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Abstract

In a recent paper Blum (1999) shows that in a dynamic setting intertemporal effects can arise that render capital rules in banking as advocated by the Basle Committee of Banking Supervision counterproductive. It is quite possible that the banks' desire for excessive risk-taking is being reinforced by a binding capital rule such as the Cooke ratio. In this paper an attempt is made to explore the impact of the so-called precommitment approach, recently proposed as an alternative to risk-based minimum capital rules, on the risk-taking behavior of banks. According to this proposal banks are free to self-assess their maximum possible losses, but make a commitment to the regulator to hold at least as much capital as is needed to cover these losses. It turns out that in a dynamic setting the precommitment approach is superior to the prevailing minimum capital rule in that the risk-neutral bank which maximizes its expected value of equity subject to a precommitted solvency constraint chooses a risk-level which is socially optimal. Future research will show if this result is robust.

1. Introduction

Recently new and interesting light was shed on intertemporal aspects of standard capital adequacy rules in banking by Jürg Blum (1999). Intertemporal implications of risk-based capital adequacy requirements in banking with the undesirable potential to increase rather than decrease banks' risk-taking are explored within a two-period model. The major insight of Blum's analysis is that a bank may value an additional unit of equity tomorrow more with a binding capital requirement in operation than without it. This particularly holds when raising equity is costly, and when the only way available to increase equity tomorrow is to increase risk today. Put differently, when the dynamic setting is so that banks have an incentive to increase risk today in order to forestall undercapitalization tomorrow (and hence profit limitations) the tendency of banks towards excessive risk-taking due to limited liability may rather be reinforced through a binding risk-oriented capital rule. Undoubtedly, adverse implications of minimum capital standards like these question, to a high degree, the theoretical underpinning of risk-based capital rules as an appropriate regulatory means of restricting excessive risk-taking in banking.

With the theoretical foundation of capital rules as advocated by the Basle Committee of Banking Supervision becoming increasingly ambiguous, one question becomes more and more important, namely which regulatory measure if not risk-oriented minimum capital requirements can do the job of efficaciously restraining the banks' desire for excessive risk-taking (that is, risks taken higher than first best). This short paper attempts to give an answer to this question within the compound of Blum's model.

The paper is organized as follows. Section 2 gives a short recap of Blum's model. In Section 3 the model is extended by the regulatory requirement that banks must be solvent any time, with the aim to explore the impact of this regulatory constraint on banks' risk-taking behavior. Section 4 concludes.

2. The Dynamic Structure of Blum's Model

A risk-neutral bank is supposed to invest its available funds (that is, equity and deposits) for two periods. At date 0 the bank faces two investment opportunities: A risk-free asset with (gross) rate of return $R_f \geq 1$and a risky portfolio with gross rate $\tilde{R} \geq R_f$, governed by a two-point distribution, with the lower realization normalized to zero:

$\tilde{R} = X$ *with probability* $p(X)$

$\tilde{R} = 0$ *with probability* $1 - p(X)$

for $X \geq R_f$, with $p'(X) < 0, \quad p''(X) \leq 0$ and $p(R_f) = 1$. For the expected return to be increasing in X at R_f, the constraint $p'(R_f) \geq -\frac{1}{R_f}$ is introduced. With these assumptions the expected return function $E[\tilde{R}|X] = p(X)X$ is strictly concave, with X^* denoting the unique level of risk that maximizes expected return. Since the risky portfolio dominates the safe asset, all the funds are invested in the risky portfolio. Thus, the distribution used in Blum (1999) has two important properties: (a) an increase in risk leads to a higher probability of default, and (b) the conditional expected return given no default rises as risk is increased.

The bank is financed by equity W and deposits D. The former is assumed to be exogenously given, the latter is supplied by the bank which faces a strictly convex cost function $C(D)$, that is, $C', C'' > 0$ and $C(0) = 0$ (for a rationale of this cost function, see Blum, 1999). Further, $C(D_0)$ is payable at the end of period 1 whereas deposits are assumed to be fully covered by deposit insurance. The bank defaults if the funds available at date 1 are not sufficient to cover $C(D_0)$.

If the bank does not default at time $t = 1$, another investment can be undertaken whereas the structure of period 1 is replicated in period 2 with the exception that the random variable $\tilde{R}$ is replaced by its expected value $\overline{R} > R_f$. At the end of period 2 all parties are compensated.

The model has the important feature that a safe investment policy, i. e., $X = R_f$ is not optimal. It is socially efficient that the bank bears a positive amount of risk $X^* > R_f$, with X^* satisfying

$$p'(X^*)X^* + p(X^*) = 0 \qquad (1)$$

That is to say, barring any bankruptcy costs, a risk-neutral social planner chooses that level of risk that maximizes expected returns.

In Blum's model the optimal level of risk $\hat{X}$ chosen by an unregulated bank is determined by the following first order condition

$$p'(\hat{X}) + p(\hat{X}) - p'(\hat{X})\left\{\frac{\overline{R}C(\hat{D}_0) - [\overline{R}\hat{D}_1 - C(\hat{D}_1)]}{\overline{R}[\hat{D}_0 + W_0]}\right\} = 0 \qquad (2)$$

It is easy to see that the unregulated bank chooses a higher level of risk than first best, i. e., $\hat{X} > X^*$, when the expression in curly brackets is positive. In other words, in the given context the unregulated bank takes on too much risk from a social point of view when the rent in period 2 is expected to be not too high. Thus, limited liability alone does not suffice to cause excessive risk-taking in the given dynamic setting.

Given these assumptions Blum (1999) shows that if the bank faces - according to the so-called Cooke ratio $\frac{W_0}{c_0} \equiv k_0 W_0$ of the Basle Committee - a binding adequacy requirement in the first period, an increase in the requirement reduces the level of risk in the first period. If the adequacy requirement becomes binding in the second period, however, elevating the requirement in period 2 induces the bank to raise the level of risk in period 1. A further increase of the requirement may result in a reduction of the risk level but it never falls below the level of an unregulated bank. If a uniform capital requirement is applied in both periods, the impact on the bank's risk-taking is ambiguous. Blum (1999) rightly concludes that these results are a reminder that it is quite possible (if not likely) that the actual effects of risk-based capital adequacy rules may turn out to be contrary to the ones intended and therefore may be counterproductive.

3. Risk-Optimization and the Precommitment Approach

For prudential authorities excessive risk-taking in banking is viewed as one of the main sources held responsible for the intrinsic fragility of the banking system. It is said that banks' desire for excessive risk-taking has the potential to destabilize the banking system to a degree that triggers banking crises with undesirable macroeconomic consequences. Undoubtedly, over the last decades banks have played a pivotal role in the impressive increase of the activity of financial markets, and of international capital movements, both of which contributed substantially to the dramatic enhancement of the banks' overall risk exposure (Rochet, 1999).

Banking authorities in many countries (i. e., USA, EU member states) responded to these developments by implementing risk-based capital adequacy standards as discussed in the preceding section. Capital requirements are supposed to deter bank managers not only from holding overly risky assets in the first place, but also from gambling irresponsibly with the depositors' money when the bank faces tough times. However, as shown by Blum and others, the theoretical foundation of risk-based capital rules such as the Cooke ratio is very unclear when it comes to assessing its regulatory value as a means of controlling banks' excessive risk-taking over time efficaciously. Theoretical and empirical evidence in favor of risk-based capital requirements as the regulatory core instrument to induce banks to allocate risks efficiently appear to be fading rapidly. Risk-based capital regulation is, most probably, too rigid a conception to bring banks' risk-taking behavior into line with the social optimum.

In this respect a regulatory approach which has recently been proposed by two U. S. economists (Kupiec and O'Brien, 1995, 1997), called the Precommitment Approach, appears to be more promising. According to this proposal banks are free to self-assess their maximum possible losses, but make a commitment to the regulator to hold at least as much capital as is needed to cover these losses. The crucial point is that if a bank under-assesses its losses the regulator is entitled to impose a penalty on the bank. This is considered to be the touchy aspect of the precommitment approach and it shall not be discussed further here.

In the following we are going to translate the precommitment approach into the language of Blum's dynamic model in order to explore the impact of this ´regulatory philosophy´ on banks' optimal choices by comparing them with the first-best solution of the model. In doing so, we state that the precommitment approach requires that the bank solve the following optimization program

$$\max_{X,D_0,D_1} p(X)\{X[(1-\lambda)W_0 + D_0]\}\overline{R} + [(\lambda W_0 R_f - C(D_0))\overline{R} + D_1\overline{R} - C(D_1)] \qquad (3)$$

$$\textit{subject to} \quad \lambda W_0 R_f \geq C(D_0), \quad 1 \geq \lambda > 0$$

This optimization program represents a situation where banks promise the regulator to invest large enough a portion of equity into the riskless asset so that the costs that have to be paid at $t=1$ for the deposits supplied at $t=0$ are fully covered regardless whether the risky investment works out fine or turns sour. Since all depositors are protected by deposit insurance for banks to remain solvent at the end of period 1 it suffices to have enough funds available for sure to pay the interest rate $C(D_0)$.

The optimality conditions for (3) are

$$p'(\breve{X})\breve{X} + p(\breve{X}) = 0 \qquad (3a), \qquad p(\breve{X})\breve{X} - C'(\breve{D}_0) = 0 \qquad (3b)$$

$$\breve{\lambda} = \frac{C(\breve{D}_0)}{W_0 R_f} \qquad (3c), \qquad \overline{R} = C'(\breve{D}_1) \qquad (3d)$$

Obviously, a risk-neutral bank which is regulated according to the precommitment approach, that is, which maximizes the expected value of equity subject to a binding solvency constraint chooses a risk level that is socially efficient. Thus, as for the appropriate regulatory approach for public intervention in banking within the dynamic structure of Blum's model the precommitment philosophy is socially superior to the risk-based capital adequacy philosophy. It remains to be seen if this result is robust enough to accelerate the ongoing change of paradigm in banking regulation.

4. Conclusion

So far intertemporal aspects have been widely neglected in the ongoing debate about the effectiveness of risk-based capital adequacy requirements as a regulatory means to control banks' risk-taking behavior. In a recent paper Blum (1999) shows that in a dynamic setting intertemporal effects can arise that render capital rules as advocated by the Basle Committee of Banking Supervision counterproductive. It is quite possible that the banks' desire for excessive risk-taking is being reinforced by a binding capital rule such as the Cooke ratio. In this paper an attempt is made to explore the impact of the so-called precommitment approach, recently proposed as an alternative to risk-based minimum capital rules, on the risk-taking behavior of banks. According to this proposal banks are free to self-assess their maximum possible losses, but make a commitment to the regulator to hold at least as much capital as is needed to cover these losses. It turns out that in the dynamic setting of Blum's model the precommitment approach is superior to the prevailing minimum capital rule in that the risk-neutral bank which maximizes its expected value of equity subject to a precommitted solvency constraint chooses a risk-level which is socially optimal. Future research will show if this result is robust.

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