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Abhandlungen

Risk-Taking and Solvency Regulation in Banking – A Note –

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I. Introduction

New and interesting light was shed on intertemporal aspects of standard capital adequacy rules in banking by 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.

The recent financial crisis serves as a further rude reminder of how weak the regulatory efficacy of risk-sensitive capital rules actually is. Though all internationally active banks have been well-capitalized under the terms of the Basel Accords the international financial system has nearly collapsed as in the course of the sub-prime turmoil previously undisclosed risk positions abruptly showed up in the banking books. Obviously, risk-based capital regulation is, most probably, too rigid a conception to bring banks' risk-taking behavior into line with the social optimum.

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With the theoretical and empirical foundation of capital rules as advocated by the Basel 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 frame of Blum's model by exploring the impact of the so-called precommitment approach on the risk-taking behavior of banks. According to this market-based regulatory approach 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 paper is organized as follows. Section 2 gives a short recap of Blum's model. In Section 3 the model is extended along the lines of the precommitment approach by imposing the regulatory requirement to stay liquid any time on banks. The aim is to explore the impact of this regulatory constraint on banks' risk-taking behavior. Section 4 concludes.

II. 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:

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

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

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 $p'(R_f) \geq -\dfrac{1}{R_f}$ 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 $C(0) = 0$. Convex cost functions indicate that banks are assumed to be operating in an incomplete competition environment enjoying some sort of local monopoly power[1]. 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

$$p'(X^*)X^* + p(X^*) = 0. \tag{1}$$

That is to say, barring any bankruptcy costs, a risk-neutral social planner chooses that level of risk that maximizes expected return $E[\tilde{R}|X]$.

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

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

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 not to be too high. Thus, limited liability alone does not suffice to cause excessive risk-taking in the given dynamic setting.

[1] *Blum* (1999) argues that banks with local monopoly power wanting to attract more deposits have to raise interest rates. In order to get a greater market share a bank will raise all its deposite rates. Hence, the banks' costs of deposits will be going up at an increasing rate. In section 3, we will introduce a further strong argument in favor of a strict convex cost function for banks whose deposits are under the umbrella of a deposit insurance scheme.

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 Basel Committee – a binding adequacy requirement in the first period, an increase in the requirement reduces the level of risk in the first period[2]. 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. Most importantly, the latter holds irrespective of the design of the risk-sensitive capital rule[3].

III. Risk-Optimization: Precommitment Approach Revisited

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).

[2] Under the direction of W. P. Cooke, the first chair of the Basel Committee, the Committee proposed that the minimum capital requirement for commercial banks be at least 8 percent of risk-weighted assets. In the following, by the term Cooke ratio we mean this particular risk-based capital rule.

[3] For example, the key implications of Blum's analysis hold under both regimes Basel I and Basel II. As compared with Basel I, risk-sensitive capital regulation à la Basel II only requires more sophistication in terms of credit risk measurement. That is to say, Basel II does not change the rules of the game from scratch. In a recent paper, *Blum* (2008) shows very clearly that under the Basel II-type advanced internal ratings-based approach banks do have a strong incentive to systematically understate their exposure to credit risks rather than report their risks faithfully. This may even be intensified in a setting which accounts for strategic interbank behavior.

Banking authorities in many countries (i.e., U.S., EU) 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 efficaciously banks' excessive risk-taking over time. 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 away rapidly. The recent financial crisis is just a further piece of evidence that questions the efficacy of risk-based capital rules in banking. Hence, it should come as no real surprise when, with the current crisis keeping to unfold, the search for alternatives to the Basel approach of banking regulation will set in anew.

In this soon-to-be-debate a regulatory approach which has been proposed by two U. S. economists (Kupiec/O'Brien (1995, 1997)), called the Precommitment Approach, is very likely to again play a prominent role (see, for example, Tarullo (2008)). 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 has been considered the touchy aspect of the precommitment approach. However, new suggestions have recently been brought forward, all of which aimed to remedy this shortcoming. For example, Taylor (2002, 2007) proposes that any bank should choose a capital threshold that is supposed to serve as regulatory yardstick. A bank falling below this threshold will be subject to supervisory actions such as being put under surveillance of regulatory authorities. Another proposal is that banks are forced by regulatory laws to keep as much liquid reserves in their books as needed to stay solvent any time.

In the following we are going to translate this liquidity-oriented precommitment approach into the language of Blum's dynamic model. In so doing, we make an attempt to explore the impact of this´regulatory philosophý on banks' optimal choices by comparing them with the first-best solution of the model as expressed in equation (1). It is easy to see that within the simple frame of the model the risk-neutral bank has an incentive to state the maximum possible loss to be as large as the amount of money needed to guarantee that the cost $C(D_0)$ of the bank at time $t = 1$ be fully covered. This becomes even clearer if one calls to mind that given that the banks' deposits are under the umbrella of a deposit insurance scheme the banks' cost function $C(D_0)$ also includes the rates for deposit insurance. The latter implies that the cost function of banks is indeed strongly convex as assumed by Blum (1999). An increase of deposit rates aimed at raising more deposits will also lead to an accelerating increase of insurance rates since a bank behaving like this is considered to be of higher risk from the viewpoint of the insurance company. Though the deposits are insured against failure the costs associated with issuing deposits are not.

That is to say, holding capital as large as the maximum possible loss simply amounts to meeting a binding liquidity constraint which is, of course, a very credible commitment in the eye of banking regulators, while observable and, thus, traceable. Solvency constraints like those are very similar to minimum liquidity requirements which have increasingly been pressed for lately by financial economists who consider the ongoing financial crises primarily to be driven by unsurmountable counterparty risks rather than by a shortage of capital (see, for example, Morris/Shin (2008) and Kashyap et al. (2008))[4].

Beyond that, in the given context, the precommitment approach comes very close in meaning to the approach of 'narrow banking' where the banks are required to hold 100 percent segregated reserves against checkable deposits (Freixas/Rochet (1997)).

In doing so, we state that the precommitment approach requires that the bank solve the following optimization program

$$\begin{aligned} &\max_{X,D_0,D_1,\lambda} p(X)\{X[(1-\lambda)W_0 + D_0]\}\overline{R} + [(\lambda W_0 R_f - C(D_0))\overline{R} + D_1\overline{R} - C(D_1)] \\ &\quad \textit{subject to} \quad \lambda W_0 R_f \geq C(D_0), \quad 1 \geq \lambda > 0. \end{aligned} \tag{3}$$

This optimization program represents a situation where banks promise the regulator to invest large enough a portion of equity into the riskless

[4] *Morris/Shin* (2008) point out that "recent events raise a fundamental challenge to the traditional approach to financial regulation that rests on identifying solvency with capital". Instead, the authors propose a liquidity requirement "which places limits on the composition of the balance sheet, not merely the relative size of equity to total assets".

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. As indicated above, since all depositors are protected by deposit insurance, for the bank to remain solvent at the end of period 1 it suffices to have enough funds available to pay the costs $C(D_0)$ associated with deposit-taking.

The optimality or first order conditions for (3) are

$$
\begin{aligned}
&p'(\breve{X})\breve{X} + p(\breve{X}) = 0, && p(\breve{X})\breve{X} - C'(\breve{D}_0) \geq 0, \\
&\breve{\lambda} \geq \frac{C(\breve{D}_0)}{W_0\,R_f}, && \overline{R} = C'(\breve{D}_1).
\end{aligned}
\tag{4}
$$

Obviously, a risk-neutral bank which is regulated according to the precommitment approach as outlined above, that is, which maximizes the expected value of equity subject to a binding liquidity constraint chooses a risk level that is socially efficient. That is, the bank chooses a risk level $\breve{X}$ where the marginal cost of increasing risk equals the marginal return on risk. This is exactly the risk level X^* that the social planner would choose (see equation (1)). Thus, as for the appropriate regulatory approach for public intervention in banking within the dynamic structure of Blum's model the precommitment philosophy supplemented with a binding liquidity requirement is socially superior to the risk-based capital adequacy philosophy á la Basel.

IV. 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 an insightful paper Blum (1999) shows that in a dynamic setting intertemporal effects can arise that render capital rules as advocated by the Basel 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 risk-weighted minimum capital requirement according to Basel I and Basel II, respectively.

In this paper an attempt was made to explore the impact of a liquidity-oriented precommitment approach, 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 credible 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 liquidity requirement chooses a risk-level which is socially optimal.

References

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Summary

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– A Note –

In a dynamic setting intertemporal effects can arise that render capital rules in banking as advocated by the Basel 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 Basel risk-based capital requirement. In this paper an attempt is made to explore the impact of the so-called precommitment approach, 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 standard 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 liquidity constraint chooses a risk-level which is socially optimal. (JEL G21, G28)

Zusammenfassung

Risikoverhalten und Solvenzbestimmungen im Bankensektor – Eine Anmerkung –

Kapitaladäquanzregeln, wie sie vom Basler Ausschuss für Bankenaufsicht empfohlen werden, können sich auf das Risikoverhalten der Banken negativ auswirken. Banken können durch risiko-gewichtete Eigenkapitalregeln dazu verleitet werden, höhere Risken als gesamtwirtschaftlich wünschenswert einzugehen, um mögliche zukünftige Eigenkapitalbeschränkungen zu vermeiden. Der Artikel zeigt, dass im Rahmen des dynamischen Modells von Blum (1999) Eigenkapitalbestimmungen gemäß dem sogenannten Precommitment Approach Banken zu einem gesamtwirtschaftlich wünschenswerten Risikoverhalten veranlassen. Banken geben dabei dem Regulator ihren möglichen maximalen Verlust bekannt und verpflichten sich gleichzeitig dazu, Eigenkapital im Ausmaß dieses Verlustes zu halten.