

Market discipline and banking supervision: the role of subordinated debt

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Abstract: One of the aims of mandatory subordinated debt is to enhance both direct and indirect market discipline. Indeed, on the one hand, holding subordinated debt can affect banks' behaviour by changing their funding cost and, on the other hand, the rate of return of subordinated debt can be used by supervisors as a signal of their riskiness. In this paper, we analyse how mandatory subordinated debt may affect both bank riskiness and the effectiveness of bank supervision. We take into account the ability and incentives of subordinated debt holders to exert market discipline. We show that requiring banks to hold subordinated debt should reduce bank risk *via* direct market discipline. To do so, two criteria must be fulfilled: subordinated debt holders should have access to sufficient information about bank riskiness, but they should not benefit from any kind of insurance. If these criteria are not fulfilled, direct discipline can have perverse effects. We also show that the use of market information by supervisors can, in some cases, counteract these perverse effects or complete the beneficial effects of direct market discipline.

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1. Introduction

One of the aims of banking supervision is to detect bank financial distress early in order to avoid failure or to limit its cost. Supervisory risk assessment is mainly based on two procedures: off-site and on-site examinations. During on-site examinations, supervisors make an overall assessment of a banking institution *in-situ*, which allows obtaining private information. They can check that the accounts of a bank provide a true and fair view of the bank's financial condition. This assessment is based on quantitative factors such as accounting data and on qualitative ones like management capabilities and internal control procedures. It leads to the assignment of supervisory ratings (like CAMELS¹) and, if necessary, to the implementation of prompt corrective actions.

However, supervisory resources are limited, and on-site exams, which are the most efficient exams, are very costly. Thus, they are conducted only once a year except if problems are detected (Cole and Gunther, 1998). Between two on-site exams, supervisors lead off-site exams, which rely exclusively on accounting data provided by banks on a quarterly basis. They enable supervisors to detect risky banks from quantitative data and to decide whether an early on-site exam must be conducted. However, accounting data are available only on an annual or quarterly basis; and, between two on-site exams, their information content can decay fairly quickly (Gunther and Moore, 2003). Berger, Davies, and Flannery [2000] show that the assessments of banks' financial conditions by supervisors are less accurate than the market assessments except if supervisory assessments follow immediately an on-site exam; in this case supervisory assessment is more accurate because they gain access to private information but it gets "stale" quite quickly. Between two on-site exams, the use of market information may improve supervisory risk assessment.

Indeed, market discipline can be exerted by market participants if they have sufficient information and if they have the incentives and ability to assess bank risk. BGFRS² [1999] distinguishes two components in market discipline: direct and indirect market discipline. Direct market discipline means that market participants can directly influence banks' behaviour: uninsured debtholders are at risk, and as they bear losses in case of bank failure they require a rate of return that increases with the risk they perceive. If they correctly assess banks' risk, the increase in the bank's funding cost following an increase in risk should restrain banks' excessive risk taking. Indirect market discipline generates a signal about banks' risk that can be used by supervisors for banking supervision in order to better allocate supervisory resources.

¹ Capital, Asset Quality, Management, Earnings, Liquidity, and Sensitivity.

² Board Of Governors Of The Federal Reserve System (BGFRS)

In the field of market discipline, a large part is dedicated to mandatory subordinated debt proposals. Several researchers suggest that banks should hold a portion of their liabilities in the form of subordinated debt (see BGFRS, 2000, Calomiris, 1999, Evanoff and Wall, 2000, and Lang and Robertson, 2002). Indeed, subordinated debt holders and supervisors are both concerned about bank risk. If a bank fails and if its assets value is less than its liabilities, depositors and senior debtholders are compensated first. Then, subordinated debt holders, who are junior claimholders, share the residual value. If a bank is at risk, subordinated debt holders bear a considerable risk because of their junior status. The aim of subordinated debt proposals is to enhance both direct and indirect market discipline: direct market discipline is exercised *via* the funding cost of banks, which depends on bank risk; and indirect market discipline is possible if supervisors use subordinated debt rate of return as a signal about bank risk. Thus, market discipline may improve the efficiency of banking supervision and decrease its cost.

Several empirical studies show that subordinated debt spreads reflect bank risk correctly (Hancock and Kwast, 2001, Morgan and Stiroh, 2001, and Sironi, 2003). Thus, subordinated debt holders seem able to correctly assess bank risk. However, the evidence of their influence on banks' behaviour are weak (Bliss and Flannery, 2002, Flannery, 2001). Other studies have considered the consequences of mandatory subordinated debt from a theoretical point of view. Blum [2002] focuses on direct discipline. He considers that subordinated debt holders can perfectly assess bank risk; he shows that the ability of the bank to commit to a level of risk impacts the effectiveness of market discipline. Levonian [2001] considers both direct and indirect market discipline. Like Blum [2002], he assumes that subordinated debt holders can perfectly assess bank risk and incorporate it into the rate of return they require. He shows that, if subordinated debt replaces insured deposits, it can limit the bank's excessive risk taking due to its limited liability and to deposit insurance. Indirect market discipline corresponds to the fact that supervisors can infer the market value of assets and its volatility from the price of subordinated debt. Rochet [2004] studies how the three pillars of Basel II can complete each other. He demonstrates that, under some restrictions, mandatory subordinated debt can allow regulators to decrease capital requirements and it can also allow a better allocation of supervisory resources.

In all these studies, market agents are supposed to know exactly the risk of the bank and to incorporate it into the rate of return they require; they are supposed to have the ability and incentives to assess bank risk. However, these ability and incentives can be affected by the specificities of banking activity. For example, if subordinated debt holders are not able to assess

bank risk accurately because of a lack of information or opacity³, this risk can not be correctly reflected in the rate of return they require. Similarly, if they perceive the possibility of a bail out in the event of bank defaults, they do not feel at risk: they have no incentives to ask for a rate of return dependent on bank risk. And, the fact that subordinated debt holders have only weak incentives to discipline banks or that they are unable to assess bank risk should have consequences on banks' behaviour and on the effectiveness of banking supervision if supervisors use the rate of return of subordinated debt as a signal about bank riskiness.

Thus, the aim of this theoretical paper is to determine how, between two on-site exams, mandatory subordinated debt can affect banks' behaviour and the effectiveness of banking supervision. More specifically, we study under what conditions market discipline can complete banking supervision and lead to a better control of bank risk. We analyse the direct influence of subordinated debt on bank risk *via* funding cost. An indirect influence is also taken into account, supposing that supervisors use subordinated debt rate of return as a signal about bank risk. Indeed, between two on-site exams, supervisors watch banks; and if a bank is viewed as particularly risky, they may decide to inspect it earlier and to implement corrective actions. As supervisors cannot perfectly assess bank risk, the use of market assessments may allow a better allocation of supervisory resources. However, the behaviour of subordinated debt holders and so the effectiveness of market discipline may be affected by the information they hold, their ability to use it, and their perception of a possible bail out in the event of bank failure. Thus, to analyse the consequences of mandatory subordinated debt, we take into account the ability and incentives of subordinated debt holders to assess bank risk. We aim to determine what conditions are needed for market discipline to be effective and how indirect discipline can complete direct discipline. We also determine what mandatory subordinated debt would imply if market agents can not correctly assess bank risk or lack incentives to do it. The relevance of this question can not be overstated. Indeed, in the light of the sub-prime crisis, the credibility of the limitation of insurance to the sole insured depositors can be questioned. Given the increasing complexity of banks' activities, we can also cast doubt upon the ability of market agents to perfectly assess bank risk. As mandatory subordinated debt is often viewed as a way to complete the current regulation, it is important to analyse, in this context, its consequences.

³ Morgan [2002] shows that banks are opaque institutions.

The paper is organized as follows: Section 2 presents the general framework of the model; we explain banks' excessive risk-taking incentives and how we take into account banking supervision. In section 3, we introduce market discipline by requiring banks to hold a certain portion of their liabilities in the form of subordinated debt. We analyse the effects depending on the ability and incentives of subordinated debt holders to exert a discipline. Two cases are considered: i) subordinated debt holders cannot perfectly assess bank risk; ii) the perception of a possible bail out in the event of bank failure affects their incentives to restrain banks' excessive risk taking. We analyse the effectiveness of both direct and indirect market discipline and we study how indirect discipline can complete direct discipline. Finally, section 4 concludes.

2. General framework

We consider a one-period model. A risk neutral bank is funded by debt that consists of fully insured deposits or, when we consider mandatory subordinated debt, of both insured deposits and subordinated debt. We assume that the insurance premium cannot be made contingent on bank risk, and for simplicity it is set equal to zero. Depositors are fully insured, and they earn the risk free rate of return (R_f) on their deposits even if the bank fails.

As our aim is to study the link between banking supervision and market discipline (pillars 2 and 3 of Basel II) taking into account the conditions of effectiveness of market discipline, to simplify, we do not consider capital constraint. Besides, we suppose that the level of equity is satisfactory⁴ and, to simplify, equity is normalized to zero. We know that the rate of return of subordinated debt should depend on the capital cushion held by the bank which influences its default probability. In this model, this rate of return does depend on the default probability. This default probability is a function of the monitoring exerted by the bank and of an exogenous parameter, ρ , which implicitly accounts for bank's assets risk and capital cushion, both fixed and exogenous in our model. Total assets are normalized to 1.

The bank invests in a portfolio with a two-point distribution of the rate of return as in Gropp and Vesala [2004]: $R = R_H$ with probability $1 - \rho(1 - m)$ denoted π_S (survival probability) and $R =$

⁴ We do not consider the case where the bank is near insolvency. Indeed, in that case, subordinated debt holders and shareholders share the same incentives. They both accept a higher risk taking (Black and Cox, 1976, Gorton and Santomero, 1990). In this model, the effects of a change in the level of equity on the incentives of market participants are not taken into account.

$R_L = 0$ with probability $\rho(1-m)$ denoted $(1-\pi_S)$. Thus, R_H and R_L are respectively the return obtained in the event of survival or default.

m represents the bank's choice of monitoring effort ($m \in [0,1]$). Monitoring increases the probability that R_H is obtained, but it is costly. We assume a strictly positive and convex monitoring cost schedule $C(m)$ ($C'(m) > 0$, $C''(m) > 0$ and $C(0) = 0$).

ρ is the probability of default in the absence of monitoring ($\rho \in [0,1]$).

Thus, bank risk, taken into account *via* the probability of default, depends on two components: i) the effort of monitoring chosen, m , which is non observable; ii) the probability of default in absence of monitoring, ρ , which can be interpreted as the observable part (without cost) of the bank's asset risk. As ρ is exogenous, when the bank chooses its level of monitoring m (the choice variable in this model), it also determines its risk of default. Thus, we will consider that an increase in monitoring is identical to a decrease in bank risk of default.

We can show that, if the debt is fully insured, the bank chooses an excessive level of risk (i.e., a low level of monitoring) because the expected cost of its liabilities ($\pi_S R_f$) is a decreasing function of default risk (an increasing function of monitoring⁵). Indeed, due to its limited liability, it does not take into account the cost of the debt in the event of default and, as depositors are fully insured, they have no incentives to monitor the bank and to penalize excessive risk taking. This excessive risk taking has been emphasized in several models (Blum [2002] and Levonian [2001]). From a social point of view, the level of monitoring should be higher because the cost of liabilities in the event of default has to be taken into account in the optimization problem. Thus, the expected cost of debt⁶ does not depend on the level of monitoring, m , and is equal to R_f .

In this model, we introduce banking supervision in order to control the risk taken by the bank. We suppose that, between two on-site exams, supervisors classify banks into two groups depending on their estimated risk of default. They decide to inspect a bank early if its probability of default is greater than a threshold that they fix. However, between two on-site exams, the risk of the bank is not fully observable. To assess it, supervisors use statistical models relying on accounting information,⁷ which is essentially backward looking. Thus it does not reflect perfectly the current

$${}^5 \left(\pi_S R_f \right)'_m = \left((1 - \rho(1 - m)) R_f \right)'_m = \rho R_f$$

$${}^6 \pi_S R_f + (1 - \pi_S) R_f = R_f$$

⁷ These statistical models are used to anticipate financial distress (prediction of bank failures or downgradings) and correspond for example to the American systems SEER (System for Estimating Examination Ratings) and SCOR (Statistical CAMELS Offsite Rating) or to the French system SAABA (Support System for Banking Analysis).

situation of the bank. Besides, these statistical models are rigid, and they cannot be adjusted as frequently as necessary. Therefore, supervisors assess imperfectly the risk taken by the bank. To take into account this imperfection, we suppose that supervisors know the observable asset risk, ρ , but not the level of monitoring chosen by the bank. As a consequence, supervisory resources are not optimally allocated because of classification errors, which imply that particularly risky banks may not be inspected whereas safe banks may be subjected to inspection. At the bank level, the probability of being inspected does not depend on the true level of monitoring but on the level assessed by supervisors. However, we suppose that after an inspection, supervisors are fully informed about the situation of the bank and they can impose corrective actions such as to limit the risk taken by the bank. These measures depend on the situation of the bank: only a few changes are required if the financial situation of the bank is correct, but supervisors are much more demanding if the bank is damaged. Corrective actions implemented after an on-site exam can be recommendations on decisions to take to improve the quality of management or the financial situation, or some restrictions into banks' activities. Supervisors can also enforce sanctions in the form of financial fines, official warnings, or in extreme cases accreditation withdrawals.

In this model, we take into account corrective actions *via* a cost CC borne by the bank as soon as it is inspected. This cost is defined such that it eliminates excessive risk-taking incentives from a social point of view: if a bank is inspected it chooses the optimal level of monitoring. Thus, the expected cost of liabilities and corrective actions is set independent of risk⁸:

$$(1) \pi_s R_f + CC = R_f$$

That is:

$$(2) CC = (1 - \pi_s) R_f$$

The cost of corrective actions borne by an inspected bank is a decreasing function of the level of monitoring exerted by the bank. It is a function of the level of monitoring because it is determined after the inspection when supervisors have all the information necessary to correctly

Recently, some systems have included market information in addition to accounting information. The central bank of Sweden uses equity market information *via* indicators such as the variation of the “distance to default” or the EDF (Expected Default Frequency) (Persson and Blavarg, 2003).

⁸ Indeed, as shown previously, the excessive risk taking in the absence of supervision is due to the fact that the expected cost of debt is a decreasing (increasing) function of risk (monitoring).

assess the risk of the bank. Thus, the existence of these measures encourages the bank to restrict its risk.

The bank maximizes its expected value taking into account the possibility of being inspected and of bearing corrective actions:

$$(3) \max_m V = \pi_s(R_H - R_f) - qCC - C(m)$$

with $CC = (1 - \pi_s)R_f$

with q the inspection probability which is independent of the true level of monitoring as it is unknown before the inspection.

Incorporating CC into the objective function, the problem of the bank is:

$$(4) \max_m V = \pi_s R_H - R_f + (1 - q)(1 - \pi_s)R_f - C(m)$$

The term $(1 - \pi_s)R_f$ corresponds to the saving made by the bank on its payment to depositors in case it defaults because of its limited liability. However, this saving is possible only if the bank is not inspected that is with a probability $1 - q$.

The expected value of the bank is maximized when:

$$(5) \rho(R_H - (1 - q)R_f) = C'_m$$

Thus, the probability of being inspected encourages the bank to choose a level of monitoring (m^{INSP}) greater than the one chosen without supervision (m^B)⁹ because the expected saving on the cost of liabilities in case of default, which encourages a reduction in monitoring, exists only if the bank is not inspected. If all banks were inspected with certainty ($q=1$), the optimal level of monitoring from a social point of view (m^S)¹⁰ would be reached. However, as supervisors have only limited resources, they do not inspect all banks; and, as they have only imperfect information about banks' risk, they cannot discriminate between banks to inspect according to their risk.

⁹ Without supervision the expected value of the bank is maximized when $\rho(R_H - R_f) = C'_m$

¹⁰ From a social perspective, the optimum is obtained when $\rho R_H = C'_m$

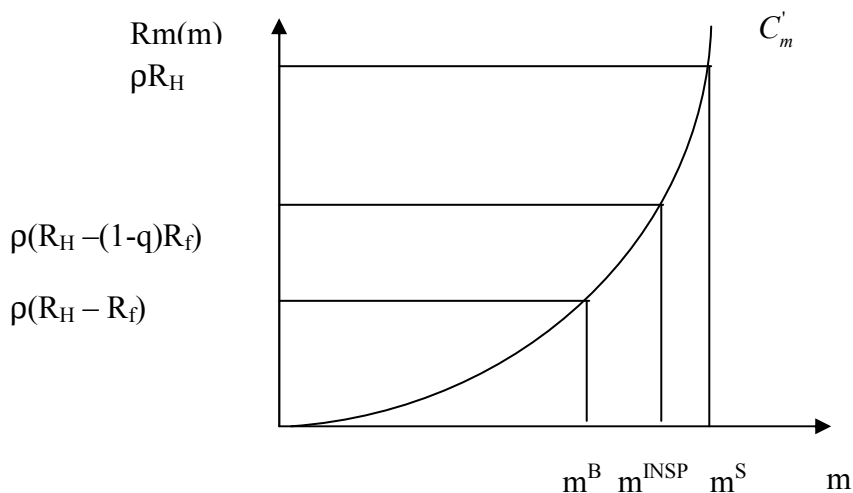


Figure 1: Level of monitoring in different cases: socially optimal level (m^S), monitoring chosen by the bank with (m^{INSp}) and without supervision (m^B)

Between two on-site exams, supervision implies a reduction in bank's excessive risk. However, as supervisors have only limited resources and imperfect information about the risk of default of the bank, the allocation of supervisory resources is not optimal, the probability of an inspection is independent of the actual monitoring, and the socially optimal level of monitoring is not always reached.

In order to improve excessive risk-taking limitation, the use of market discipline can be considered *via*, for example, mandatory subordinated debt, which implies that banks have to hold a certain portion of their liabilities in the form of subordinated debt. The effectiveness of bank supervision may be improved thanks to direct and indirect market discipline induced by these liabilities. Indeed, as their rate of return depends on bank's risk of default, it should affect bank's behaviour and could be used by supervisors as a signal about a bank's risk.¹¹

The improvement of the effectiveness of banking supervision is possible if the market can assess the bank's situation and help in identifying or controlling its risk exposure. Indeed, if supervisors benefit from private information thanks to on-site exams, this information is updated at a lower frequency than market information, which is available on a daily basis. Besides, because banks' financial assessment models on which supervisors rely are rigid, they cannot adjust continuously in contrast to market information. Requiring banks to hold a certain portion of their liabilities in subordinated debt may allow a better control of bank risk. However, depending on the

¹¹ See Board Of Governors Of The Federal Reserve System (BGFRS) [1999].

ability and incentives of subordinated debt holders to exert market discipline, a bank's risk taking and the effectiveness of banking supervision can be modified quite differently.

3. Market discipline: conditions of effectiveness

Until this section, we have considered a bank as fully funded by deposits. Depositors are fully insured and thus indifferent to the default risk of the bank. Yet, other actors can exist: subordinated debt holders. They are concerned about bank's risk of default because, as they are not insured, they are not compensated in the event that the bank defaults.

We assume that the bank has to hold a portion, $u \in [0,1]$, of its liabilities in the form of subordinated debt. The bank's liabilities are subdivided into two parts: insured deposits in proportion $(1-u)$ and subordinated debt in proportion u , with u exogenous.

The bank's behaviour is affected by the presence of subordinated debt because market discipline can be exerted by its holders. This discipline is exerted *via* two channels: a direct channel, which corresponds to the direct influence of the market on bank's behaviour; and an indirect channel corresponding to the fact that supervisors use the assessment of bank's risk made by the market¹².

Blum [2002] shows that the level of risk chosen by the bank corresponds to the socially optimal one if subordinated debt holders can perfectly observe the bank's risk, if the debt is fully uninsured, if there is no bankruptcy cost not borne by the bank¹³ and if the bank can commit to a level of risk. When only a portion of debt is uninsured, the presence of resources with a cost depending on the bank's risk enables the outcome to get closer to the socially optimal solution.

In this model, in addition to this direct market discipline considered in Blum [2002], we take into account an indirect market discipline: supervisors use market information to assess the bank's risk of default and to decide to conduct early on-site inspections. This indirect market discipline is

¹² We focus on the information content of the rate of return of subordinated debt. However, if the bank's equity is traded, it is possible to extract information from equity prices. The relative quality of these two sources of information is not discussed here. See Berger, Davies, and Flannery [2000], and Gropp, Vesala, and Vulpes [2006].

¹³ If there are social costs due to bank's failure, they are not taken into account by the market, which only considers private costs. Thus, the socially optimal level of risk can not be reached.

pertinent, even if subordinated debt holders are fully informed about bank's risk, once a portion of debt is insured because the bank's risk remains greater than the socially optimal level. Indeed, as underlined by Levonian [2001], "the subordinated debt market does "punish" shareholders for shifting risk to debt holders, which is the essence of market discipline. But because subordinated debt is just that – subordinate, and therefore junior to deposits – the subordinated debt holders in effect "give credit" to shareholders for the portion of risk shifted past them to the senior claimant (or any deposit guarantor)". Market discipline is exerted only for the portion of debt that is uninsured. Once a portion of debt is insured, the bank has incentives to take excessive risk.

We also consider the conditions of effectiveness of market discipline. Indeed, it is likely that the assessment of the bank's risk by subordinated debt holders is not perfect. And, market discipline is effective only if debt holders have the abilities and incentives to exert it. The ability of market participants to assess the bank's risk depends on the information that they hold and on their ability to analyze it; their incentives depend on the credibility of a non bailout in the event of the bank's default. Thus, we consider the consequences of mandatory subordinated debt in different contexts. We first consider that subordinated debt holders cannot perfectly assess bank's risk. Then, we consider that subordinated debt holders can perfectly assess bank's risk but perceive the possibility of a bailout in the event of the bank's default. Indeed, if mandatory subordinated debt is implemented, it is important to determine in what cases it really allows a better control of bank risk.

3.1. *Imperfect assessment of the bank's risk by subordinated debt holders*

In a first case, we assume that subordinated debt holders assess only imperfectly the risk of the bank. They can correctly assess the level of monitoring of the bank and adjust the rate of return that they ask for with a probability $\alpha \in [0; 1]$.¹⁴ With probability $(1-\alpha)$, they cannot correctly assess monitoring. The parameter α reflects the information held by the market and its ability and rapidity to analyze it, to extract the actual risk from it, and to incorporate it into the rate of return that they require.

¹⁴ This notion of partial observability is used by Boot and Schmeits [2000].

We suppose that subordinated debt holders accept an expected rate of return equal to the risk free rate of return.¹⁵

If $\alpha = 1$, market discipline is perfect, and the rate of return required by subordinated debt holders perfectly reflects bank's risk of default:

$$(6) R_u^I = \frac{R_f}{\pi_s}$$

If $\alpha = 0$, they cannot correctly estimate the level of monitoring chosen by the bank. The rate of return of subordinated debt is independent of m but depends on the observable risk (ρ) and on an average level of monitoring, \tilde{m} , depending on past information about the whole banking sector both embedded in $\tilde{\pi}_s$:

$$(7) R_u^{NI} = \frac{R_f}{\tilde{\pi}_s}$$

Between these two extremes, subordinated debt holders can partially assess actual monitoring, and the rapidity and effectiveness with which they incorporate it into the rate of return they ask for are represented by the parameter α .

Thus, the rate of return of subordinated debt is:

$$(8) R_u^{IMPINF} = \alpha \frac{R_f}{\pi_s} + (1 - \alpha) \frac{R_f}{\tilde{\pi}_s}$$

Once $\alpha \neq 1$, this rate of return reflects bank's actual risk of default only imperfectly. The error in risk assessment is higher as the ability of subordinated debt holders to correctly assess bank's risk and to incorporate it into the rate of return they ask for is lower (i.e., α low).

We aim to determine the consequences of the imperfect assessment of bank's risk by the market on the bank's behaviour and on the effectiveness of supervision. First, we only consider direct market discipline: the bank has to hold a portion u of its liabilities in the form of subordinated debt, but the probability of an inspection is independent of the subordinated debt rate of return. Then, we add indirect market discipline by supposing that supervisors use market information to classify banks.

¹⁵ This hypothesis, used by Calm and Rob [1999] and Blum [2002], implies that subordinated debt holders are risk neutral. If we consider that they are risk averse, it implies that they ask for a risk premium. In this case, the expected rate of return is equal to the risk free rate plus this premium. In this model, it would modify the equilibrium value of the level of monitoring without changing our conclusions.

3.1.1. Direct market discipline

We wonder how mandatory subordinated debt affects bank's behaviour and how the imperfection of bank's risk assessment by the market can modify the risk taken by the bank.

The maximisation problem of the bank when it has to hold a portion u of subordinated debt becomes:

$$(9) \max_m V = \pi_s \left(R_H - (1-u)R_f - uR_u^{IMPINF} \right) - qCC^{IMPINF} - C(m)$$

$$\text{with: } R_u^{IMPINF} = \alpha \frac{R_f}{\pi_s} + (1-\alpha) \frac{R_f}{\tilde{\pi}_s} = \alpha R_u^I + (1-\alpha)R_u^{NI}$$

The bank is inspected with probability q and is subject to corrective actions. We consider that these measures are such that they remove excessive risk taking. This is taken into account *via* the cost CC^{IMPINF} . Without these measures, the expected cost of debt is $u\alpha R_f + (1-\pi_s)[(1-u)R_f + u(1-\alpha)R_u^{NI}]$ and is increasing with monitoring. The cost implied by corrective actions is fixed so that the expected cost of debt and corrective actions becomes independent of monitoring:

$$(10) \pi_s \left[(1-u)R_f + u(1-\alpha)R_u^{NI} \right] + CC^{IMPINF} = (1-u)R_f + u(1-\alpha)R_u^{NI}$$

That is :

$$(11) CC^{IMPINF} = (1-\pi_s)((1-u)R_f + u(1-\alpha)R_u^{NI})$$

The problem can be rewritten:

$$(12) \max_m V = \pi_s R_H - (1-u + u\alpha)R_f - u(1-\alpha)R_u^{NI} + (1-q)(1-\pi_s)((1-u)R_f + u(1-\alpha)R_u^{NI}) - C(m)$$

Excessive risk taking incentives still exist with probability $(1-q)$ for the portion of debt that is insured $(1-u)$ and the portion $(1-\alpha)$ of the uninsured debt.

The expected value of the bank is maximized when:

$$(13) \rho \left[R_H - (1-q) \left((1-u)R_f + u(1-\alpha)R_u^{NI} \right) \right] = C'_m$$

By comparing (5) and (13), we can notice that the presence of subordinated debt leads to a greater level of monitoring and so a lower default probability only if:

$$(14) \alpha > 1 - \frac{R_f}{R_u^{NI}}$$

Subordinated debt holders must have access to valuable and adequate information, and they must have the ability to assess correctly the bank's risk of default and to incorporate it into the rate of return they require. It means, here, that α must be sufficiently high. If this is not the case, the bank's risk of default is increased in the presence of subordinated debt. The presence of subordinated debt modifies bank's choice of monitoring. Indeed, with probability α , the rate of return correctly incorporates the bank's risk of default; the bank has no incentives to increase its risk because it is fully reflected in subordinated debt rate of return. By contrast, with probability $(1-\alpha)$, the rate of return is independent of the bank's risk and is greater than the risk free rate. Thus, by decreasing its monitoring, the bank increases its default probability and so decreases the probability of having to pay this higher rate.

Depending on the information held by subordinated debt holders and their ability to use it, the presence of subordinated debt contributes either to limit bank's risk of default or to increase it. The presence of subordinated debt is more likely to lead to a decrease in risk as the ability of its holders to correctly assess bank risk (α) is higher and the rate of return required in the absence of information about the monitoring chosen by the bank (R_u^{NI}) is lower. Thus, a bank forced to hold subordinated debt but that can not efficiently communicate about its situation, that can not provide good quality information, can adopt a riskier behaviour. This can be considered in the case of small banks that do not have the resources necessary for an efficient communication or in the case of banks largely involved in traditional intermediation activities which generate opacity (Diamond, 1984). Increased diversity of non-interest income activities can also generate opacity (Elyasiani and Wang, 2008).

3.1.2. Use of market information by supervisors

We now consider the effects of indirect market discipline in addition to the direct consequences of the presence of subordinated debt on the bank's behaviour. We assume that the probability of an inspection depends on the rate of return of subordinated debt. Supervisors use the market assessment about the bank's risk of default to classify banks and to decide whether to inspect a bank early. They infer the probability of default of the bank estimated by the market from the rate of return on subordinated debt and they decide to inspect a bank early if its probability is greater than the threshold that they fixed. Thus, the probability for a bank of being inspected is now

a function of its monitoring. Indeed, we suppose that, between two on-site exams, the assessment of the bank's risk by the market is better than the supervisors' assessment. This hypothesis, empirically checked by Berger, Davies and Flannery [2000], is justified by the fact that the market's assessment is more forward looking and more frequent, and methods used can adjust continuously, contrary to the fixed methods used by supervisors.

The cost of supervision errors borne when supervisors use market information is lower than the one obtained using only the information held by supervisors. The reason is that, with probability $(1-\alpha)$, like supervisors, subordinated debt holders do not know the actual monitoring of the bank but, with a probability α , they can perfectly assess it. The use of market information, even if it is imperfect, by limiting bank's risk assessment errors, enables a better allocation of supervisory resources and limits the cost of errors. The use of this information is more beneficial as the ability of the market to correctly assess bank's risk of default (α) is higher.

The behaviour of the bank is also affected by indirect discipline; its problem becomes¹⁶:

$$(15) \max_m V = \pi_s (R_H - (1-u)R_f - uR_u^{IMPINF}) - q^u CC^{IMPINF} - C(m)$$

$$\text{with: } R_u^{IMPINF} = \alpha \frac{R_f}{\pi_s} + (1-\alpha) R_u^{NI}$$

$$CC^{IMPINF} = (1-\pi_s)((1-u)R_f + u(1-\alpha)R_u^{NI})$$

$$q^u = q^u(R_u^{IMPINF}) \text{ and } q^u(R_u^{IMPINF}) > 0$$

The probability of being inspected (q) is an increasing function of the subordinated debt rate of return, which is a decreasing function of bank monitoring.

The problem can be rewritten:

$$(16) \max_m V = \pi_s R_H - (1-u + u\alpha)R_f - u(1-\alpha)R_u^{NI} + (1-q^u)(1-\pi_s)((1-u)R_f + u(1-\alpha)R_u^{NI}) - C(m)$$

¹⁶ We do not take into account the influence of an *on-site* exam on the behavior of subordinated debt holders. However, it could be the case that the rate of return required by subordinated debt holders depends on the possible intervention of supervisors, the latest using this rate of return as a signal about bank risk (see Bond, Goldstein, and Prescott, 2007, and Birchler and Facchinetti, 2007).

The expected value of the bank is maximized when:

$$(17) \rho \left[R_H - (1 - q^u + q_m^{u'}(1 - m)) \left((1 - u)R_f + u(1 - \alpha)R_u^{NI} \right) \right] = C_m'$$

By using market information, supervisors make the probability of an inspection a function of the bank's actual monitoring. Thus, comparing to the previous situation where supervisors do not use market information, the bank can influence its probability of being inspected: that probability diminishes when the bank increases its monitoring. This is reflected into the marginal return of monitoring.

Using indirect discipline, in addition to direct discipline, leads to a lower risk level if:

$$(18) \rho \left[R_H - (1 - q^u + q_m^{u'}(1 - m)) \left((1 - u)R_f + u(1 - \alpha)R_u^{NI} \right) \right] > \rho \left[R_H - (1 - q) \left((1 - u)R_f + u(1 - \alpha)R_u^{NI} \right) \right]$$

That is if:

$$(19) -q_m^{u'} > \left(\frac{q - q^u}{(1 - m)} = \phi \right)$$

Indirect market discipline leads the bank to choose a higher level of monitoring only if the probability of an inspection, q^u , is sufficiently sensible to the level of monitoring chosen by the bank. This situation is more likely as the probability of an inspection without indirect discipline (q) is lower. And, this is always the case when the probability of an inspection is higher when supervisors use market information ($q^u > q$). Thus, the use of market information is interesting when the risk assessed by supervisors without market information is under-estimated.

Table 1 summarized the effects of direct and indirect discipline on the level of monitoring chosen by the bank. Direct discipline can have pernicious effects; it can lead to a higher risk taking if subordinated debt holders can not assess bank risk with a sufficient accuracy. Indirect market discipline can complete the beneficial effects of direct discipline and, in some cases, counteract its pernicious effects.

Table 1: Direct discipline and indirect discipline: level of monitoring m , ability α of agents to assess bank risk, and sensitivity q_m^u of the probability of an inspection to the monitoring exerted by the bank.

m^{IMPINF} monitoring chosen by the bank with subordinated debt, when agents can not perfectly assess bank risk and when there is no indirect discipline.

$m^{IMPINF,DI}$ monitoring chosen by the bank with subordinated debt, when agents can not perfectly assess bank risk and when there is indirect discipline that is when supervisors use market signal.

m^{INSP} monitoring chosen by the bank without subordinated debt (there is only banking supervision).

θ the threshold for $-q_m^u$ such that the monitoring chosen by the bank without subordinated debt is equal to the monitoring chosen with subordinated debt and indirect discipline.

In bold, the cases where imposing banks to hold subordinated debt leads to a lower risk taking compared with the reference case where there is banking supervision but no subordinated debt.

		DIRECT DISCIPLINE	
		BENEFICIAL if $\alpha > 1 - \frac{R_f}{R_u}$	PERNICIOUS if $\alpha < 1 - \frac{R_f}{R_u}$
EFFECTS OF INDIRECT DISCIPLINE	NEUTRALISATION	$m^{IMPINF,DI} < m^{INSP} < m^{IMPINF}$ $-q_m^u < \frac{q - q^u}{1 - m}$ and $-q_m^u < \theta$	$m^{IMPINF} < m^{INSP} < m^{IMPINF,DI}$ $-q_m^u > \frac{q - q^u}{1 - m}$ and $-q_m^u > \theta$
	LIMITATION	$m^{INSP} < m^{IMPINF,DI} < m^{IMPINF}$ $\theta < -q_m^u < \frac{q - q^u}{1 - m}$	$m^{IMPINF} < m^{IMPINF,DI} < m^{INSP}$ $\frac{q - q^u}{1 - m} < -q_m^u < \theta$
	DEVELOPMENT	$m^{INSP} < m^{IMPINF} < m^{IMPINF,DI}$ $\frac{q - q^u}{1 - m} < -q_m^u$	$m^{IMPINF,DI} < m^{IMPINF} < m^{INSP}$ $-q_m^u < \frac{q - q^u}{1 - m}$

Thus, if the bank holds subordinated debt, it has incentives to increase its monitoring if subordinated debt holders can assess its risk with a sufficient accuracy. They exert a direct market discipline, which yields a decrease in the bank's default probability. By contrast, if their assessment of bank's risk is not sufficiently accurate, the presence of subordinated debt leads the bank to choose a lower level of monitoring.

Inspection of banks by supervisors yields, in all cases, a decrease in the bank's risk of default. However, as they have only limited resources, they cannot inspect all banks and, due to a lack of information, they cannot discriminate between banks according to their default probability. They make errors which are costly. If they decide to use market information that is included in the subordinated debt rate of return, supervisors can reduce their errors and allocate their resources

more efficiently. Besides, by using market information, they make the probability of inspection, *via* subordinated debt rate of return, dependent on the level of monitoring decided by the bank. Indirect market discipline induced by the use of market signal by supervisors can allow a better control of bank risk if the probability of an inspection when market information is used is sufficiently sensitive to the monitoring exerted by the bank.

3.2. *Credibility of the absence of bail out in case of bank's default*

We now consider the incentives of subordinated debt holders to exercise market discipline. We aim to determine how the bank's risk of default and the effectiveness of supervision vary depending on these incentives. We suppose that subordinated debt holders can perfectly assess the bank's risk of default; however, they perceive the possibility of receiving an indemnity in the event of the bank's default: supervisors are not credible in the limitation of insurance to depositors. The probability perceived by the market of a bailout in the event of the bank's default is $\gamma \in [0,1]$. This absence of credibility in the limitation of insurance can be considered in the case of large banks perceived by the market as too big to fail and for which a lender of last resort can intervene in case of distress. Massive government interventions in the fear of a systemic crisis, like in the sub-prime crisis, can also destroy the credibility of the no bail-out policy.

With probability γ , subordinated debt holders suppose that in the event of the bank's default they will be compensated. Besides, they ask for an expected rate of return equal to the risk free rate. Thus, the expected return of subordinated debt holders is:

$$(20) E(R_u) = \pi_s R_u^\gamma + (1 - \pi_s) \gamma R_u^\gamma$$

And, the rate of return they require is:

$$(21) R_u^\gamma = \frac{R_f}{\pi_s + (1 - \pi_s) \gamma}$$

If the perceived probability of being compensated is equal to zero, we find $R_u^\gamma = \frac{R_f}{\pi_s}$. On the other hand, if this probability is equal to one, which means that subordinated debt holders are convinced that they will be compensated if the bank defaults, the rate of return is equal to the risk free rate; there is no market discipline. The perception of a possible extension of the compensation to the

whole group of creditors diminishes the rate of return they ask for. The rate of return of subordinated debt reflects only imperfectly the bank's risk of default.

We aim to determine the impact of the degree of supervisors' credibility to not compensate subordinated debt holders on the bank's behaviour and on the effectiveness of supervision. First, we consider direct market discipline: banks have to hold a portion u of their liabilities in the form of subordinated debt, but their probability of being inspected is independent of the subordinated debt rate of return. Then, we add indirect market discipline by supposing that supervisors use market information to classify banks.

3.2.1. Direct market discipline

We consider the consequences of the perception of implicit insurance by subordinated debt holders on the bank's choice of monitoring.

With a portion u of subordinated debt, the problem of the bank is:

$$(22) \max_m V = \pi_s (R_H - (1-u)R_f - uR_u^\gamma) - qCC^\gamma - C(m)$$

$$\text{with : } R_u^\gamma = \frac{R_f}{\pi_s + (1-\pi_s)\gamma}$$

The cost of corrective actions, imposed with a probability q independent of the level of monitoring, is set so that it eliminates excessive risk taking. The subordinated debt rate of return does not perfectly reflect the risk of the bank due to the lack of credibility of the restriction of insurance to depositors. And, the expected cost of subordinated debt is an increasing function of the level of monitoring¹⁷.

As corrective actions eliminate excessive risk taking, we set the cost of these measures so that the expected cost of debt and corrective actions is independent of bank monitoring:

$$(23) \pi_s ((1-u)R_f + uR_u^\gamma) + CC^\gamma = R_f$$

That is:

$$(24) CC^\gamma = (1-\pi_s)(1-u)R_f + uR_f - \pi_s u R_u^\gamma$$

¹⁷ $\left[E(R_u) \right]'_m = \left[\pi_s u \frac{R_f}{\pi_s + (1-\pi_s)\gamma} \right]' = \frac{u \rho \gamma R_f}{[\pi_s + (1-\pi_s)\gamma]^2} > 0$

The problem of the bank can be rewritten as:

$$(25) \max_m V = \pi_s R_H - R_f + (1-q) \left((1-\pi_s)(1-u)R_f - \pi_s u R_u^\gamma + u R_f \right) - C(m)$$

The expected value of the bank is maximized when:

$$(26) \rho R_H - \rho(1-q) \left((1-u)R_f + u R_u^\gamma \right) - (1-q)u \pi_s (R_u^\gamma)'_m = C'_m$$

The presence of subordinated debt, with its holders perceiving the possibility of compensation if the bank defaults, has two opposite effects on the marginal return of monitoring. Comparing with the case without subordinated debt:

- The marginal return decreases because the cost of debt in the event of non default is greater $((1-u)R_f + u R_u^\gamma > R_f)$ and an increase in monitoring raises the probability of having to pay this higher cost,
- The marginal return increases because the rate of return of subordinated debt, paid in the event of non default, is a decreasing function of the monitoring decided by the bank $((R_u^\gamma)'_m < 0)$.

By comparing (5) and (26), we can determine when mandatory subordinated debt leads to a greater level of monitoring and thus to a lower probability of default. We find that the probability of default is lower compared to the one obtained without subordinated debt if:

$$(27) (1-q) \left(\rho \left((1-u)R_f + u R_u^\gamma \right) + (1-\pi_s)u (R_u^\gamma)'_m \right) < \rho(1-q)R_f$$

That is:

$$(28) \rho \left((1-u)R_f + u R_u^\gamma \right) + \pi_s u (R_u^\gamma)'_m < \rho R_f$$

Thus, the probability of default is lower when the bank holds subordinated debt if:

$$(29) \gamma < \left(\frac{\pi_s}{1-\pi_s} \right)^2$$

The perception by subordinated debt holders of possible compensation if the bank defaults must be sufficiently low so that the presence of subordinated debt leads to a decrease in the probability of

default of the bank *via* direct market discipline. In a period of strong governmental intervention, mandatory subordinated debt can lead banks to choose a higher risk taking.

3.2.2. Use of market information by supervisors

We consider the effects of indirect market discipline in addition to direct discipline: the probability of being inspected depends on the rate of return of subordinated debt.

Once $\gamma \neq 0$, the perception of possible compensation in the event of the bank defaults is equivalent to an overestimation of bank monitoring. The subordinated debt rate of return, which is used by supervisors as a signal about bank's default risk, is:

$$(30) \quad R_u^\gamma = \frac{R_f}{(1 - \rho(1 - m)) + \rho(1 - m)\gamma} = \frac{R_f}{[(1 - \rho) + \hat{m}\rho]}$$

The signal carried by the market overestimates the actual level of monitoring. Supervisors infer from R_u^γ that subordinated debt holders assess a level of monitoring \hat{m} :

$$(31) \quad \hat{m} = m + \gamma(1 - m) > m$$

The bias introduced in the market signal due to the lack of credibility of subordinated debt holders' non insurance implies that the probability of default inferred from market information is always lower than the true one. Thus, it is not possible on the basis of this information to inspect a bank that is in reality safe. On the other hand, it is possible that the market signal leads supervisors not to inspect a risky bank. Errors of non inspection can be larger if supervisors use market information, and this is more likely as the perception of compensation in the event of bank's default (γ) is higher.

If subordinated debt holders think that they will be compensated if the bank defaults, for example if they perceive the bank as too big to fail, they have no incentives to assess the bank's risk of default and to incorporate it into the rate of return they ask for. Then, they are the functional equivalent of depositors, and they only ask for the risk free rate. Thus, the use of market information by supervisors does not always reduce errors in supervision. The allocation of supervisory resources is not necessarily more efficient by using market information.

The problem of the bank is also affected by the use of market information; it becomes:

$$(32) \max_m V = \pi_s \left[R_H - (1-u)R_f - uR_u^\gamma \right] - q^u CC^\gamma - C(m)$$

$$\text{with: } R_u^\gamma = \frac{R_f}{\pi_s + (1-\pi_s)\gamma}$$

$$CC^\gamma = (1-\pi_s)(1-u)R_f + uR_f - \pi_s u R_u^\gamma$$

$$q^u = q^u(R_u^\gamma) \text{ et } q^{u'}(R_u^\gamma) > 0$$

That is:

$$(33) \max_m V = \pi_s R_H - R_f + (1-q^u) \left((1-\pi_s)(1-u)R_f - \pi_s u R_u^\gamma + uR_f \right) - C(m)$$

$$\text{with: } q = q(R_u^\gamma) \text{ and } q'(R_u^\gamma) > 0$$

The probability of being inspected is an increasing function of the subordinated debt rate of return, which is a decreasing function of the level of monitoring.

The first order condition is:

$$(34) \rho R_H - (1-q^u) \left[\rho \left((1-u)R_f + uR_u^\gamma \right) + \pi_s u (R_u^\gamma)' \right] - q^{u'} \left(u \left(R_f - \pi_s R_u^\gamma \right) + (1-\pi_s)(1-u)R_f \right) = C'_m$$

As the probability of being inspected is an increasing function of the subordinated debt rate of return, it is a decreasing function of the level of monitoring. A bank can decrease the probability of being inspected by increasing its monitoring.

The bank chooses a higher level of monitoring when supervisors use market information comparatively to the case where there is only direct discipline if:

$$(35) \frac{\rho R_H - (1-q^u) \left(\rho \left((1-u)R_f + uR_u^\gamma \right) + \pi_s u (R_u^\gamma)' \right) - q^{u'} \left(u \left(R_f - \pi_s R_u^\gamma \right) + (1-\pi_s)(1-u)R_f \right)}{\rho R_H - (1-q) \left(\rho \left((1-u)R_f + uR_u^\gamma \right) + \pi_s u (R_u^\gamma)' \right)} >$$

That is if:

$$(36) -q^{u'} > \left\{ \frac{(q - q^u) \left(\rho \left[(1-u)R_f + uR_u^\gamma \right] + \pi_s u (R_u^\gamma)' \right)}{\left(u \left(R_f - \pi_s R_u^\gamma \right) + (1-\pi_s)(1-u)R_f \right)} = \lambda \right\}$$

Indirect market discipline can lead to a lower bank risk if the probability of an inspection is sufficiently sensitive to the monitoring exerted by the bank.

Table 2 summarized the effect of direct and indirect market discipline on the choice of monitoring of the bank.

Table2: Direct discipline and indirect discipline: level of monitoring m , probability γ perceived by subordinated debt holders to be bailed out in the event of bank default and sensitivity of the probability of an inspection q_m^u to the monitoring exerted by the bank.

m^γ monitoring chosen by the bank with subordinated debt and when agents perceived the possibility of a bail out in the event of bank default.

$m^{\gamma,ID}$ monitoring chosen by the bank with subordinated debt, when agents perceive the possibility of a bail out in the event of bank default and when there is indirect discipline that is when supervisors use market signal.

m^{INSP} monitoring chosen by the bank without subordinated debt.

λ the threshold for $-q_m^u$ such as the monitoring chosen by the bank when supervisors do not use market information is equal to the one chosen when supervisors use the rate of return of subordinated debt as a signal about bank risk..

η the threshold for $-q_m^u$ such as the monitoring chosen by the bank without subordinated debt is equal to the monitoring chosen with subordinated debt and when supervisors use market signal.

In bold, cases where the fact of imposing banks to hold subordinated debt leads the bank to choose a lower risk taking compared with the reference case with banking supervision but without subordinated debt..

		DIRECT DISCIPLINE	
		BENEFICIAL if $\gamma < \left(\frac{\pi_s}{1-\pi_s}\right)^2$	PERNICIOUS if $\gamma > \left(\frac{\pi_s}{1-\pi_s}\right)^2$
EFFECTS OF INDIRECT DISCIPLINE	NEUTRALISATION	$m^{\gamma,ID} < m^{INSP} < m^\gamma$ $-q_m^u < \lambda$ and $-q_m^u < \eta$	$m^\gamma < m^{INSP} < m^{\gamma,ID}$ $-q_m^u > \lambda$ and $-q_m^u > \eta$
	LIMITATION	$m^{INSP} < m^{\gamma,ID} < m^\gamma$ $\eta < -q_m^u < \lambda$	$m^\gamma < m^{\gamma,ID} < m^{INSP}$ $\lambda < -q_m^u < \eta$
	DEVELOPMENT	$m^{INSP} < m^\gamma < m^{\gamma,ID}$ $-q_m^u > \lambda$	$m^{\gamma,ID} < m^\gamma < m^{INSP}$ $-q_m^u < \lambda$

Thus, if the bank issues subordinated debt, it has incentives to increase its monitoring if subordinated debt holders have sufficient incentives to assess bank's default risk; they must not perceive that they will be compensated if the bank defaults. In this case, they exert direct market

discipline, which yields a decrease in the probability of default of the bank. If supervisors use the information contained in subordinated debt rate of return to assess bank's risk, inspection errors of safe banks no longer exist, but this information can also misguide them; they can decide not to inspect a bank that is in reality risky. This case is more likely when the perception of a bailout in the event of the bank's default is higher. Supervision errors are not necessarily lower when supervisors use market information to decide to inspect (or not) a bank early. However, using this information influences bank's behaviour because its inspection probability depends henceforth on its monitoring. And, the use of market signal reinforced the positive effects of direct discipline on bank risk control only if the probability of an inspection is sufficiently sensitive to the monitoring exerted by the bank.

4. Conclusion

One of the aims of mandatory subordinated debt is to enhance both direct and indirect market discipline. Direct market discipline is exercised *via* the rate of return of these liabilities, which depends on the bank's default risk. Indirect market discipline corresponds to the use of the market signal by supervisors. In this model, we are between two on-site exams; supervisors cannot fully observe the bank's risk of default but wish to assess it in order to decide if an early inspection is necessary. They can, in this context, use the subordinated debt rate of return as a signal. If subordinated debt holders are able to assess the bank's default risk and have sufficient incentives to exert market discipline, mandatory subordinated debt gives banks incentives to increase their monitoring and decrease their probability of default. In addition, if the subordinated debt rate of return perfectly reflects the bank's risk of default, supervisors no longer make errors in banks classification; supervisory resources are optimally allocated.

However, if subordinated debt holders cannot perfectly assess the bank's default risk, the consequences of mandatory subordinated debt are ambiguous. Holding subordinated debt yields a decrease in the bank's default risk only if market participants are sufficiently informed and able to assess that risk which implies that the subordinated debt rate of return incorporates with sufficient accuracy the bank's risk of default. If this is not the case, the bank can decide to decrease its monitoring, which has only a small impact on the cost of its liabilities. Indirect market discipline yields a decrease in supervision errors, and can complete the beneficial effects of direct discipline or counteract its pernicious effects if the probability of an inspection is sufficiently sensitive to the monitoring exerted by the bank.

The incentives of subordinated debt holders also play a crucial role because if subordinated debt holders perceive strongly the possibility of a bailout if the bank fails, they do not incorporate the bank's default risk into the rate of return that they ask for. This can lead to an increase in risk. Besides, if supervisors use market information as a signal about the bank's risk of default, this can in some cases increase classification errors and can lead to a less efficient allocation of supervisory resources. But, indirect discipline can still be a good complement to direct discipline if the probability of an inspection is sufficiently sensitive to the monitoring exerted by the bank.

Thus, if mandatory subordinated debt can yield a decrease in banks' risk exposure by enhancing market discipline and can allow a better allocation of supervisory resources between two on-site exams, it is necessary beforehand to make sure that the conditions needed for market discipline to be effective are fulfilled. Subordinated debt holders must have abilities to assess banks' default risk, which implies that they have access to accurate and valuable information. The third pillar of Basel II by recommending increased financial transparency goes this way. However, it is also necessary that subordinated debt holders credibly perceive that they will not be compensated if the bank defaults. This implies, for example, that banks are not perceived as too big to fail. And, it is essential that supervisors remain credible in their no bail-out policy. However, in the light of the sub-prime crisis, this non-intervention policy seems difficult or impossible to respect in view of the threat of a systemic crisis.

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