The impact of ownership concentration on the *monitoring* and *influence* effects of shareholders market discipline?
An empirical assessment in the case of European banks[1]

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FIRST DRAFT

Abstract :

We investigate the impact of banks' ownership concentration on the effectiveness of shareholders' market discipline. More precisely, we assess whether the ability of the distance to default to predict banks financial distress is affected by the level of ownership concentration ("monitoring" hypothesis) and also whether banks' future financial situation is directly affected by ownership concentration ("influence" hypothesis). Our econometric estimates are conducted on a panel of 77 European banks observed between the first quarter of 1997 and the last quarter of 2005. We find that ownership dispersion reduces the predictive power of the distance to default. The data collected come from three sources: Bankscope, Datastream and Thomson One Banker Ownership. The econometric methodology is based on simple pooled-logit estimates corrected for the clustering effect. Several tests are then conducted to assess the robustness of the results. We also recall that theoretical results do exist to explain why banks' ownership structure can alter market discipline and the ability of market-derived indicators to predict future financial distresses. This work finally suggests that the empirical literature dealing with market discipline should not focus only on the moral hazard potentially created by bad insurance deposit design, balance sheet opacity or the safety net: the evolution of banks ownership structure might also be an important prudential issue.

[1] Frédérik Ducrozet and Adrian Roche (Crédit Agricole SA, Paris) have provided us with very helpful research assistance on collecting *Bankscope* and *Datastream* data and computing the distances to default. Sophie Cancel (LEREPS, Toulouse University) has provided similar help on collecting *Thomson One Banker* ownership data. Preliminary results on the predictive power of our distances to default can be found in Brossard, Ducrozet and Roche 2007.

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1. Introduction

Market discipline and the ability of market-derived indicators to predict banks' financial distress are important issues for prudential supervision (BIS 2003, Borio and alii 2004, Pop 2007). Indeed, the use of market signals to evaluate banks' risk profiles has, in theory, many advantages. For instance, share and debt prices are intrinsically forward looking and high frequency indicators. On the contrary, accounting indicators and public or private ratings are mainly backward-looking and published at a much lower frequency. These market-based indicators are also much less costly than the qualitative assessments produced by supervisors when they implement in site monitoring actions.

Nevertheless, the existence of a valuable market discipline is strongly questioned when a major banking crisis such as the 'Subprime' one is occurring. It is then necessary to recall that market discipline is a reliable support for public supervision only if at list two conditions are plainly fulfilled (Bliss and Flannery 2002): 1) firstly ("monitoring" hypothesis), share- and debtholders must be able to efficiently monitor banks, and their assessment must be rapidly transmitted into banks' assets prices; 2) secondly ("influence and feedback" hypothesis), banks' managers are to correct their strategies in reaction to market signals and there must be a feedback into banks' assets prices. Unfortunately, the first hypothesis challenges the modern theory of banking: if banks had no private information about the risk levels of their borrowers, there would be no economic rationale for their existence. In a world of asymmetric information, banks have a comparative advantage in gathering and processing information (Freixas and Rochet, 1999). Without a certain amount of opacity between investors and borrowers, only direct market financing would be economically efficient. This argument limits the scope of market discipline and suggests that the relevant information about banks assets is not fully captured by their shares and bonds prices, so that market derived indicators are to be considered as complement rather than substitutes to other indicators such as ratings, accounting variables and qualitative information produced by in site monitoring.

The two underlying hypothesis of market discipline are also highly questionable if we think of the lessons we can retain from the theories of ownership structure. Indeed, there is no clear consensus about the type of ownership structure which is more prone to align shareholders, debtholders, supervisors and banks' managers' incentives. And there is consequently an intense debate on the influence of ownership structures on the quality of market signals. Some argue that dispersed ownership combined with good shareholder protection laws is the best way to avoid shareholders expropriation by managers (La Porta and alii 2002). Others point that a certain amount of ownership concentration in the hands of insiders produces incentives alignment between inside blockholders and managers (Berle and Means 1932, Jensen and Meckling 1976). Similarly, Shleifer and Vishny (1986) and Holmström and Tirole (1993) show that effective market discipline requires a certain level of ownership concentration in the hands of blockholders.

This problem is even more complex in the case of banking because of the possible supplementary conflict between shareholders and regulators (Park 1997). Indeed, Park and Peristiani (2007) have clearly demonstrated that incentives of banks' shareholders and regulators are not always aligned because banks' share prices are influenced by two opposites determinants : the charter value and the option value. When the charter value outweighs the option value, shareholders and regulators incentives are aligned. The former do not whish to augment the bank risk level, and they sell its shares if the bank's manager do so. Consequently, the price signal is not misleading since the bank's share price is decreasing with risk taking. On the contrary, when the bank is more risky, so that the option value outweighs the charter value, the bank's share price is increasing with risk taking and this market signal is misleading for the regulator. If there exists such a risk threshold beyond which share prices become misleading, it is important to know how it can be lowered as far as

possible so that market signals do not induce positive evaluation by supervisors when the banks are in fact increasing their risky positions. The important issue here is to uncover by empirical assessment what are the determinants of that threshold, that is to say, what kind of phenomena can blur the accuracy of market signals.

Empirical researches focused on the determinants of the predictive power of market signals have already given some valuable answers but very few, to our knowledge, have taken into account the possible impact of banks' ownership structure on the accuracy of market signals, and none deals with this determinant on European banks, as far as we know.

Some studies have show that the predictive power of subordinated debt spreads can be lowered by the existence of a safety net, by explicit public guarantees, by banks' government ownership or by badly designed insurance deposit (Sironi 2003, Imaï 2006, Gropp and alii 2006, Pop 2007). Similarly, Nier and Baumann 2006 find that market discipline (captured by higher capital buffers) is stronger when the government safety net is weaker, when uninsured liabilities are important in banks balance sheets and when they have a good information disclosure policy. Gropp and alii also find that subordinated bond spreads tend to lose their predictive power far away from the default date. Finally, all these evidence suggest that a high charter value lower the market discipline from debtholders.

The evidence is different a regards the predictive power of indicators derived from share prices. Gropp and alii 2006 find that the predictive power of the distance to default is not blurred by public support. Distinguin and alii (2006) even found that share prices signals are more accurate for bigger banks. This is empirically and theoretically explained by Park and Peristiani 2007 who show that banks' size and their core deposits base increase their charter value and, consequently, reinforce the accuracy of share prices signals.

The confrontation of these two kinds of empirical results, concerning market discipline by debtholders or by shareholders, suggests to use debt-based indicators for the supervision of banks with low charter value close to the default. Price share-derived indicators should rather be used far from the default and for banks with higher charter value. Nevertheless, the effectiveness of shareholders market discipline is influenced by the ownership structure. As a consequence, the relevance of share price-derived signals will certainly depend on such parameters as ownership concentration, insider holdings, stability of the composition of shareholders, nature of the most important shareholders and so on.

Indeed, some empirical studies have found that insider ownership influences banks' risks and performances (Anderson and Frazer 2000, Spong and Sullivan 2007). Berger and alii (2000) also found that the proportion of shares held by institutional investors has a significant impact on banks' abnormal returns. Most interestingly, Caprio and alii (2007) study a panel of 244 banks across 44 countries and show that banks' valuation is positively influenced by the concentration of cash flow rights and, to a lesser extend, by the concentration of control rights. These studies suggest that the second side of market discipline, the "influence and feedback" one, may work better when governing is rather concentrated.

Surprisingly, no empirical study of which we are aware has treated the influence of banks' ownership structure on the other side of market discipline (the "monitoring" side). Nevertheless, it is important to check whether some ownership structures deteriorate or, on the contrary, improve the quality of share prices signals. The theoretical prediction here is rather that concentrated ownership improves the quality of this signal (Shleifer and Vishny 1986), but other authors have argued that dispersed ownership produces a better signal (Fama 1980, Fama and Jensen 1983).

In this paper, we propose a test of the predictive power of the distance to default similar to Gropp and alii (2006), but we design it to take into account the influence of banks' ownership concentration. We find that the direct effect of ownership concentration is to augment the probability of financial distress but that, at the same time, the predictive power of the distance to default exists only for the banks with a higher level of ownership concentration[2]. Our interpretation is that blockholders may favour risk taking (a negative effect of the "influence" side of market discipline) but, at the same time, allow a better prediction of these risks by the stock market (reinforcement of the "monitoring" effect).

The remainder of the paper is organized as follows: in section 2 we discuss the theoretical predictions as regards the influence of ownership structure on shareholders' market discipline. Section 3 describes our database, the variables and the empirical methodology. The empirical results are discussed in section 4, and section 5 concludes the paper.

2. Ownership structure and market discipline

Since prudential regulation is now partly relying on market discipline according to the Basel II third pillar, the effectiveness of market monitoring is a main issue for regulators. The liability structure is the main determinant of market discipline. Many theoretical and empirical works show multiple liability effects on the monitoring level. An effective supervision by market agents may rely on the capital structure (Harris and Raviv, 1991), the debt structure, and the equity structure (Shleifer and Vishny, 1997). These three kinds of structures cause different patterns of information diffusion. Therefore, market discipline can be exercised in various ways on the basis of these market signals. Here, we focus on the equity structure in order to assess the effectiveness of the market discipline exercised by a particular kind of security holders, the shareowners.

From the regulator's point of view, the main issue is to know whether shareholders are able to impose strong constraints on banks when they pursue too risky strategies. Bliss and Flannery (2002) explain that this matter raises two questions about market discipline. On the one hand, it is a necessary condition that market monitoring transmits accurate information about banks' risk strategies into share prices (The "monitoring effect" of market discipline). On the other, this monitoring should induce managers to correct their faults when banks are close to the default. Hence, an "influence" effect may be added to the monitoring effect if one whishes to rely fully on the market to discipline banks' managers.

Concerning the first aspect of market discipline, Park and Peristiani (2007) show that share prices are not always relevant signals. When shareholders have a preference for charter value, and therefore a greater risk aversion, market prices are good proxies to evaluate banks' risk. Nevertheless, when shareholders have a preference for the option value, market prices are increasing with the bank's risk. Consequently, the stock price level may not be relevant on its own, and indicators mixing it with risk measures are to be preferred. That is why we chose in section 3 to implement the test of shareholders' market discipline using the distance-to-default rather than an indicator more directly derived from share prices.

Many papers about shareholders' market discipline in the banking sector try to assess shareowners "influence", that is, the subsequent effect of monitoring on risk-taking. Moreover, they analyze the effects of ownership structures in the Jensen and Meckling tradition. They distinguish between shares owned by insiders and the ones held by outsiders. This distinction has produced many insights to understand the effect of shareholding structures on banks' risk profiles. For instance, Anderson and Fraser (2000) find that

[2] In our sample, 44% of banks are "widely held", that is to say do not have any shareholder owning more than 10% of the outstanding shares.

managerial shareholdings are an important determinant of bank's risk-taking. During the late eighties, while the US banking industry was very competitive, managerial equity concentration caused more risk-taking by banks because the charter value was low. But at the beginning of the nineties, while regulations tended to improve charter value, managerial equity holding reduced incentives to risk-taking. This evidence shows clearly that the Jensen and Meckling "convergence-of-interest" hypothesis plays an important role in the understanding of bank's risk-taking strategy. Sullivan and Spong (2007) found a very similar result for US banks at the beginning of the nineties. Their main finding was that this decreasing risk effect is reinforced by the relative concentration of insider equities in managers' portfolios. Likewise, they show that an increasing relative weight of the bank's shares in the portfolio of an outside monitor contributes to the risk decrease. On the contrary, Berger and al. (2000) do not find any effect of insider ownership on abnormal returns that are rather influenced by the presence of institutional investors in their data.

This literature on bank ownership structure is focused on the influence effect of market discipline. Unfortunately, it is not directly focused on the predictive power of market monitoring itself. Moreover, it concerns only one aspect of corporate governance, namely the insider-outsider shareholding structure. In this respect, it could be fertile to use other insights of corporate governance theories. Indeed, Demsetz and Villalonga (2001) explain in a convincing way that the fraction of shares owned by insiders does not reflect the same interests when they are hold by professional managers or by a board member who represents an important shareholder of the company. Likewise, Aglietta and Rebérioux (2005) and Aglietta (2007) show various forms of control differentiated by the investors' type, and not only by the insider-outsider distinction. Therefore, we think more relevant to focus on the shareholdings of the largest owners, which constitute a more representative indicator of the ability of shareholders to effectively monitor management. According to this line of thinking, and besides the classical insider-outsider distinction, an important literature has highlighted how concentrated or dispersed ownership structures cause various subsequent monitoring patterns. These theories could be very helpful to understand what kind of shareholders structure is the best one to predict financial fragility[3]. Let us present succinctly these approaches[4].

Fama (1980) and Fama and Jensen (1983), argue that a widely held firm is an efficient shareholder structure because it permits an *ex post* adjustment of securities prices on the basis of the past managerial performance. The main idea is that the more investors' portfolios are diversified, the more shareholder structures are dispersed, and the more financial markets are efficient. It is because of the risk dispersion between shareholders that the market generates accurate signals, that is, could ensure a good monitoring.

Grossman and Hart (1980) develop a contrarian hypothesis to the efficient capital market one. They show difficulties in the exercise of market discipline in a situation of capital dispersion. If market discipline is reflected in the securities price, a free rider problem exists and may inhibit takeovers. Then, the threat of the loss of control has not influence and cannot discipline management. It hence reduces the research of information by investors and the informational content of price.

Shleifer and Vishny (1986) overcome this free rider problem by showing the importance of big shareholders in the monitoring activity. Because they own a substantial share of equities, these shareowners can support the cost of monitoring, which is the cost of research

[3] In their study of corporate governance of banks, Caprio and al. (2007) use the dispersion-concentration distinction but rather to assess the influence effect than the monitoring one.

[4] This survey is focused on dispersed-concentrated ownership models. Other theories like the ones of Morin (1996, 2000) mix in an integrative framework the two main dimensions of ownership, namely the insider/outsider control and the dispersed/concentrated ownership patterns.

information. Thus, they can diffuse an accurate signal to the market and thereby facilitate the event of a takeover. There is no free rider problem when a big shareholder exists. In that case, *ex ante* monitoring and its influence effect on management are strongly effective.

Holmström and Tirole (1993) explain in an integrative framework the cost and benefits of each kind of ownership structure. First, ownership dispersion permits to increase exchanges on company securities. The subsequent increase in liquidity allows "speculative investors" with private information about the firm to hide buying or selling activities behind the active trading on corporate securities. Hence, the more the market is liquid, the more private information is valuable. Ownership dispersion is therefore an incentive to collect private information about past managerial behavior in order to assess its effect on the assets' value. Thus, the monitoring enhancement improves the informational content of prices about past events. This monitoring is a "passive" one insofar as it relies on backward looking information and does not imply any interference with managerial team or board members (Tirole, 2006).

Nevertheless, this kind of passive monitoring has a cost for some investors who are not well informed. Indeed, their loss is the counterpart of the gain of speculative shareholders. Because the market anticipates this potential cost, investors would minimize the value of securities when the corporation issues them. Then, it could be optimal to maintain a certain level of concentration. But, more than anything, the benefits from ownership concentration arise from the high-powered influence effects that can be implemented by control rights. Thanks to their voting rights, big shareholders can interfere with the board decisions. Thereby ownership concentration is significantly associated with the research of prospective information about managerial or board strategies. Shareowners then collect forward-looking information in order to alter the course of action of the firm, especially if the board pursues strategies against their interests. By this active monitoring, and their capacity to interfere with the firm, big shareholders transmit accurate signals to the market.

In short, passive monitoring linked to ownership dispersion has low-powered influence effects insofar as the market price on the secondary market does not constraint firms in their capacity to secure their funding (Tirole, 2006). Nonetheless, this market price correctly assesses the effect of past managerial behavior on the firm's assets and can serve as a basis for the payment of incentive schemes. But it does not have the same extent as an active monitoring. Because the latter relies on forward looking information, it has more predictive properties, and all the more when it is associated with potential interference, which guaranties the sense of the firm's course of action.

In summary, ownership concentration is the condition to an efficient active monitoring. On the one hand a big shareholder may be the pivot actor during a takeover and can support the monitoring costs (Shleifer and Vischny, 1986; Holmström and Tirole, 1993), overcoming therein a free rider problem. The power of this threat ensures the quality of the monitoring and the effectiveness of its influence on managerial behavior. On the other hand, ownership concentration may convey control rights that provide strong incentives to carry out an accurate active monitoring (Tirole, 2006).

All in all, corporate governance theories forecast that ownership concentration should improve the predictive power of monitoring inasmuch as it goes with a strong influence or control effect. They do not say if monitoring leads to an increasing or rather a decreasing risk. This point depends on shareholders' preferences for option or charter value. These insights are summarized in the following table.

Ownership structure	**Dispersion**	**Concentration**	
Monitoring	Passive Monitoring	Active Monitoring	
Information type	Backward looking information	Forward looking information	
Influence and control effect	Influence by speculative shareholders	Influence by a big shareholder and potential entrant shareholders	Control by incumbent or entrant shareholders
Influence and control effect channel	Payment Incentive Schemes	Threat of a takeover	Interference with board strategies
Accuracy of the market price to reveal risk taking	Low	Strong	Strong

These theoretical insights allow us to formulate two predictions about the effectiveness of the two indissoluble sides of shareholders' market discipline in the banking sector:

Proposition 1: Ownership concentration and the monitoring effect

Banks' stock prices will better anticipate future financial distress when their ownership is concentrated rather than dispersed.

We will test this proposition using the distance to default as a predictor of banks financial distress.

Proposition 2: Ownership concentration and the influence effect

Concentrated ownership should have an impact on banks' strategies and risk-taking because the influence (and control) power of large shareholders is then reinforced.

We will test this proposition by assessing whether the probability of financial distress is directly influenced by the existence of blockholders in banks' ownership structure.

3. The empirical method and the dataset

3.1. Empirical method

Since we deal with the predictive power of indicators derived from share prices, we have a choice to make between several possible measures such as banks' stock prices, returns, abnormal returns, and the more sophisticated distance to default (DD). As described in the Appendix B, the distance to default (DD) is defined as the number of standard deviations of the assets volatility that separate the firm from its default point, in which the value of assets equals the value of debt[5].We chose this indicator because, as it is demonstrated by Gropp,

[5] Several studies have shown that this indicator provides additional information to traditional financial ratios. Many are applied to the US banking system, for instance Gunther, Levonian and Moore (2001), Krainer and Lopez (2003), Curry, Elmer and Fissel (2004). In the European case, Gropp, Vesala and Vulpes (2006)) show that the distance-to-default has predictive power for bank fragility up to 18 months before the "failure" event, even when they control for the safety net effect and include a synthetic measure of the CAMEL indicators. Nevertheless, Distinguin, Rous and Tarazi (2006), who also worked on European banks but with a different definition of the downgrade event, found that a stepwise regression procedure

Vesala and Vulpes (2005), it has two advantages for assessing banks fragility. Firstly, it is *complete* , that is to say it reflects the three major determinants of default risk (Market value of assets, leverage and volatility of assets). Secondly, it is *unbiased* since it is increasing in the value of assets and decreasing in the leverage and the volatility of asset. We know that this is not the case for indicators such as the market value of equity or the share prices because, when the option value outweighs the charter value, shareholders give value to risk-taking behaviours (Park and Peristiani 2007).

We first estimate a pooled-logit model to predict the probability of financial distress with the same covariates as in Gropp and alii (2006), that is to say the DD and the CAMEL-type score. Nevertheless, it must be underlined that we work with a different definition of the dependant variable (see section 3.2 below), and we observe a different period (1997-2005 while they worked on 1991-2001). Consequently, we have a different panel of European banks : our sample integrates more recent data, but we also lose the 1991-1996 observations because the data on ownership structure we use afterwards were only available from 1997 on. We also loose some banks for the same reason.

Nevertheless, we obtain a benchmark model where the DD indicator has a clear predictive power. We are then able to integrate several dummies and crossed variables capturing the effect of ownership concentration, and we can thus assess the way it affects the quality of the DD signal.

3.2. Database and variables construction

In the sample selection process, we started from a panel of 82 European banks, for which we could obtain accounting ratios, stock market indicators and credit ratings. We then had to reduce this panel to 77 banks because 5 banks could not be found in Thomson One Banker ownership database. Table 1 shows the composition of the sample as regards banks' type: there are 53 commercial banks, 10 bank holding companies, 6 savings banks, 3 investment banks & securities houses, 2 cooperative banks, 2 real estate & mortgage banks and 1 medium & long term credit bank

PLEASE INSERT TABLE 1

The DD is computed on a monthly basis (see Appendix B) but we converted it to a quarterly frequency afterwards, using the mean of the monthly DDs. Concerning the accounting ratios which are available either on a yearly, semi-yearly or quarterly basis, we created quarterly observations by simply reporting the latest known value. We used the same method for the ratings which can be modified at any point in time. Ownership information is directly available at a quarterly frequency in Thomson One Banker ownership database.

To build the benchmark model, we used two different sources: Datastream for the stock prices and Bankscope for the financial ratios and the Fitch/ICBA credit ratings. We constructed a first sub-sample of 85 banks on the basis of three criteria: (i) the commercial bank is a public company and the stock prices are available from Datastream, (ii) its total market capitalization exceeds 100 €m by the end of 2005, and (iii) it is -or used to be- rated by the rating agency Fitch. In practice, this last criterion of credit rating availability is the most restrictive since we could get only 376 credit rated banks over more than 5000 European commercial banks identified by Bankscope. Finally, we used a minimum threshold for the turnover on equity to eliminate the companies whose stocks were not sufficiently traded over

always conduct to prefer a stock price indicator (the difference between the natural logarithm of the stock price and its moving average on 261 days) to the DD.

the period[6]. This lead to the suppression of 3 more banks and to the constitution of the initial database of 82 banks.

Of course public companies are not representative of the entire universe of European banks. The firms rated by Fitch may also be bigger in average than the other banks in this universe[7]. Therefore, we shall underline the fact that our conclusions only apply to the biggest European banks and the most actively traded on the stock market.

To construct the dependant variable capturing financial distress, we use the Individual Ratings from the Fitch/ICBA database because it reflects the risks associated with the intrinsic activity of the bank, regardless of the financial profile of the holding it may be related to. This notation takes values ranging from A (the best rating) to E (the worst) and can be potentially revised at any moment. We also consider the 'Support Rating' from the same agency describing the intensity of the safety net the bank might benefit from in case of financial difficulties. As we will see, this rating will help us to control for *Too-Big-To-Fail* effects.

We selected two cut-off ratings to identify the situations of financial distress: as in Gropp and alii (2006), the variable *fragile2_c* is equal to one whenever the rating falls to C or below, but we also test the variable *fragile2_cd*, which is equal to one if the rating falls to C/D or below. Gropp, Vesala and Vulpes (2005) provide convincing arguments to assess the quality of such a rating-based indicator of bank fragility. We will see however that the results are quite different when we choose a threshold at C/D in state of C[8]. As can be seen in Table 2, in our sample downgrade to C or C/D or below are rare events in the period under scrutiny (29 downgrades to C or below; 17 downgrades to C/D or below). Moreover, some banks enter the sample already downgraded (11 for the cut-off C and 3 for the cut-off C/D) and we do not know precisely for how long they have been downgraded. In addition, severely downgraded banks do not drop off the sample because formal bank bankruptcies is extremely rare in Europe. This may lead to overestimate the predictive power of the covariates because, when they are used with lags in order to check whether they predict downgrade in advance, we may correlate the downgraded rating of date t with covariates known at a date t-n when the bank had already been downgraded at the same level. It is therefore necessary to drop the severely downgraded banks after a certain time. We do not drop the bank immediately after the downgrade as it is done in Gropp and alii (2006), but only after four quarters if the rating does not rise any more. This is imposed by the low number of downgraded banks and the necessity to keep a not to skewed distribution of the dependant variable[9].

PLEASE INSERT TABLE 2

The CAMEL-type indicator is constructed using Bankscope data. We select the most frequently available variable for C(apital adequacy), A(sset quality), M(anagement), and E(arnings). We could not use any L(iquidity) ratio because it implied the loss of two much observations. The variables selected and the ratios constructed are presented in Table 3[10]. We

[6] The banks whose stock was traded less than 1000 times a day in 25% of the trading days (or less) were deleted from the sample.

[7] In fact the 82 banks of our dataset have an average market capitalization of 15 €bn by the end of 2005 and an average Total of Assets of 150 €bn by the end of 2005, which are significantly higher than the averages of the 5000 banks available in Bankscope.

[8] More details on the reasons for these different results can be found in Brossard and alii (2006).

[9] Contrary to Gropp and alii (2006) we do not drop the dates at which there is no severe downgrade event, which was another way to obtain an acceptable balance between the '0' and the '1' of the dependant variable.

[10] Please note that :

- *Capital funds* means (equity + hybrid capital + subordinated debt);
- *Return on average equity* is preferred to a classic return on equity in order to minimize the volatility of this indicator. The average equity is calculated on a period of two years.

then construct the same score variable as used in Gropp and alii (2006), using the same quartile ranking methodology which is in our opinion the best way to avoid the multi-colinearity problems in the subsequent estimations. This score variable is labelled 'came'.

The construction of the DD indicator from Datastream and Bankscope data is detailed in Appendix B.

We also use Fitch/ICBA support rating to construct a dummy variable dsupp which equals 1 if the bank is strongly supported by its supervision/governmental authorities (Table 3).

Finally, we merged this dataset with information on the ownership structure of banks taken from Thomson One Banker ownership database (TOBO). TOBO offers a huge amount of ownership information such as the percentage of outstanding shares held by the investors, investors type, country, size and identification and so on. We only exploit here the information about investors' holdings to construct several measures of ownership concentration. These measures are presented with all the covariates in Table 3.

The matching of the Datastream/Bankscope dataset with the TOBO dataset implies the loss of five more banks for which we could not retrieve enough information on the ownership structure. The final sample is thus made of 77 banks observed on 36 quarters, and the panel is unbalanced. Consequently, we have up to 1555 banks/quarters observations when we use only the DD and "came" explanatory variables, and up to 1453 banks/quarters observations when we integrate the measures of ownership concentration.

PLEASE INSERT TABLE 3

4. The results

In this first section we implement several tests designed to assess the predictive power of our distance-to-default indicator. These tests will provide a useful first-step assessment of our specific distance-to-default indicator. If it proves to be robust, we will be able to use it in a second step for the detection of the supposed impact of banks' ownership concentration on the predictive power of the DD indicator.

We estimate separately two standard (pooled) Logit models of the form :

$$\text{Prob}\{Y_i = 1\} = \Phi(\alpha + \beta_t \text{dd}r_t + \beta_t' \text{dddsupp}r_t + \alpha_t' \text{dsupp}r_t + \gamma_t \text{came}r_t)$$

where :

- Y is either fragile2_c or fragile2_cd;
- r_t (t= 1, …, 8) stands for the number of lags in quarter ;
- dddsuppr_t = ddr_t×dsupp$r;_t$
- Φ(.) is the cumulative logistic distribution.

Since we use panel data and pooled estimations, observations are not independent within banks -which can generate autocorrelation- and they are independent across banks -which can produce heteroskedasticity. As a consequence, the standard errors are adjusted using the Hubber/White/Sandwich method.

Table 4 reports the estimations of the models with independent variables lagged 2, 3, 4, and 6 quarters. With this dummy-designed specification, the direct coefficient of ddr_t (β_t) represents the predictive power of DD for the non-supported banks, and the coefficient for the supported banks is the sum of the dddsuppr_t and ddr_t coefficients (β_t+β'_t).

Interestingly, we see that the DD has **predictive power only for the supported banks** when the cut-off rating is set to C or below (dependant variable fragile2_c). On the contrary, it has predictive power for all the banks up to four quarters in advance when the cut-off C/D or below is used (dependant = fragile2_cd). Consequently, we find again Gropp & alii's safety net neutrality only for the cut-off rating at C/D or below. The non neutrality result for the cut-off at C is nevertheless consistent with other studies that found a "reverse too-big-to-fail effect" whereby share price indicators keep there predictive power only for the sample of bigger banks (Distinguin and alii 2006).

However, the predictive power of the DD remains very interesting since we can see that it is significant even though we introduced the synthetic score capturing banks performance in terms of capital adequacy, asset quality, management efficiency and earnings (variable camer_t)[11]. As a consequence, we can use this benchmark model to assess the influence of ownership concentration on the "monitoring" side of market discipline, but we will keep on differentiating two models, one with the cut-off of the dependant variable at C or below and the other at C/D or below. Moreover, the model with fragile2_c as the dependant variable will be estimated only for the sub-sample of supported banks while the case with fragile2_cd will be estimated on the full sample.

PLEASE INSERT TABLE 4

We now introduce a supplementary dummy variable du10c1r_t to account for the influence of ownership concentration on the predictive power of the DD. More precisely we construct a cross variable dddu10c1r_t = ddr_t×du10c1r_t. Banks with du10c1r_t = 1 are those for which the investor holding the most important percentage of the outstanding shares holds at list 10% of these shares. Consequently, he is either a minority blockholder or a majority owner if he holds more than 50%. The results of the regressions are to be interpreted with the same method as in the previous case: the direct coefficient of ddr_t (β_t) represents the predictive power of DD for the banks with relatively low ownership concentration, and the coefficient for the banks with relatively high ownership concentration is the sum of the dddu10c1r_t and ddr_t coefficients (β_t+β'_t). The interpretation is then straightforward (Table 5):

- with fragile2_c, and consequently on the sole supported banks, the predictive power of the DD remains significant only for the banks with high ownership concentration and only 2 and 3 quarters in advance;
- with fragile2_cd, and consequently on all the banks, the predictive power of the DD remains significant only for the banks with high ownership concentration, 2, 3 and 4 quarters in advance.
- Moreover, there is a significant positive effect of du10c1r_t on the probability of downgrade to C/D or below, but only 2 quarters in advance.

PLEASE INSERT TABLE 5

These results are consistent with Proposition 1 predicting that a certain level of ownership concentration is necessary to allow shareholders' monitoring to be correctly transmitted to the stock market.

Moreover, in the case of a cut-off rating at C/D or below, there is a significant direct effect of ownership concentration on the probability of financial distress, but only 2 quarters in

[11] Please note that we also checked whether it provides some supplementary information in comparison to the Fitch individual rating considered at the same time-lead. We implement the same estimations controlling for the Fitch individual rating observed at the time the distance-to-default is also observed. The distance-to-default remains fairly powerful.

advance. This may suggests that the existence of blockholders modify banks' strategies. This would be consistent with Proposition 2 which states that concentration also favors the "influence and feedback" side of market discipline.

It is necessary to check whether these results are robust when the definition of the ownership concentration criteria is modified. That is why we implement two supplementary series of regressions.

In the first one, we changed to 20% the threshold for the definition of first investors' blockholding (du20c1r_t). The "monitoring" and "influence" effects appear to be reinforced (Table 6):

- with fragile2_c, and consequently on the sole supported banks, the predictive power of the DD remains significant only for the banks with high ownership concentration, and it is now true 2, 3 and 4 quarters in advance;
- with fragile2_cd, and consequently on all the banks, the predictive power of the DD remains significant only for the banks with high ownership concentration, 2, 3 and 4 quarters in advance;
- Moreover, there is a significant positive effect of du20c1r_t on the probability of downgrade to C/D or below, which is now true 2, 3 and 4 quarters in advance.

Here we can conclude that the monitoring and influence effects of ownership concentration are bigger when the first investor's shareholdings are higher. The influence effect is significant only on the probability of a very severe downgrade (to C/D or below).

PLEASE INSERT TABLE 6

Finally, we introduce another definition of blockholding (Table 7) excluding majority block holders: duminorityblockpremier10r_t = 1 when the first investor's holdings represent at list 10% of the outstanding shares but less than 50%. The differentiated monitoring effects are much less significant: in the case of a cut-off at C, the DD of the banks in the category loses its predictive power, except two quarters in advance. In the case of a cut-off at C/D, the DD of the banks in the category has no supplementary predictive power in comparison to the other banks. Moreover, the influence effects are no longer significant since the direct coefficients of duminorityblockpremier10r_t are never significant.

In an additional test not reported here, we introduced another threshold for minority blockholding, duminorityblockpremier20r_t = 1 when the first investor's holdings represent at list 20% of the outstanding shares but less than 50%. Here the results for fragile2_c are very similar to the case of du20c1r_t described above: the differentiated monitoring effects become significant again. When the cut-off is at C/D, the DD of the banks in the category has no supplementary predictive power in comparison to the other banks, but the influence effects come back since the direct coefficients of duminorityblockpremier20r_t become again significant.

Over-all, the impact of ownership concentration on the effectiveness of market discipline seems to be partly related to the existence of big blockholders. More precisely, the monitoring effect is always limited to the banks with highly concentrated ownership, when the measure of ownership concentration includes majority blockholders. Therefore, big blockholders, but above all majority blockholders, seem to be an important source of market discipline in the sense of "monitoring and influencing the stock price".

Big blockholders holding at list 20% of the outstanding shares also seem to be a source of "influence" in the sense that they modify the probability of a future downgrade to C/D or below. Unfortunately, on the data we have used, they seem to exert a "bad influence" leading to "Market indiscipline" rather than discipline.

PLEASE INSERT TABLE 7

5. Conclusions

We have constructed a simple early warning model of banks' financial distress in order to test the impact of ownership concentration on shareholders' market discipline. We test the two possible effects of market discipline, according to the distinction proposed by Bliss and Flannery (2002): 1) the "monitor and modify the stock prices" one; and 2) the "influence the decisions and strategies" one. These tests are conducted on a panel of 77 European banks observed between the first quarter of 1997 and the last quarter of 2005. Our database is the result of a matching of Datastream, Bankscope and Thomson One Banker ownership data.

The first striking result is that a certain level of ownership concentration is necessary if one desires shareholders' monitoring to be correctly transmitted into the distance-to-default indicator. This specificity of banks with concentrated ownership is particularly strong when the measure of concentration includes majority shareowners or at list big blockholders holding more than 20% of the outstanding shares.

The second striking result is that banks' ownership concentration also seem to have an "influence" effect in the sense that it modifies the probability of future financial distress. This is only true, however, when the future financial distress to be predicted is very severe (downgrade to C/D or below). More surprisingly, this influence is positive in our data, meaning that it leads to more risk taking and consequently higher failure probability. This is not in contradiction with ownership theories since they only predict that ownership concentration reinforces the monitoring and influencing powers of shareholders but not that this should always lead to more cautious strategies. Indeed, Park and Peristiani (2007) have clearly shown that shareowners may value risk taking when the option value outweighs the charter value. This problem is reinforced when the blockholding shareholder is a big one endowed with an uncontestable control. The reasons for this behavior should be studied more deeply but we may hypothesize that some financial conglomerates push-down their risks among companies that constitute the corporate group. This problem, well-known by regulators (Scialom, 1997, 2004) cannot be altered by minority shareholders if they do not have sufficient legal rights to protect them, even if passive monitoring can anticipate this kind of behavior.

Financial regulators may have to be aware that the predictive power of the distance-to-default is weakened when banks have a dispersed ownership. And they may also have to consider that shareholders sometimes exert a "bad influence" leading to "market indiscipline" rather than market discipline.

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Appendix A : Tables

TABLE 1

COMPOSITION OF THE SAMPLE BY COUNTRY AND SPECIALIZATION (number of banks)

Specialization / **Country**	Commercial Bank		Bank Holding & Holding Company		Savings Bank		Investment Bank & Securities House		Cooperative Bank		Real Estate & Mortgage Bank		Medium & Long Term Credit Bank		**Total**	
Austria					1	(1)									**1**	**(1)**
Belgium			3	(0)											**3**	**(0)**
Czech Republic	1	(1)													**1**	**(1)**
Denmark	2	(0)													**2**	**(0)**
Finland	1	(1)													**1**	**(1)**
France	4	(2)													**4**	**(2)**
Germany	4	(3)					1	(1)			1	(0)	1	(1)	**7**	**(5)**
Greece	5	(4)													**5**	**(4)**
Ireland	3	(0)													**3**	**(0)**
Italy	10	(4)			1	(1)			2	(2)					**13**	**(7)**
Netherlands	1	(0)	1	(0)											**2**	**(0)**
Norway	1	(0)			3	(0)									**4**	**(0)**
Poland	5	(5)													**5**	**(5)**
Portugal	1	(0)	1	(0)			2	(1)							**4**	**(1)**
Spain	8	(1)													**8**	**(1)**
Sweden	2	(1)			1	(0)									**3**	**(1)**
Switzerland	1	(0)	1	(0)											**2**	**(0)**
United Kingdom	4	(0)	4	(0)							1	(0)			**9**	**(0)**
Total	**53**	**(22)**	**10**	**(0)**	**6**	**(2)**	**3**	**(2)**	**2**	**(2)**	**2**	**(0)**	**1**	**(1)**	**77**	**(29)**

NOTES: Specialization is the Bankscope specification. Number of downgraded banks in parentheses.

TABLE 2: DOWNGRADED BANKS

Type of the downgrade	*Downgrade to C*		*Downgrade to CD*	
Bank	First downgrade	Duration of the downgrade (quarters)	First downgrade	Duration of the downgrade (quarters)
Commerzbank	March 97	25	March 97	13
IKB Deutsche Industriebank	March 97	13	March 97	13
Banca Monte Dei Paschi	March 97	10	March 97	1
Komercni Banka	March 97	36	March 98	28
Oko Bank	March 97	36	Sept. 99	26
CIC	March 97	36	March 01	20
Banca Intesa	Dec. 97	33	Dec. 02	5
National Bank of Greece	June 98	21	June 00	6
Erste Bank Der OesterreichischenSparkassen	Dec. 98	29	Dec. 98	29
Credit Lyonnais	Dec. 98	29	Dec. 01	17
Bankgesellschaft Berlin	June 00	23	June 00	15
Aspis Bank	Dec. 01	9	Dec. 01	9
Banca Carige	Dec. 01	17	Dec. 02	6
Bayerische Hypo-Vereinsbank	March 02	16	March 02	15
Deutsche Bank	March 02	16	Dec. 02	13
Alpha Bank	Sept. 02	12	Sept. 02	10
Emporiki Bank Of Greece	March 04	8	March 04	8
Banca Popolare Italiana	March 97	12		
Bank Zachodni Wbk	March 97	35		
ING Bank Slaski	March 97	27		
Banif	March 97	36		
Skandinaviska Enskilda Banken	March 97	34		
Bank Ochrony Srodowiska	Sept. 98	21		
Banca Popolare di Milano	Dec. 02	11		
Capitalia	March 03	12		
Cassa di risparmio di Firenze	March 02	14		
Bank BPH	March 02	10		
Bank Polska Kasa Opieki Grupa Pekao	March 02	16		
Banco Espanol de Credito	March 03	12		
Total number of severe downgrades		29		17

NOTES: This table shows banks downgraded by Fitch/IBCA to a rating of C or below, or to one of CD or below.

TABLE 3

DESCRIPTION OF THE VARIABLES AND EXPECTED SIGNS

Variables	Definition	*N*	Mean	Std. dev	Min	Max	Expected sign
Dependent variables							
fragile2_c	= 1 if the rating falls to C or below.	23 21	0.26	0.44	0	1	
fragile2_cd	= 1 if the rating falls to CD or below.	23 17	0.1	0.3	0	1	
Independent variables							
Capital ratio	Capital Funds / Liabilities %	22 73	8.51	2.61	2.43	18.5	–
Asset quality ratio	Loan Loss Provisions / Net Interest Revenue %	22 73	16.59	14.83	-59.12	141.87	+
Management ratio	Cost-to-income ratio %. It represents the overheads or costs of running the bank, the major element of which is salaries, as a percentage of income generated before provisions.	22 73	61.74	14.67	0.41	156.71	+
Earnings ratio	Return on average equity (ROAE) %. This performance indicator is preferred to a classic return on equity to minimize its volatility. The average equity is calculated on a period of two years.	22 73	13.8	9.2	-64.83	75.78	–
Capital Score	Score from 0 to 3 that is formed by adding one when the bank exceeds a quartile of the capital ratio. By quarter, the score is equal to 0 if this accounting ratio is inferior to the 25th percentile of the capital ratio.	22 73	1.49	1.12	0	3	–
Asset quality Score	Score from 0 to 3 that is formed by subtracting one when the bank exceeds a quartile of the asset quality ratio. By quarter, the score is equal to 3 if this accounting ratio is inferior to the 25th percentile of the asset quality ratio.	22 73	1.51	1.12	0	3	–
Management Score	Score from 0 to 3 that is formed by subtracting one when the bank exceeds a quartile of the management ratio. By quarter, the score is equal to 3 if this accounting ratio is inferior to the 25th percentile of the management ratio.	22 73	1.51	1.12	0	3	–
Earnings Score	Score from 0 to 3 that is formed by adding one when the bank exceeds a quartile of the earnings ratio. By quarter, the score is equal to 0 if this accounting ratio is inferior to the 25th percentile of the earnings ratio.	22 73	1.49	1.12	0	3	–
came	Composite index from 0 to 12 using the quartile ranking of accounting ratios in each quarter. The index is formed by aggregating capital score, asset quality score, management score and earnings score.	22 73	6.00	2.82	0	12	–

Variables	Definition	*N*	Mean	Std.dev	Min	Max	Expected sign
dsupp	= 1 if the bank is strongly supported by public authorities in case of financial difficulties (safety net). Rating by Fitch/IBCA.	2413	0.67	0.47	0	1	Unclear
dddtkmvvol6m	The distance-to-default indicator represents the number of standard deviations (measured in terms of the assets' volatility) that separate the bank from its default point (defined by Total Assets = Total Debt). The smaller the distance-to-default, the higher the default risk.	2282	4.52	2.41	0.59	35.56	–
du10c1	= 1 if the largest shareholder owns more than 10% of common shares.	2239	0.56	0.50	0	1	Unclear
du10c3	= 1 if the sum of the three largest shareholders' holdings is more than 10% of common shares.	2239	0.79	0.41	0	1	Unclear
du10c5	= 1 if the sum of the five largest shareholders' holdings is more than 10% of common shares.	2239	0.88	0.33	0	1	Unclear
du20c1	= 1 if the largest shareholder owns more than 20% of common shares.	2239	0.37	0.48	0	1	Unclear
du20c3	= 1 if the sum of the three largest shareholders' holdings is more than 20% of common shares.	2239	0.56	0.50	0	1	Unclear
du20c5	= 1 if the sum of the five largest shareholders' holdings is more than 20% of common shares.	2239	0.61	0.49	0	1	Unclear
duwidelyheld	= 1 if no shareholder owns more than 10% of common shares.	2239	0.44	0.50	0	1	Unclear
duminorityblockpremier10	= 1 if the first shareholder owns more than 10% of common shares and is a minority shareholder, that is a shareholder whose the holding is inferior to 50% of common shares.	2239	0.37	0.48	0	1	Unclear
duminorityblockpremier20	= 1 if the first shareholder owns more than 20% of common shares and is a minority shareholder, that is a shareholder whose the holding is inferior to 50% of common shares.	2239	0.18	0.39	0	1	Unclear
dd(varname)	The product of the distance-to-default indicator and a dummy variable.						*fn*(dummy)
(varname)r*t*	A variable at date $d - t$ where $t = 2, 3, 4$ quarters.						

NOTES: accounting data come from Bankscope, ratings from Fitch/IBCA Bankscope, market data from Datastream, and ownership data from Thomson One Banker Ownership and annual reports.

Table 4

COEFFICIENT	(1) fragile2_c	(2) fragile2_c	(3) fragile2_c	(4) fragile2_c	(1) fragile2_cd	(2) fragile2_cd	(3) Fragile2_cd	(4) fragile2_cd
ddr2	-0.07				-0.88***			
	(0.24)				(0.21)			
dddsuppr2	-0.20				0.38			
	(0.28)				(0.33)			
dsuppr2	-0.31				-2.53*			
	(1.26)				(1.41)			
camer2	-.54***				-0.57***			
	(0.08)				(0.09)			
ddr3		-0.16				-0.92***		
		(0.25)				(0.24)		
dddsuppr3		-0.08				0.56*		
		(0.28)				(0.30)		
dsuppr3		-0.80				-3.09**		
		(1.23)				(1.37)		
camer3		-0.58***				-0.68***		
		(0.11)				(0.11)		
ddr4			-0.21				-0.82***	
			(0.32)				(0.23)	
dddsuppr4			-0.06				0.53*	
			(0.35)				(0.27)	
dsuppr4			-0.67				-2.70*	
			(1.41)				(1.41)	
camer4			-0.53***				-0.69***	
			(0.14)				(0.12)	
ddr6				0.12				-0.70***
				(0.24)				(0.22)
dddsuppr6				-0.42*				0.54**
				(0.25)				(0.26)
dsuppr6				1.46				-1.70
				(1.30)				(1.47)
camer6				-0.37***				-0.58***
				(0.12)				(0.11)
Constant	0.62	0.91	0.52	-1.97	2.85**	3.17**	2.52*	0.94
	(1.15)	(1.16)	(1.34)	(1.21)	(1.15)	(1.24)	(1.31)	(1.26)
Observations	1329	1323	1318	1214	1555	1552	1550	1423
N_clust	72	72	66	64	77	76	75	73
Observations with Y=1	60	49	37	33	45	39	33	26
Observations with Y=1 (%)	4,51%	3,70%	2,81%	2,72%	2,89%	2,51%	2,13%	1,83%
$\chi 2$ statistic for $\beta_t+\beta_t'=0$	2.95*	2.76*	2.62*	4.00***	3.53*	2.93*	3.20*	1.00
$\chi 2$ statistic for $\beta_t'=0$ and $\alpha_t'=0$	3.90	2.94	1.56	3.15	3.68	5.10*	4.23	5.79**
chi2	61.8	35.6	25.2	23.6	78.9	45.9	45.9	73.4
r2_p	0.24	0.26	0.23	0.13	0.30	0.33	0.31	0.25

Model Specification : $\text{Prob}\{Y_i = 1\} = \Phi(\alpha + \beta_t \text{ddr}_t + \beta_t' \text{dddsuppr}_t + \alpha_t' \text{dsuppr}_t + \gamma_t \text{camer}_t)$

where r_t (t= 1, …, 8) stands for the number of lags in quarter and $\text{dddsuppr}_t = \text{ddr}_t \times \text{dsuppr}_t$

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5

COEFFICIENT	(1) fragile2_c	(2) fragile2_c	(3) fragile2_c	(1) fragile2_cd	(2) fragile2_cd	(3) Fragile2_cd
ddr2	-0.05			-0.18		
	(0.16)			(0.16)		
dddu10c1r2	-0.72**			-0.38*		
	(0.32)			(0.21)		
du10c1r2	1.42			2.41**		
	(1.17)			(1.07)		
camer2	-0.56***			-0.58***		
	(0.16)			(0.08)		
ddr3		-0.09			-0.20	
		(0.19)			(0.29)	
dddu10c1r3		-0.43*			-0.42	
		(0.24)			(0.32)	
du10c1r3		0.72			2.54*	
		(1.21)			(1.35)	
camer3		-0.55***			-0.64***	
		(0.18)			(0.09)	
ddr4			-0.10			-0.14
			(0.21)			(0.37)
dddu10c1r4			-0.16			-0.45
			(0.30)			(0.39)
du10c1r4			0.18			2.72*
			(1.63)			(1.62)
camer4			-0.58***			-0.68***
			(0.18)			(0.11)
Constant	-0.36	-0.35	-0.45	-1.03	-0.90	-1.10
	(0.75)	(0.88)	(1.07)	(0.89)	(1.12)	(1.35)
Observations	830	834	838	1435	1445	1453
N_clust	45	45	45	76	75	75
Observations with Y=1	24	22	19	40	37	34
Observations with Y=1 (%)	2,89%	2,64%	2,27%	2,79%	2,56%	2,34%
$\chi 2$ statistic for $\beta_t+\beta_t'=0$	5.34**	5.98***	1.73	17.03***	16.06***	19.43***
$\chi 2$ statistic for $\beta_t'=0$ and $\alpha_t'=0$	5.88**	4.39	0.78	5.22*	3.81	3.48
chi2	30.7	30.5	23.9	93.5	83.5	81.3
r2_p	0.30	0.27	0.27	0.31	0.33	0.35

Model Specification : $\text{Prob}\{Y_i = 1\} = \Phi(\alpha + \beta_t \text{ddr}_t + \beta_t' \text{dddu10c1r}_t + \alpha_t' \text{du10c1r}_t + \gamma_t \text{camer}_t)$

where r_t (t= 1, …, 8) indicates the number of lags in quarter and $\text{dddu10c1r}_t = \text{ddr}_t \times \text{du10c1r}_t$

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6

COEFFICIENT	(1) fragile2_c	(2) fragile2_c	(3) fragile2_c	(1) fragile2_cd	(2) fragile2_cd	(3) fragile2_cd
ddr2	-0.09			-0.33		
	(0.17)			(0.20)		
dddu20c1r2	-0.67**			-0.32		
	(0.28)			(0.24)		
du20c1r2	1.31			2.72***		
	(1.04)			(0.86)		
camer2	-0.57***			-0.57***		
	(0.16)			(0.07)		
ddr3		-0.09			-0.29	
		(0.17)			(0.27)	
dddu20c1r3		-0.72***			-0.45	
		(0.20)			(0.33)	
du20c1r3		1.49			3.28***	
		(1.29)			(1.21)	
camer3		-0.56***			-0.63***	
		(0.18)			(0.08)	
ddr4			-0.04			-0.19
			(0.16)			(0.31)
dddu20c1r4			-0.50*			-0.56
			(0.30)			(0.41)
du20c1r4			0.51			3.55**
			(2.21)			(1.59)
camer4			-0.62***			-0.68***
			(0.20)			(0.10)
Constant	-0.29	-0.39	-0.48	-0.64	-0.78	-0.97
	(0.69)	(0.74)	(0.82)	(0.77)	(0.94)	(1.05)
Observations	830	834	838	1435	1445	1453
N_clust	45	45	45	76	75	75
Observations with Y=1	24	22	19	40	37	34
Observations with Y=1(%)	2,89%	2,64%	2,27%	2,79%	2,56%	2,34%
$\chi 2$ statistic for $\beta_t+\beta_t'=0$	7.14***	9.29***	3.16*	17.85***	14.90***	10.93***
$\chi 2$ statistic for $\beta_t'=0$ and $\alpha_t'=0$	7.03**	14.34***	11.67***	11.25***	9.99***	7.56**
chi2	36.6	38.2	26.3	96.9	102	124
r2_p	0.29	0.27	0.28	0.35	0.38	0.38

Model Specification : $\text{Prob}\{Y_i = 1\} = \Phi(\alpha + \beta_t \text{ddr}_t + \beta_t' \text{dddu20c1r}_t + \alpha_t' \text{du20c1r}_t + \gamma_t \text{camer}_t)$

where r_t (t= 1, …, 8) indicates the number of lags in quarter and $\text{dddu10c1r}_t = \text{ddr}_t \times \text{du10c1r}_t$

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7

COEFFICIENT	(1) fragile2_c	(2) fragile2_c	(3) fragile2_c	(1') fragile2_cd	(2') fragile2_cd	(3') fragile2_cd
ddr2	-0.18			-0.28**		
	(0.17)			(0.14)		
dddduminorityblockpremier10r2	-0.53			-0.33		
	(0.37)			(0.25)		
duminorityblockpremier10r2	1.05			1.31		
	(1.21)			(1.00)		
camer2	-0.53***			-0.55***		
	(0.15)			(0.08)		
ddr3		-0.23			-0.30*	
		(0.18)			(0.18)	
dddduminorityblockpremier10r3		-0.17			-0.35	
		(0.29)			(0.30)	
duminorityblockpremier10r3		0.19			1.36	
		(1.16)			(1.15)	
camer3		-0.52***			-0.59***	
		(0.17)			(0.09)	
ddr4			-0.24			-0.28
			(0.20)			(0.21)
dddduminorityblockpremier10r4			0.17			-0.27
			(0.29)			(0.27)
duminorityblockpremier10r4			-0.57			1.19
			(1.54)			(1.17)
camer4			-0.58***			-0.63***
			(0.18)			(0.10)
Constant	-0.16	-0.13	-0.18	-0.20	-0.08	-0.14
	(0.77)	(0.89)	(1.08)	(0.78)	(0.87)	(0.94)
Observations	830	834	838	1435	1445	1453
N_clust	45	45	45	76	75	75
Observations with Y=1	24	22	19	40	37	34
Observations with Y=1 (%)	2,89%	2,64%	2,27%	2,79%	2,56%	2,34%
$\chi 2$ statistic for $\beta_t+\beta_t'=0$	3.58*	2.13	0.11	7.03***	6.34**	9.53***
$\chi 2$ statistic for $\beta_t'=0$ and $\alpha_t'=0$	2.31	0.50	0.34	1.94	1.51	1.12
chi2	30.7	30.4	27.1	63.8	56.1	63.3
r2_p	0.28	0.26	0.26	0.28	0.30	0.31

Model Specification : $\text{Prob}\{Y_i = 1\} = \Phi(\alpha + \beta_t \text{ddr}_t + \beta_t' \text{dddduminorityblokpremier10r}_t + \alpha_t' \text{duminorityblokpremier10r}_t + \gamma_t \text{camer}_t)$

where r_t (t= 1, …, 8) indicates the number of lags in quarter and $\text{dddduminorityblockpremier10r}_t = \text{ddr}_t \times \text{duminorityblockpremier10r}_t$

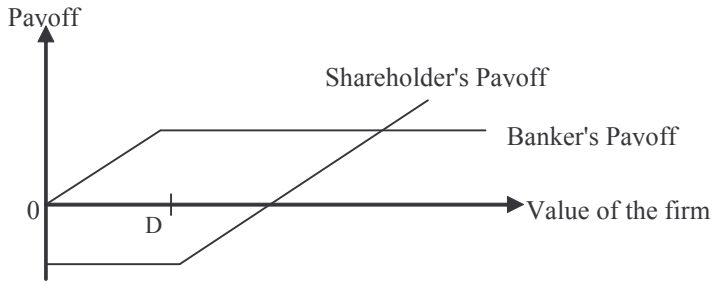
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix B[12] : Merton's structural model of credit risk (1974)

We follow Merton's approach ("On the Pricing of Corporate Debt: The Risk Structure of Interest Rates", 1974) by using an option-based structural model of credit risk. In this framework, the firm goes bankruptcy whenever the value of its assets falls below the face value of its debt at maturity. A measure of the creditworthiness of the firms is then given by the distance-to-default indicator, which represents the number of standard deviations (measured in terms of the assets' volatility) that separate the firm from its default point (defined by Total Assets = Total Debt). The smaller the distance-to-default, the higher the default risk.

However, the value of the firm's assets, as well as their volatility, are not observable. Since we have access to the price of equity, we can use the option-pricing formula derived by Black and Scholes (1973) to calculate these unknown values. Indeed, Merton (1974) shows that a firm's equity value is equivalent to an European call option on the asset value of the firm with strike price equal to the face value of debt under the assumptions of risk-neutrality[13].



As usual, we assume that the asset value of the firm, V_A, follows a Geometric Brownian Motion with drift equal to the risk-free rate, r, and volatility σ_A . The value of equity as an option on the firm's assets, as well as its volatility, are given by two formulae derived from the standard option pricing approach and depends on V_A, σ_A, r, D and T, the time to maturity.

$$V_E = V_A \cdot N(d_1) - D \cdot e^{-rT} N(d_2) \qquad \text{(Price of the option)}$$

$$\sigma_E = \frac{V_A}{V_E} \cdot N(d_1) \cdot \sigma_A \qquad \text{(Delta formula[14])}$$

Where N(d) is the cumulative distribution function for the standard normal distribution and $N(d_2)$ represents the probability that the debt D will be paid at maturity.

$$d_1 = \frac{\left[\ln(d) + (\mu + \sigma_A^2 / 2))T\right]}{\sigma_A \sqrt{T}} \qquad \text{and} \qquad d_2 = d_1 - \sigma_A \sqrt{T}$$

Reverse-engineering of these two equations yields the asset value and the asset volatility. Finally, the distance-to-default is given by : $DD = \frac{V_A - D}{\sigma_A}$

To compute the distance-to-default indicator on a monthly basis, we need the following inputs: the total market capitalization, the level and maturity of the debt, the volatility of stock prices.

The market capitalization (€m) is extracted from Datastream. The definition of the debt we use is the KMV standard given by the sum of the short-term debt and the half of the long-term debt. Finally, the historical volatility of the stock at the date t is defined as the moving average of the daily returns on the stock. The only parameter of choice is the width of the moving average window, traditionally ranging from 1 to 12 months. We have tested several width of this window because they influence the evolution of the volatility and the DD (see Brossard, Ducrozet & Roche, 2007). We also tried alternative specifications of the debt (Total Debt, interpolated or not), but this had no significant effect on the values of the DD.

We finally chose to set the window width to 6 months, as Gropp, Vesala and Vulpes (2005) did, because this is a good compromise between volatility smoothing and reactivity of the final DD indicator. We do not interpolate the value of the debt because it would imply the use of future information (the future value of the debt) as an input to predict current rating changes (see Distinguin, Rous and Tarazi, 2005).

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[12] This Appendix has been redacted by F. Ducrozet and A. Roche (See Brossard, Ducrozet and Roche 2007).

[13] The risk neutral framework simplifies calculations since we do not need to estimate the drift of the asset value.

[14] Itô's Lemma implies $\sigma_E V_E = \frac{\partial V_E}{\partial V_A} \sigma_A V_A$. Besides, $\frac{\partial V_E}{\partial V_A} = N(d_1)$.