	16,04
2	0,11	0,78	1,56	8,16	8,6	5,81	10,61	16,54	12,74	9,5	7,37	18,21
1	0	0,24	0,82	2,83	4,59	3,53	6,48	12,96	8,48	24,5	15,31	20,26

A lot of migration probabilities are rather small. The significant values are mainly around the main diagonal, which represents the proportions of firms keeping their previous class of default probability, and for column "D" default as absorbing state. The risk of default changes in time, and the score of any firm can maintain it in the same class of risk or switch it into another class. The structure of migrations among the classes allows us to analyse the risk dynamics. In France the data have been collected since 1992, which provides 13 years of transition matrices.

4. Analysis of default dynamic

The matrices of yearly migration probabilities can be summarized by considering the probabilities of a down-grade [respectively of an up-grade][4]. One can extract directly the information concerning the firms of class k that, with certain probability, can change their score. Let define for each year the percentage of firms of class k down-grading [respectively, up-grading] their scores $\pi^d_{k,t}$ ($\pi^u_{k,t}$), as:

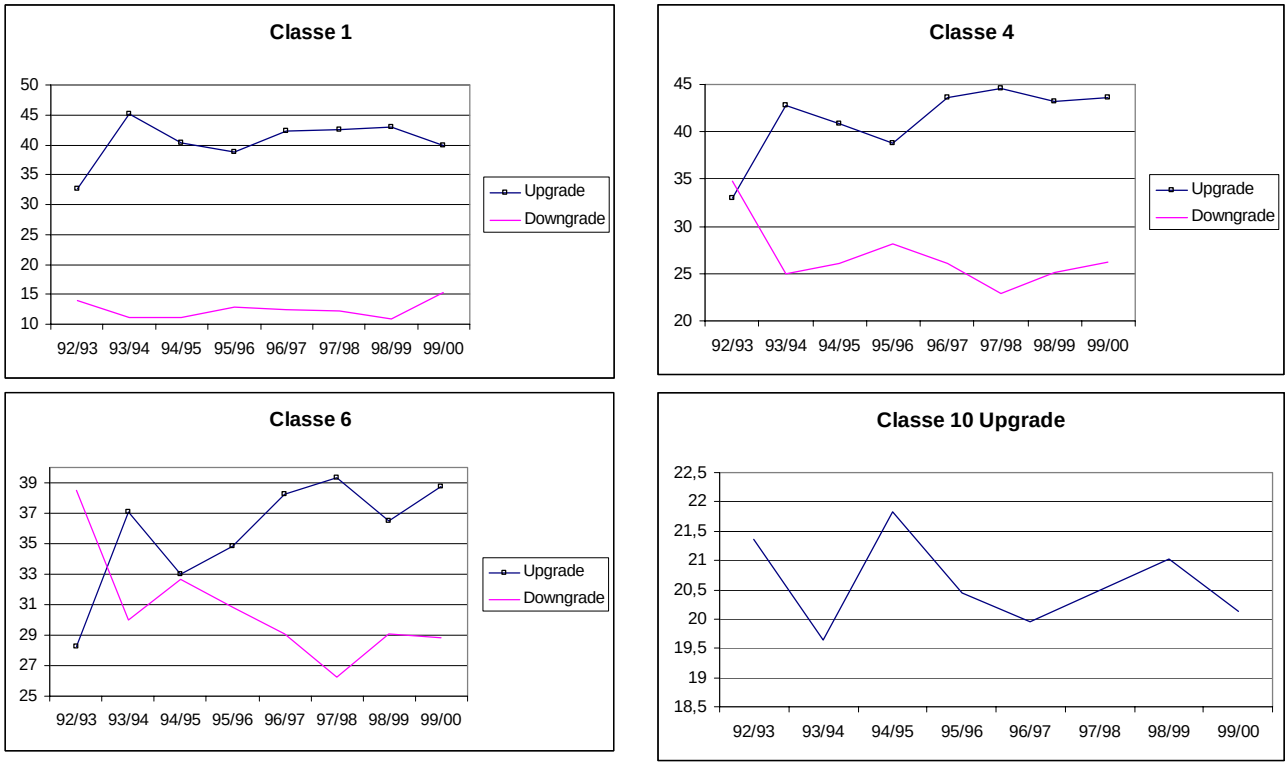
$$\pi^d_{k,t} = \sum_{h<k} \pi_{kh,t},$$

$$\pi^u_{k,t} = \sum_{h>k} \pi_{kh,t}\ .$$

Since we have a set of matrices of transition corresponding to different years, we can deduce the sets of $\{\pi^u_{k,t}\}_t$ and of $\{\pi^d_{k,t}\}_t$ for each class of risk $k = 1\ldots10$. The graphs of evolution of these sets give us the picture of dynamic evolution of firms' scores. Example for four classes of French industrial firms, from 1992 to 2001, is given in Graph 1.

[4] As usual, in empirical studies it is important to interpret carefully the estimation results. For example, the study of ratings of U.S. corporates by Moody's shows that the number of down-grades in corporate bond has exceeded the number of up-grades, leading to think that the credit quality of U.S. corporate debt has declined. However Blume and alii (1998) suggest that a major part of down-grades trend in ratings is the result of changing standards of scoring and rating by this agency

Graph 1. Evolution of probabilities to upgrade and downgrade the score



The evaluation of migration probabilities of firms in France shows clearly some common feature, with at most two underlying patterns: 1) the evolutions for up-grade are in the inverse directions of the evolutions for down-grade, the up-grades have an ascending trend in each class of risk on the period between 1992-2001, and the down-grades feature has inverse declining general trend (except the class 1 of high default risk); 2) the evolutions of class of risk on the period between 1992-2001 in France for three sectors: industry (presented here), wholesale and retail trade (Gagliardini & Gourieroux (2005)) are very similar.

In order to analyse the systemic default risk, it is important to consider the simultaneous rating migrations of firms with different indicators of risk in the same direction. Such migration is called migration correlation. The stochastic transition matrix, which assumes a common multivariate factor across firms, represents the migration correlation between different classes of risk.

The ordered qualitative model with factor is usually considered in the literature as a convenient specification for stochastic transition matrices. Indeed it allows reducing the number of factors, which are driving the different migration probabilities, while keeping the model tractable with a reasonable number of parameters.

The specification is based on a latent variable $S_{i,t,}$, which can be interpreted as an underlying quantitative score, directly related to an expected probability of default at some horizon. Typically the horizon is 3 years for the BdF score. Thus $S_{i,t}$ is the value of the score for firm i at date t. It is assumed that the conditional distribution of variable $S_{i,t}$ given the information available at the beginning of period t depends on some factor Z_t and on the most recent rating $Y_{i,t-1}$. It is such that:

$$S_{i,t} = \alpha_k + \beta_k Z_t + \sigma_k u_{i,t}, \quad \text{if } Y_{i,t-1} = k, \quad k = 0, \ldots, K-1, \tag{1}$$

where α_k, β_k, σ_k are scalar parameters and $u_{i,t}$ are independent error terms, identically distributed with

common distribution function *G*. Thus three parameters are introduced for each rating class: α_k measures a level effect, β_k is the risk sensitivity with respect to the factor[5], whereas σ_k is the idiosyncratic (firm specific) standard error.

The factor has to be assumed non observable, to allow for migration correlation. If the different sensitivity coefficients are nonnegative, a positive movement on Z_t will imply a joint increase of the individual risks whatever the rating class of the firms. Thus we get a positive migration or up-grade correlation, if the future of the factor is not a priori known. It will be assumed that the evolution of the factor is independent of the values of the shocks $u_{i,t}$, that they depend on the past by means of the most recent factor value (which is the Markov assumption), and that the transition factor density can be parameterized. This density will be denoted by:

$$\frac{1}{dz} P[Z_t \in (z_t, z_t + dz) \big| Z_{t-1} = z_{t-1}] \cong f(z_t \big| z_{t-1}; \theta), \tag{2}$$

for small *dz*.

Finally the rating of period *t* is defined by discretizing the quantitative score:

$$Y_{i,t} = \ell, \text{ if and only if } a_\ell < S_{it} < a_{\ell+1}, \tag{3}$$

where: $a_0 = -\infty < a_1 < ... < a_{K-1} < a_K = +\infty$ are fixed (unknown) thresholds.

Under the specification above, it is easy to derive the migration probabilities given the factor value. Since the factor is indexed by time only, these quantities are closed to the observed sample transition matrices, computed per year. We get:

$$\begin{aligned} p_{k,\ell,t} &= P\,[Y_{i,t} = \ell | Y_{i,t-1} = k, Z_t] \\ &= P\,[a_\ell < S_{i,t} < a_{\ell+1} |\, Y_{i,t-1} = k, Z_t] \\ &= P\,[a_\ell < \alpha_k + \beta_k Z_t + \sigma_k\, u_{i,t} < a_{\ell+1} |\, Z_t] \\ &= P\left[\frac{a_\ell - \alpha_k - \beta_k Z_t}{\sigma_k} < u_{i,t} < \frac{a_{\ell-1} - \alpha_k - \beta_k Z_t}{\sigma_k} \Big| Z_t\right] \\ &= G\left(\frac{a_{\ell+1} - \alpha_k - \beta_k Z_t}{\sigma_k}\right) - G\left(\frac{a_\ell - \alpha_k - \beta_k Z_t}{\sigma_k}\right). \end{aligned}$$

The discussion by Gagliardini & Gourieroux (2005) turns our attention to the fact that this model reduces to an ordered probit model with factor, if the common distribution *G* corresponds to the standard Gaussian distribution, but to a Cox model with stochastic intensity if exp $u_{i,t}$ follows an exponential distribution. As for beta model, it assumes independent transition matrices, with independent rows, following beta distribution.[6]

Different specifications of the factor dynamics can be retained in practice. Feng et alii (2003) assume a Gaussian vector autoregressive factor. When business cycle is specified by means of a hidden Markov chain, it seems natural to consider a factor with discrete state space {0, 1}, where "0" represents "recession" and "1" represents "expansion". The factor dynamics is summarized in this case by a (2,2) transitions matrix $P = \begin{pmatrix} p_{00} & p_{01} \\ p_{10} & p_{11} \end{pmatrix}$. For this model, the joint process (Y_{1t}, ..., Y_{nt}, Z_t) defines a Markov chain, with some recursivity in the joint transition matrix.

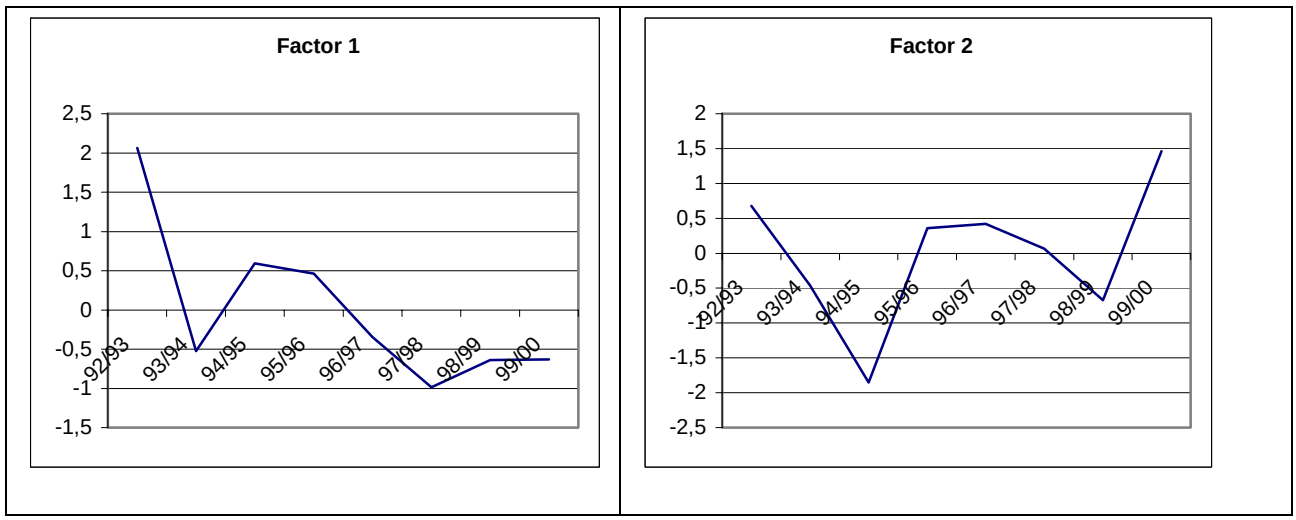
I suppose that the elements of migration matrices of BdF are the transformed series $\tilde{\pi}_{k,t} = G^{-1}(\hat{\pi}_{k,t})$ for $\forall\ k$ et l . To estimate the latent factors of migration I realise the principal corposants analysis on the series $\{\tilde{\pi}^d_{k,t}\}_t$, which are the down trends of firms' performance. In this study the function *G* is the function of normal law standard distribution, utilised in the probit model.

[5] We have implicitly considered a one factor model for expository purpose.

[6] The beta distribution is the basic specification used in probability and statistics for the law of a stochastic discrete distribution.

The first two factors explain 89% of down-grade series variation $\{\tilde{p}^{d}_{k,t}\}_t$. The dynamic of factors corresponding to two greatest eigenvalues is produced on Graph.2.

Graph 2 Evolution of latent common factors $Z_{1,t}$ and $Z_{2,t}$ of down-grading series $\{\tilde{\pi}^{d}_{k,t}\}_t$



Such revealed trends of migration of all classes of risk of default can be interpreted as the general economic climate on which the Regulator can't shape.

5. Default migration, economic growth, and credit

The relationship between firm default and general economic dynamic has been advocated since a long time in the economic literature. During a recession period, the firms have more difficulty to sell their productions, which can deteriorate their balance sheet, their probability of failure increases, as well as the credit rate, offered by their lender. Conversely, if the probability of failure of a firm increases, it has more difficulty to find credit at a small rate, which can increase the amount of regular reimbursement and reacts negatively on its situation. This creates an accelerated movement towards default, with the usual consequences on employment, growth, deflation… The databases on credit histories allow for a better understanding of the relationship between the business cycle and the factors influencing credit risk and credit migration. They essentially concern the US business cycle at a general level, and do not take into account the effect specific of a sector structure of economy.

I use the sets of up-grading and down-grading risk of default in French industrial sector, looking to dynamic correlation with GDP grows trend. For that I use a causality analysis of the dynamic linear link between the down-grade series and the GDP.

Test of causality

The test of causality is performed accordingly to methodology proposed by Gouriéroux & Jasiak (2001). To test if the variable X_2 causes the variable X_1 ($X_2 \rightarrow X_1$), one consider two regressions

$X_{1,t} = a + b_1 X_{1,t-1} + b_2 X_{2,t-1} + e_t$, (unconstrained regression, s)
$X_{1,t} = a' + b'_1 X_{1,t-1} + e'_t$, (constrained regression, c).

The null hypothesis of no causality corresponds to the resruction: $b_2 = 0$. To test this hypothesis, one can use the likelihood ratio test. For that I estimate the logarithm of likelihood

function for both regressions with hypothesis of normality of errors distribution:

$\log L = -n(\log 2\pi + \log \sigma^2 + 1)/2$,
where σ^2 is the variance of errors of corresponding regression.
The statistic of the test is:
$\xi_{LR} = 2 (\log L_c - \log L_s) = n \log (\hat{\sigma}_c^2 / \hat{\sigma}_s^2)$.
This statistic in nonnegative and equal to 0 if the variances of errors of both regressions coincide $\hat{\sigma}_c^2 = \hat{\sigma}_s^2$. It can be considered as a measure of unidirectional causality from X_2 to X_1.
The hypothesis of no directional causality will be rejected if $\xi_{LR} > \chi^2 (1) \approx 4$.

For analysed French industrial sectors the test of causality indicates that, on the one hand, for the classes of low risk the GDP is a leading indicator of the down-grade risk migration, but on the other hand, the ordering between both measures is reversed for the very risky classes. For these classes the down-grade probabilities can be considered as leading indicator of the economic growth with a lead of two and three years. Besides, the down-grade tendency is more reactive than the up-grade one to GNP modification.

Table 2. Study of causal relations between GNP and $\tilde{\pi}^d_{k,t}$ et $\tilde{\pi}^u_{k,t}$

Classe	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
GNP $\rightarrow \pi^d_{k,t}$	7,60	4,72	13,12	11,91	7,45	9,29	25,66	12,09	10,71	3,05
$\pi^d_{k,t} \rightarrow$ GNP	14,26	19,92	23,16	22,86	15,07	17,26	39,76	21,00	14,64	14,71
GNP$\rightarrow \pi^u_{k,t}$		5,78	21,51	13,18	7,54	7,36	11,33	2,08	3,67	3,61
$\pi^u_{k,t} \rightarrow$ GNP		14,41	31,96	20,87	15,96	15,72	19,86	17,99	16,42	13,26

Such are our recent empirical investigations concerning the dynamic analysis of default risk in Industrial sector of French economy and of economic growth of its causal relation with the this country.

The firms' scoring determines the class of risk to which it belongs and consequently the condition of credit (amount and term) it can count on. In any case the "health" of operating firm depends on quality of credit it gets.

Interest represents the amount that lenders charge borrowers for use of the lenders' money over a period of time. Interest is paid in two principal ways: simple interest is expressed as a percentage of the principal over a year; compound interest occurs when calculations of interest are made on the principal plus accumulated interest. Banks do not necessarily determine the general level of interest rates. As intermediaries between lenders and borrowers, they reflect the relative intensity of the supply of and demand for creditable funds.

Time has an important influence on the level of interest rates. Short-term interest rates usually apply to money lent for a period of less than one year. As the term of the credit increases, interest rates can be either higher or lower than short-term rates. They reflect the expected level of short-term interest rates in the future plus a premium to compensate for uncertainty. Term spreads are long-term minus short-term interest rates.

In Boussyguine & Peaucelle (2004) the causal relation between the trends of upgrade and downgrade in French industrial sector and the spreads evolution, as well as with evolution of treasury bonds are analysed. It is shown that the rate of bonds remuneration is an advanced indicator for downgrade movement in one risky class (2nd class) and in neutral risky classes (6, 7, 8, 9). It is also

leading indicator for upgrade movement in relatively neutral to risk classes (4, 5, 6 and 7). The causal impact of spread is observed only for two classes of risk (5 and 7) and it is statistically significant for upgrade trend as well as for downgrades.

Table 3 Study of causal relations between spreads, treasury bonds, taa, and $\tilde{\pi}^{d}_{k,t}$ et $\tilde{\pi}^{u}_{k,t}$

	10	9	8	7	6	5	4	3	2	1
taa→$\pi^{d}_{k,t}$	3,43	**4,08**	**4,61**	**4,92**	**7,16**	1,64	1,87	1,38	**3,98**	1,22
spread→$\pi^{d}_{k,t}$	0,07	2,62	2,25	**4,00**	2,85	**4,72**	1,15	1,50	2,64	0,29

	9	8	7	6	5	4	3	2	1
taa→$\pi^{u}_{k,t}$	1,07	1,53	**8,91**	**9,85**	**10,19**	**7,75**	2,85	2,95	1,65
spread→$\pi^{u}_{k,t}$	3,48	2,26	**4,95**	1,28	**4,22**	0,87	2,24	1,05	0,82

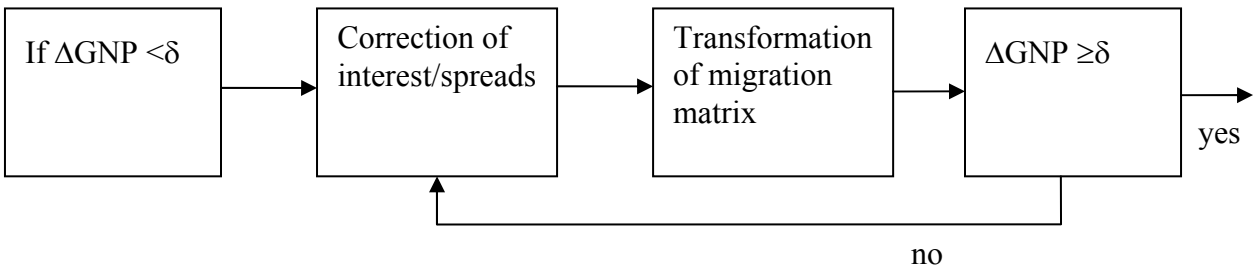
The performed causal statistical analyses show, that, contrary to theory, the variability in credit spreads can cause only a fraction of the changing default expectations. For the highest quality firms, where the probability of default is low, this factor explains relatively little of the variation of risk migration. In future empirical works it will be important to decompose credit spreads into credit and non-credit risk components, because, as we could observed, credit risk is not the only factor that affects firm yield spreads. More strong results in the analysis on the impact of financial tools on real default risk are necessary if one hopes to use them in credit policy.

6. Risk management and/or restructuring through economic growth control

I start my control problematic by confirming my position: any system with some degree of probability at some instant reaches the attractive position of "catastrophe", like bankruptcy in this paper. I hypothesise that safety of the system is not the aim, because if it would the aim than the solution would be obvious and consisted in breaking off the system. If an existing system is considered as useful, than the problem of its safety must be analysed in the context of some incentives to operate it. My fields of interest are the investigation in the systemic risk prevention and the adaptive control of interconnections that exist between business cycle and heterogeneous risk aversion of the firms. In particular I want to consider the stabilisation of complex production-financial systems through feedback management. The aim is not to come across the most effective means to achieve the goal, but rather to explore the principal possibilities of its' achievement and to analyse the class of potential movements of the system under control.

The migration matrices characterise the "health" of financial and real economy (as a system). The impulses on them can be used to feedback on the system. The feedback or regulation consists in credit policy addressed to firms regarding the correlated trend of risk of default in major sectors (analysed in section 4) or the general rate of economic growth. For example, in the case of growth-promoting industrial policy, the impulses throw crediting, can be realised following the model presented in schema 1.

Schema 1.



The output gap ΔGNP is the difference between the economy's actual output and the level of production it can achieve with existing labour, capital, technology and prices' level. It is also referred to as spare capacity or excess capacity. The gap is positive when actual output exceeds the economy's potential and negative when actual output is below potential output. A positive output gap is also referred to as excess demand and a negative output gap is referred to as excess supply.

The regulator is concerned about both too much and too little output in the economy when either puts sustained up-grade or down-grade pressure on risk default migration of firms. The transmission of Regulators' policy occurs as changes in monetary conditions that affect the demand for credits. Lower interest rates tend to increase industrial activity. Conversely, higher interest rates tend to curb firms' spending. Strong demand for goods and services puts down-grade pressure on interest rate if it exceeds the economy's output. Thus, when the output gap is thought to be small and demand is seen to be increasing faster than potential output, the Regulator will act to tighten monetary conditions to promote production by modifying interest rate for firms belonging to some classes of risk, revealed as sensitive by statistical analysis. Conversely, if the economy must be kept from over-heating, than the Regulator will be less likely to intervene, and monetary conditions will be required later to control default trends.

Typically it is the Central Bank that carries out monetary policy. It does it by influencing short-term interest rates: by raising and lowering the target for the one-day rate. The one-day rate is the interest rate at which major financial institutions borrow and lend funds among themselves. The Central Bank sets a target level for that rate, called key policy rate. For example, the Bank of Canada introduced a system of eight fixed dates each year on which it announces whether or not it will change the key policy rate. Change in the target for the one-day rate influence other interest rates, including prime rates charged by commercial banks. When interest rates go down, firms are encouraged to borrow and produce more. But if the economy grows too fast, the Central Bank can than raise interest rates to slow down borrowing. It increases the probability of bankruptcy in low quality firms, and promotes restructuring.

In my previous works I described the mechanism, called method of adaptation, that allow to control the output dynamic of the system, formalised as stochastic Markov chain (Peaucelle (1982)). This methodology is applicable to the control problem of this paper.

Conclusion

The foregoing analysis gives up one main theoretical and empirical theme in industrial and financial policy: running of credit for preventing systemic industrial crises and for growth with restructuring. Actually the monetary policy is principally aimed to inflation stabilisation. This paper suggests the method to get it used to flexible regulation of firms. The method displays the selective crediting of firms with heterogeneous risks of default, which controls the development of whole decentralised system of production.

Theoretical background is evolutionary economics in a sense that the attention is turned not to structural model, but to make use of existing institutions, such as: bankruptcy for restructuring, key interest rate of Central Bank for monetary policy, firms' balance sheets for measuring their competitive capacities.

Besides the embodiment of existing economical and financial procedures the empirical relationships between some variables that I propose to use for industrial regulation are considered. The database concerns the French firms over eleven years. The tests reveal some causal links between the default probability trends and the industrial sector rate of growth, the rate of interest (spreads), and the latent factors of correlated defaults. These econometric results are not yet satisfactory for detecting the "neuralgic cells" of migration matrices of defaulting and their reactions. Subsequent improvements of empirical study, and/or introduction of other financial variables, susceptible to influence representative firms' default probabilities, will likely allow in future the simulation of industrial policy with control. The algorithm for such simulation – adaptation method for control the rates of transition in matrices of Markov – was tested by us some years ago.

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