



Subordinated debt, market discipline, and banks' risk taking

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Abstract

The present paper demonstrates the ambiguous impact of subordinated debt on the risk-taking incentives of banks. It is shown that in comparison with full deposit insurance, subordinated debt reduces risk only if banks can credibly commit to a given level of risk. If, however, banks are not able to commit, subordinated debt leads to an increase in risk. This is because due to limited liability banks always have an incentive to increase their risk after the interest rate is contracted in order to reduce the expected costs of debt. Rational debt holders anticipate this behavior and accordingly require a higher risk premium ex ante. The higher interest rates in turn further aggravate the excessive risk-taking incentives of banks.

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1. Introduction

The recurring and severe banking crises during the last two decades made evident the high costs of extensive safety nets for banks. These costs comprise the substantial costs to taxpayers as well as the costs in terms of moral hazard and other market distortions created by the presence of the various safety nets.¹ Recognizing these facts, many economists and practitioners have begun to search for ways to reduce

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¹ See, e.g., Calomiris (1999) and Dow (2000) for an overview of the extent of moral hazard and the costs of safety nets in banking.

the costs of the safety nets. The common consensus that has emerged from this search is that market discipline should be given a more prominent role.² The most popular proposals to improve market discipline and to reduce the costs of safety nets would require banks to issue a minimal amount of subordinated, uninsured debt.³

Underlying all the proposed subordinated debt requirements is the insight that subordinated debt holders are the first creditors to bear any losses resulting from risky investments by the banks. In contrast to shareholders, however, they do not participate in the upward gains from such risky activities. This gives subordinated debt holders a strong preference for low-risk investments by the banks and an incentive to monitor the behavior of banks because the banks' risk has a direct influence on subordinated debt holders' payoffs. Rational subordinated debt holders will require a higher risk premium, i.e., a higher interest rate, from riskier banks as a compensation for the higher risk they have to bear. As a consequence, market prices and interest rates should reflect individual banks' riskiness.

According to proponents of these proposals, the advantages of subordinated debt requirements are twofold. First, subordinated debt may provide indirect market discipline because rate spreads of subordinated debt contain information about banks' riskiness. Supervisors can infer that information from market data and improve their assessment of banks' riskiness based on accounting data. Furthermore, in contrast to accounting data, market data is more readily and frequently available. In principle, supervisory action could be linked to subordinated debt prices, such as prompt corrective action measures that have to be taken when debt spreads exceed certain threshold levels.

Second, and more importantly, subordinated debt may provide direct market discipline because investors directly influence the behavior of banks.⁴ As pointed out already, subordinated debt holders will require a higher risk premium from riskier banks. Consequently, risky banks face higher debt financing costs. It is argued that these higher funding costs in turn induce banks to keep their risk at low levels.⁵

The present paper challenges this view that direct market discipline in the form of subordinated debt is an effective tool to reduce banks' risk-taking incentives. Under the plausible assumption that banks cannot commit to a level of risk, this paper suggests that subordinated debt may in fact lead to higher risks than in the absence of any market discipline, as under a complete deposit insurance scheme.

² See, for instance, the newly proposed capital adequacy framework of the Basel Committee on Banking Supervision (2001). The framework explicitly includes market discipline as one of three pillars, in addition to a minimum capital requirement and a supervisory review process.

³ For an example of a recent subordinated debt proposal, see Calomiris (1999). For a survey of various proposals, see Board of Governors (1999) and Lang and Robertson (2002).

⁴ For an excellent overview of the various aspects of direct and indirect market discipline in general, see Flannery (2001).

⁵ For instance, in Board of Governors (1999, p. 2) the view is expressed that 'the anticipation of higher funding costs provides an incentive ex ante for the banking organization to refrain from augmenting its risk'.

In a static model with endogenous risk choice, the risk-taking incentives of a bank are analyzed both with full deposit insurance, i.e., in the absence of any market discipline, and with uninsured subordinated debt, i.e., in the presence of market discipline. It is shown that if the bank is able to credibly commit to a level of risk, subordinated debt helps to reduce the bank's riskiness. If, however, the bank is not able to commit to a level of risk, subordinated debt induces the bank to take even higher risks than under full deposit insurance. The reason for this result is that due to limited liability, banks do not have to cover the costs of debt in case of default. Hence, given any nominal interest rate, the bank can reduce its expected costs of debt by increasing the probability of default. After having set a low interest rate corresponding to a low level of risk, the bank has an incentive to increase its risk. Rational creditors anticipate this behavior and therefore ask for a higher interest rate in the first place. These higher interest payments, in turn, induce the bank to take even higher risks, because the 'option to go bankrupt' becomes more valuable. Thus, if the bank can adjust its level of risk in response to changes in the interest rate, subordinated debt may raise the bank's riskiness.

The paper is organized as follows. Section 2 contains a short overview of the related literature. Section 3 presents the model. The first-best solution is compared with the solution for an individual bank under full deposit insurance. Section 4 extends the model to examine the bank's risk choice when debt is partially uninsured. In particular, it compares the situation when the bank can credibly commit to a level of risk to that when the bank cannot commit. The robustness of the results is discussed in Section 5. Section 6 contains some concluding remarks.

2. Related literature

The disciplining role of creditors on banks has been analyzed before, most notably in the seminal paper by Calomiris and Kahn (1991). This literature focuses on the fact that banks are predominantly financed by deposits, which are very short-term, demandable debt. Thus, depositors can punish banks by withdrawing their funds whenever they do not approve of the bank's behavior. Usually this implies that depositors withdraw their money *after* problems or losses have become apparent.⁶ In other words, disciplining by depositors occurs only interim or ex post. The present paper distinguishes itself from this strand of the literature in three respects, namely (i) disciplining takes place ex ante, i.e., before any uncertainty about investments is resolved, (ii) market discipline is exerted through the level of interest rates and not through the withdrawal of funds, and (iii) the bank's risk choice is modelled explicitly.

The present paper is also closely related to the literature on optimal deposit insurance. According to that literature, an insured bank, which pays actuarially unfair insurance premia, i.e., too low premia, tends to incur excessively high risks.⁷ This

⁶ For more recent papers with this feature, see Allen and Gale (1998) and Chen (1999), for example.

⁷ For an overview of this literature, see Freixas and Rochet (1997).

excessive risk-taking behavior can only be eliminated if the insurance premia reflect the true risk of the bank. It is precisely for this reason that market-based instruments such as subordinated debt, which ensure that risks are always appropriately priced, are seen as useful complements, if not as substitutes, for government regulation and supervision. The present paper, however, demonstrates that even if a bank's risk is fully reflected in the pricing of its subordinated debt, this may not constitute a sufficient condition for the bank to reduce its risk appetite.⁸ In fact, correctly priced subordinated debt may even aggravate the bank's risk-taking incentives.

To understand this seemingly contradictory result, it is useful to consider the circumstances under which a risk-sensitive deposit insurance would be an effective instrument to curb risk-taking behavior. In order for deposit insurance to limit moral hazard, it is crucial that the insurance premia always reflect the true risk of the bank. This implies that the premia must be determined in response to the chosen risk profile, i.e., premia have to be set after the bank chooses its level of risk. If premia are set *ex ante*, they represent only a fixed, sunk cost to the bank and hence are not capable of affecting the bank's incentives. The present paper shows that the effects of subordinated debt are similar to those under a deposit insurance scheme where premia are set *ex ante*. Once the terms of the subordinated debt are contracted, they are independent of the bank's behavior. In particular, they are insensitive to any subsequent readjustment of the bank's risk profile. Anticipating any potential opportunistic behavior by the bank, creditors will ask for a larger risk premium in the form of higher interest rates *ex ante*. Thus, by increasing the costs of debt, subordinated debt may exacerbate the problem of excessive risk taking as outlined above.⁹

Finally, the present paper provides a simple model to show that a mechanism that directly reduces the costs of debt, such as subsidized deposit insurance, may provide a better way to reduce excessive risk-taking behavior than a pure market tool such as subordinated debt. This result is supported by Chan et al. (1992), who use a dynamic framework to show that a subsidized deposit insurance scheme creates future rents, which lead banks to reduce their risk in order to increase the probability with which they receive those rents. Similarly, Hellmann et al. (2000) find that deposit-rate controls, as another instrument to reduce funding costs, can successfully contain the risk-taking behavior of banks. In contrast to these two articles, the present paper does not look at the impact of future rents on risk-taking incentives. Instead, the results are derived by focussing on the costs of debt in a static framework.

⁸ From the financial agency literature it is well known that debtors have an incentive for excessive risk taking in general. See, e.g., the classic contribution by Jensen and Meckling (1976). In the banking context, John et al. (1991), for instance, have also shown that the excessive risk-taking incentives are not due to unfairly priced deposit insurance, but more fundamentally are a consequence of the limited liability of debt.

⁹ The insight that higher interest rates may cause adverse selection or moral hazard on part of the borrower is also a central result of the literature on credit rationing. See, for instance, the seminal contribution of Stiglitz and Weiss (1981).

3. The model

I consider a single, risk-neutral bank that invests its available funds for one period. For simplicity, I assume that there is only one type of liabilities, which I call deposits, and no equity. The demand for deposits is either a constant $D > 0$, if the expected gross return to risk-neutral depositors is at least equal to the risk-free gross rate of return r_f (with $r_f \geq 1$), or zero if the expected return is below the risk-free rate. The contracted (gross) deposit rate is denoted by r_D , so the bank's total costs of deposits at the end of the period are $r_D D$.¹⁰

At the beginning of the period, the bank owners can choose the risk-return characteristics of the bank's portfolio. As in Blum (1999), I assume a two-point distribution of the gross rate of return \tilde{r} of the portfolio, with the lower realization normalized to zero:

$$\tilde{r} = \begin{cases} X & \text{with probability } p(X), \\ 0 & \text{with probability } 1 - p(X), \end{cases}$$

for $X \geq r_f$, with $p(r_f) = 1$. I assume that there is a standard trade-off between risk and return, $p'(X) < 0$, i.e., higher rates of return in the good state are associated with lower probabilities of ending up in that state. In order for the expected return to be increasing in X at r_f , I further assume that $p'(r_f) > -1/r_f$. The unique level of risk that maximizes expected return is denoted by \bar{X} . Together with $p''(X) \leq 0$ these assumptions imply that the expected return function $E[\tilde{r}|X] = p(X)X$ is strictly concave as illustrated in Fig. 1.

Since the risky portfolio (weakly) dominates the safe asset, all the funds are invested in the risky portfolio. Hence, the probability of default is $1 - p(X)$ for every given X . Finally, the level of risk X chosen by the bank can be observed costlessly by everyone, but it is not verifiable, i.e., contracts specifying a certain level of risk cannot be enforced.

If at the end of the period the available funds are not sufficient to cover the costs of deposits, the bank defaults. Due to limited liability bank owners cannot be forced to inject any additional money to cover unfulfilled claims. Owners of the bank, however, still incur fixed bankruptcy costs of C_B . These costs include the loss of the bank's charter, the loss of any private benefits, and reputational damage.

3.1. First best

In order to have a benchmark by which to gauge the effect of different institutional arrangements, I now derive the first-best solution of the model. A risk-neutral social planner chooses that level of risk that maximizes total expected surplus

$$p(X)XD - (1 - p(X))C_B - r_f D. \tag{1}$$

¹⁰ Here I neglect the questions of optimal contracts and optimal financial structure. Rather, I take the currently observed institutional arrangements as given and conduct the analysis within that framework.

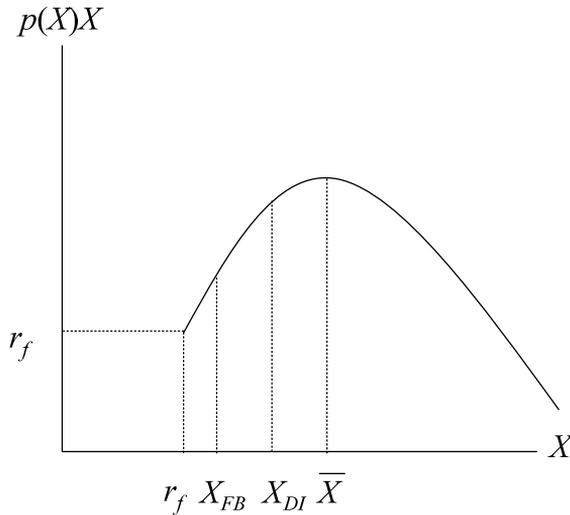


Fig. 1.

Assuming an interior solution exists, the necessary and sufficient first-order condition to this problem is

$$[p'(X_{FB})X_{FB} + p(X_{FB})]D = -p'(X_{FB})C_B. \tag{2}$$

Since the expected return function is strictly concave and $p'(\cdot)$ is negative, the first-best level of risk X_{FB} is smaller than the level of risk that maximizes the expected return, $X_{FB} < \bar{X}$ (see Fig. 1). Intuitively, a reduction of risk at the maximum of the expected return function has a first-order effect of zero on the expected return, but a positive effect on the expected bankruptcy costs $(1 - p(X))C_B$. At the social optimum the marginal expected return is equal to the marginal cost of increasing the level of risk (left-hand side and right-hand side of Eq. (2), respectively).

3.2. Deposit insurance

I now consider the decision problem of a bank whose depositors are protected by deposit insurance. Since depositors are fully insured, they are willing to accept a promised return on their deposits of r_f . I assume that the insurance premium cannot be made contingent on the bank's risk, and for simplicity, the constant premium is set equal to zero. In this scenario the bank solves

$$\max_X p(X)[XD - r_f D] - (1 - p(X))C_B. \tag{3}$$

The difference between (1) and (3) is due to the bank owners' limited liability. Since the owners do not have to cover the costs of deposits in case of insolvency, they only take the costs of deposits into account in the event that the investment is successful.

The first-order condition for the optimal level of risk under deposit insurance, X_{DI} , is

$$[p'(X_{DI})X_{DI} + P(X_{DI})]D = -p'(X_{DI})[C_B - r_f D]. \quad (4)$$

Comparing (2) and (4), it is apparent that the costs of bankruptcy are smaller for the bank than for a social planner, since $[C_B - r_f D] < C_B$. The bank therefore chooses a level of risk that is higher than first best, $X_{DI} > X_{FB}$. In fact, going bankrupt does not only represent a cost to the bank, C_B , but also a benefit, $-r_f D$. The bank benefits from insolvency because in that event the interest on deposits (including principal) does not have to be paid due to limited liability. The *expected* costs of deposits are only $p(X)r_f D$, which is decreasing in the level of risk. The expected costs of deposits in the event of default, $[1 - p(X)]r_f D$, are borne by the deposit insurance fund. This benefit to the bank is often referred to as the ‘(put) option value of deposit insurance’.

To summarize, under full deposit insurance, the level of risk chosen by the bank is too high and the costs of deposits faced by the bank are too low. As described in the introduction, proponents of subordinated debt requirements expect an improvement along both dimensions if the protection of at least some creditors is reduced and as a consequence banks are subject to increased market discipline. Whether this presumption is correct will be scrutinized in the next section.

4. Subordinated debt

To analyze the influence of market discipline on the bank’s risk-taking incentives I now consider the case where some of the bank’s debt is uninsured, subordinated debt. Specifically, I assume that a fraction $\lambda \in (0, 1]$ of depositors is not covered by any insurance or other kind of safety net, including any implicit government guarantee. In that setup the subordinated debt holders care about the bank’s risk, since the level of risk directly influences the expected return they receive from lending money to the bank.

To demonstrate the crucial impact of the bank’s commitment ability on the incentive effect of subordinated debt, I will first look at the case where the bank can commit to any level of risk. Then I will examine the case where the bank is not able to commit to a risk profile. While in the former case subordinated debt reduces the bank’s risk-taking incentive, in the latter and arguably more realistic case subordinated debt aggravates the bank’s excessive risk-taking incentive.

4.1. The commitment case

In this subsection I assume that the bank can credibly commit to a level of risk. Since subordinated debt holders can costlessly observe the precise level of risk, they will ask for an interest rate that guarantees them an expected return equal to the

risk-free return. For every level of risk X that the bank chooses, subordinated debt holders require a promised return r_D that satisfies

$$p(X)r_D = r_f,$$

or

$$r_D(X) = \frac{r_f}{p(X)}. \quad (5)$$

As is apparent from (5), the bank has to promise a higher interest rate the higher the chosen level of risk, $r'_D(X) > 0$. This relationship between risk and interest rates has to be taken into account by the bank when determining the optimal level of risk. The bank therefore solves

$$\begin{aligned} \max_X p(X) [XD - (1 - \lambda)r_f D - \lambda r_D D] - (1 - p(X))C_B, \\ \text{s.t.} \quad r_D = \frac{r_f}{P(X)}. \end{aligned} \quad (6)$$

Inserting the constraint into the objective function yields

$$\max_X p(X)[XD - (1 - \lambda)r_f D] - (1 - p(X))C_B - \lambda r_f D.$$

The solution X_{MD1} of the bank's problem satisfies

$$[p'(X_{MD1})X_{MD1} + p(X_{MD1})]D = -p'(X_{MD1})[C_B - (1 - \lambda)r_f D]. \quad (7)$$

A comparison of (4) and (7) reveals that with subordinated debt the bank's costs of default (net of the interest rate benefit) are higher than under full deposit insurance, because $(1 - \lambda)r_f D < r_f D$. This yields the following result:

Result 1. *If the bank is able to commit to a level of risk, market discipline through the use of subordinated debt leads to a lower level of risk than subsidized deposit insurance, $X_{MD1} < X_{DI}$.*

In the commitment case subordinated debt indeed reduces the bank's risk-taking incentives. The costs of subordinated debt are fully internalized and borne by the bank. In contrast to insured deposits, the bank always faces the true opportunity costs of subordinated debt and cannot reduce the expected costs by taking excessive risks. Accordingly, a higher fraction of subordinated debt leads to a lower level of risk, $dX_{MD1}/d\lambda < 0$. If all debt is uninsured ($\lambda = 1$), even the first-best level of risk can be achieved in this model.¹¹

¹¹ More generally, if the failure of the bank causes further externalities, e.g., some constant social costs of bankruptcy not borne by the bank, the level of risk chosen by the bank would still be too high even with $\lambda = 1$.

4.2. *The non-commitment case*

Now I look at the opposite case where the bank cannot commit to a level of risk. After the interest rate on subordinated debt is contracted, the bank can freely readjust its level of risk.¹² This case seems to be particularly relevant since banks' investments are highly flexible. By selling and buying assets and by using derivative financial products banks can change their risk profiles very quickly and substantially. Therefore, an investment in safe assets, for instance, does not present a credible commitment to adhere to a safe investment strategy in the future.

Rational creditors know the bank's incentives and opportunities, and they can perfectly anticipate the bank's risk choice at stage two for every possible interest rate agreed upon at stage one. Subordinated debt holders therefore require a promised rate of return \hat{r}_D that will yield them an expected payoff of r_f , given that the bank will optimally set its level of risk \hat{X} in reaction to the required rate of return. In a Nash equilibrium (\hat{r}_D, \hat{X}) the following two conditions have to hold:

$$p(\hat{X})\hat{r}_D = r_f \tag{8}$$

and

$$\left[p'(\hat{X})\hat{X} + p(\hat{X}) \right] D = -p'(\hat{X})(C_B - (1 - \lambda)r_f D - \lambda\hat{r}_D D). \tag{9}$$

Condition (8) is the requirement that subordinated debt holders receive an expected return equal to the risk-free rate in equilibrium. Eq. (9) is the bank's profit maximization condition, i.e., the first-order condition to problem (6) for a given interest rate r_D . Subordinated debt holders require a promised interest rate that is increasing in the level of risk, and the bank's preferred level of risk is an increasing function of the interest rate. Therefore, these two conditions both imply upward sloping reaction functions, i.e., the rate of interest required by creditors and the level of risk set by the bank are strategic complements.

Two cases are possible, as illustrated in Fig. 2. First, if the probability of default increases very quickly with the level of risk, the bank's reaction function always lies below the reaction function of subordinated debt holders, and no equilibrium exists (see Fig. 2A). Second, if the default probability does not increase too quickly, there is at least one equilibrium in pure strategies (see Fig. 2B).¹³

If an equilibrium exists, Eq. (8) can be inserted into (9), which yields the optimality condition for the level of risk X_{MD2} ,

$$\left[p'(X_{MD2})X_{MD2} + p(X_{MD2}) \right] D = -p'(X_{MD2}) \left(C_B - (1 - \lambda)r_f D - \lambda \frac{r_f}{p(X_{MD2})} D \right). \tag{10}$$

¹² Since the break-even condition of subordinated debt holders is always strictly binding, this case is equivalent to both the interest rate and the risk being set simultaneously. But for expositional convenience, I concentrate only on the sequential interpretation of events.

¹³ For instance, if $r_f = D = \lambda = 1$, $C_B = 0$, and $p(X) = 1 + a - aX$, no equilibrium exists, if $a > 0.17$. If $a < 0.17$, there are two equilibria (in pure strategies) as depicted in Fig. 2B.

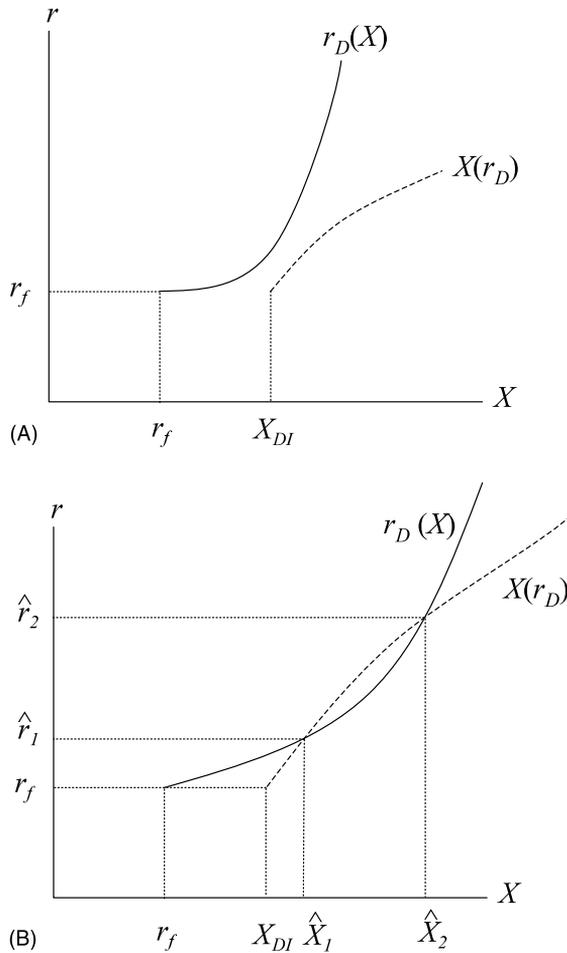


Fig. 2.

Since $p(X) < 1$ for all $X > r_f$,

$$\hat{r}_D = \frac{r_f}{p(X_{MD2})} > r_f.$$

Using this fact and comparing (4) and (10), it is apparent that the bank’s effective costs of bankruptcy are lower than under full deposit insurance, since $(1 - \lambda)r_f D - \lambda[r_f/p(X_{MD2})]D > r_f D$. This leads to the following result:

Result 2. *If the bank is not able to commit to a level of risk and if an equilibrium exists, market discipline through the use of subordinated debt leads to a higher level of risk than subsidized deposit insurance, $X_{MD2} > X_{DI}$.*

Thus, due to subordinated debt the bank is induced to choose a *higher* level of risk than if all creditors are protected by deposit insurance and do not discipline the bank. Because subordinated debt holders require a ‘risk premium’, the costs of debt in the

non-default state are higher to the bank than if all debt were insured. And given those higher costs, the bank has a stronger incentive to increase its risk in order to reduce the expected costs of debt. Increasing the fraction of uninsured, fairly priced debt further raises the total costs of debt, leading to a higher level of risk, $dX_{MD2}/d\lambda > 0$.

By increasing the costs of debt, market discipline aggravates the bank's excessive risk-taking incentives. This is squarely at odds with the alleged benefit of subordinated debt, according to which the bank is deterred from incurring high risks because it is in its own interest to keep the costs of debt low. In contrast, a subsidy to the bank in the form of deposit insurance helps to reduce the bank's risk-taking incentives. By reducing the debt burden to the bank, (subsidized) deposit insurance reduces the option value of bankruptcy, thereby mitigating the moral hazard problem.

It is important to emphasize that the failure of subordinated debt to effectively reduce risk is neither due to creditors being badly informed about the bank's risk, nor to any free-rider problems between small, dispersed creditors.¹⁴ In this model, subordinated debt holders are completely rational and are fully informed about the bank's risk choice. The problem only stems from the fact that the level of risk cannot be contracted, or rather, that any contract specifying risk cannot be enforced. This illustrates that transparency by itself does not solve the problem of 'misbehavior' of banks. While the lack of transparency may lead to the exploitation of uninformed creditors, the more fundamental problem of excessive risk-taking incentives cannot be mitigated by enhanced transparency alone.

5. Discussion

The model in this paper is deliberately kept as simple as possible to highlight the problematic incentive effects of subordinated debt. To assess the more general validity of the results, some remarks about possible impacts of various extensions are in order. One obvious question concerns the time structure of the model. While the model is purely static, banking is of course a fundamentally dynamic business with repeated and ongoing relationships between banks, customers and investors. Will the results also hold in a dynamic version of the model? If the one-shot game is repeated, the set of potential equilibria expands. In an infinitely repeated version of the game, for instance, any individually rational level of risk can be supported as an equilibrium.¹⁵ Generally, however, it cannot be ensured that the equilibrium will be socially efficient. So while low-risk equilibria become feasible in a dynamic setting, the inefficient high-risk equilibria of the last section cannot be ruled out in general.¹⁶

¹⁴ For that view, see Dewatripont and Tirole (1994).

¹⁵ This is a straightforward application of the 'Folk Theorem'.

¹⁶ This is also true for more sophisticated reputation equilibria. Assume, for instance, that the level of risk can only be observed with some noise and that a low risk by the bank is supported by trigger strategies, where subordinated debt holders play the inefficient high-risk equilibrium for several periods if the bank deviates from its low-risk choice. Since only a noisy signal of the level of risk can be observed, (ex post) inefficient 'punishment phases' will be triggered on a regular basis even though the bank does not misbehave. See, e.g., Green and Porter (1984).

Another aspect that is not captured in the static version of this model is the maturity of the subordinated debt. To avoid harmful bank runs, mandatory subordinated debt proposals typically suggest a maturity of at least one to several years. With these long maturities – in combination with the high flexibility of banks' investments – the adverse incentive effects seem to be especially pronounced. Shorter maturities, however, do not necessarily mitigate the problem of excessive risk taking. For instance, in the extreme case where subordinated debt were short-term, demandable debt, in principle the debt holders would have the ability to withdraw their funds at any time. But as long as they receive an interest payment that compensates them for the risk they bear, they lack any incentive to withdraw. As long as they break even – which they do in equilibrium – they are indifferent about the riskiness of their bank. So even though lenders may withdraw their funds as soon as a bad realization of the investment becomes apparent *ex post*, their behavior will not prevent inefficiently high-risk choices by the bank *ex ante*. Therefore, independent of the maturity of subordinated debt, the high-risk equilibrium exists.

To prevent opportunistic behavior and to provide some level of commitment by the borrower, debt contracts often contain covenants to restrict the actions of the borrower. These covenants, however, are only a rather blunt tool to rule out extreme cases of misbehavior. They generally do not provide the ability to fine-tune the actions of a borrower. This is especially true if the underlying variable specified in the covenant is not verifiable, as is in this case the banks' level of risk. In the context of subordinated debt requirements for banks the influence of covenants is further limited. In order to sharpen investors incentives to monitor their banks and to ensure the subordinate character of the debt, it is necessary to rule out many types of covenants. For instance, if subordinate debt holders were allowed to accelerate payment of principal prior to maturity in times of distress or at their discretion, they could avoid bearing any losses and their incentives to monitor their banks would be reduced. So while carefully designed covenants may reduce excessive risk-taking possibilities, in general we would not expect covenants to eliminate the adverse incentive problem described in the last section completely.

In this paper, a purely market-based implementation of subordinated debt requirements was considered. Even though this direct market discipline aspect is at the heart of most proposals, many of the more recent proposals suggest enhancements by adding some form of indirect market discipline. These enhancements are based on the yield of the subordinated debt, such as restrictions on the maximum permissible yield spread over some other type of debt or using the yield spread as a trigger for prompt corrective action by supervisors.¹⁷ If the yield always reflects the riskiness of banks, in principle rate caps could be used to impose an upper limit on the level of banks' risks. In the current model a regulator could set a maximum interest rate which is both consistent with investors breaking even and a given maximum level of risk. In this manner even the first-best level of risk could be implemented.¹⁸

¹⁷ See Board of Governors (1999) for an overview of suggested rate caps.

¹⁸ Specifically, the optimal rate cap \bar{r} consistent with the first-best level of risk X_{FB} would be defined by the condition $p(X_{FB})\bar{r} = r_f$.

However, there are practical as well as conceptual problems associated with the imposition of rate restrictions. The practical problems comprise the difficulty of determining the optimal level of the rate cap and the empirical question whether subordinated debt markets are liquid and efficient enough to reflect the riskiness of banks with sufficient precision and timeliness.¹⁹ The level of the rate cap would have to be contingent on a number of parameters that the regulator is unlikely to know. And inappropriate rate caps would still leave room for the risk-enhancing mechanism of the last section.²⁰ The main conceptual problem is the fact that the introduction of rate caps changes the rules of the game. The way in which the supervisors enforce the rate cap has direct implications for the behavior of investors and banks. Assume, for instance, that acquiring information about banks is costly and that supervisors always force the banks to reduce their risks as soon as the rate cap is exceeded. In that case the incentive of investors to acquire information about banks are reduced or even destroyed completely. Since they know that the risk can never exceed the upper bound implied by the rate cap, the potential value of monitoring banks is only limited. If the cost of acquiring information about banks exceeds this value, rational creditors would not monitor banks altogether. This lack of information production would lead to uninformative market prices, rendering subordinated debt yields an unreliable trigger for regulatory action. Furthermore, if debt yields are only a noisy signal of banks' risks, the possibility of supervisory forbearance arises. Violations of spread caps can easily be attributed to 'market irregularities' or unrelated events, putting into question the credibility of rate caps as triggers for supervisory action. To summarize, even though rate caps have some attractive properties in theory, it is not clear whether they would provide the hoped-for benefits in practice.

6. Conclusion

The present paper demonstrates the ambiguous impact of subordinated debt on banks' risk-taking incentives. In particular, the contribution of this article is to highlight the limitations of the attempt to delegate more responsibility for disciplining banks to the market. Simply requiring banks to hold a minimum amount of subordinated debt may not prevent banks from incurring inefficiently high risks, but rather may induce banks to choose even higher risks than without any market discipline.

This conclusion raises doubts about the effectiveness of subordinated debt proposals, and especially those that focus on direct market discipline.²¹ Concerning

¹⁹ See, e.g., Hancock and Kwast (2001) for an empirical study investigating these issues.

²⁰ Rate caps that are too low could also lead to distortions by forcing banks to invest in inefficiently safe assets. For instance, a rate cap $\bar{r} = r_f$ could only be met if the bank invested in the riskless asset exclusively. In that case the social benefits of higher expected returns of the risky investment opportunity would be forgone.

²¹ Sironi (2001), for instance, concludes that due to various shortcomings of the subordinated debt market, subordinated debt requirements 'should be mainly aimed at improving direct market discipline rather than indirect market discipline' (p. 259).

indirect market discipline, it is undisputed that the information contained in market prices are a useful indicator for bank supervisors. However, it is questionable whether the net benefit of obtaining that information by forcing banks to issue subordinated debt is positive, because the additional information may come at the cost of higher risks in banking. Furthermore, the informational content of subordinated debt should not be overestimated since the same information about banks' underlying riskiness can also be inferred from equity prices.²²

Finally, the results of this paper have implications for the interpretation of empirical studies of market discipline. Empirical studies tend to infer the existence of market discipline from analyzing the extent to which market data reflect the banks' risk profiles. For example, a statistically significant relationship between, say, interest rates and a bank's fundamentals is interpreted as evidence that market discipline is existing and effective. However, in the light of the present paper, this interpretation may be misleading. In the current model, interest rates and risk are positively correlated. But instead of having a disciplining effect on banks, this positive relationship actually may aggravate the excessive risk-taking incentives. Hence, even if risks are accurately reflected in prices, this does not necessarily imply that market discipline is effective. Indeed, the fact that we observe banks with high risks and high interest rates indicates that those banks are not deterred from choosing high risks. Thus, this paper emphasizes that a positive relationship between interest rates and risk is not a sufficient condition to assess the existence and effectiveness of direct market discipline.

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²² See, e.g., Levonian (2000). In principle, equity and debt prices contain the same information about banks' risks. But if market prices are only a noisy signal of banks' risks, subordinated debt and equity provide complementary information about the riskiness of banks.

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