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Does a leverage ratio requirement increase bank stability?

Ilkka Kiema [a], Esa Jokivuolle [b,*]

[a] Department of Political and Economic Studies, and Helsinki Collegium for Advanced Studies, Fabianinkatu 24, P.O. Box 4, 00014 University of Helsinki, Finland
[b] Bank of Finland, Snellmaninaukio, P.O. Box 160, 00101 Helsinki, Finland

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ABSTRACT

Basel III has introduced a non-risk-weighted leverage ratio requirement (LRR) which complements the internal ratings based (IRB) capital requirements. It provides a backstop against model risk which arises if some loans get incorrectly rated and become toxic. We study the effects of the LRR on lending strategies and its implications for banks' stability. We show that the LRR might induce banks with low-risk lending strategies to diversify their portfolios into high-risk loans until the LRR is no longer the binding capital constraint on them. If the LRR is lower than the average bank's IRB requirement, the aggregate capital costs of banks do not increase. However, because the diversification makes banks' portfolios more alike the banking sector as a whole may become more exposed to model risk in each loan category. This may undermine banking sector stability. On balance, our calibrated model motivates a significantly higher LRR than the current one.

1. Introduction

The new Basel III framework contains a *leverage ratio requirement* (LRR) which has been added to supplement risk-based, internal ratings based (IRB) minimum capital requirements on banks, introduced already in Basel II. According to the current LRR calibration, banks must have a minimum of three percent of capital of non-risk-weighted total assets, including off-balance sheet items (see Basel Committee on Banking Supervision, 2011, p. 61).[1]

The Basel Committee on Banking Supervision (2009, pp. 2–3) argues that a LRR would "help contain the build up of excessive leverage in the banking system, introduce additional safeguards against attempts to game the risk based requirements, and help address model risk". The "gaming" of the requirements might include not just dubious practices, such as giving unrealistically low internal ratings to loans in order to reduce capital requirements, but also legitimate forms of regulatory capital arbitrage.[2] By providing an all-encompassing "floor" to capital requirements the LRR reduces incentives to such manoevres.[3]

In this paper we discuss the introduction of the LRR into the Basel framework, focusing on the third of Basel Committee's motivations to introduce it, i.e., the possibility that there is model risk embedded in the IRB capital requirements. These requirements are, in both Basel II and the revised Basel III framework, based on an asymptotic single risk-factor model by Vasicek (2002), and if the model is correct, bank capital suffices for covering the unexpected losses with a 99.9% probability.[4] To keep things simple, we

* Corresponding author. Tel.: +358 10 831 2309; fax: +358 10 831 2294.
E-mail addresses: ilkka.kiema@helsinki.fi (I. Kiema), esa.jokivuolle@bof.fi (E. Jokivuolle).

[1] It might be more logical to talk about a capital to assets ratio requirement or an inverse of a leverage ratio requirement. For simplicity, however, we henceforth use the term leverage ratio requirement keeping in mind that in actuality it is imposed in terms of a minimum capital to assets ratio.

[2] E.g., banks have shifted loan risks from the banking book to the trading book or to off-balance sheet items, often with the help of securitizations, coupled with too optimistic rating agency ratings. Before Basel III such manoevres have effectively resulted in lower risk-based capital requirements (see e.g. Acharya et al., 2013).

[3] Cf. Blum (2008) who shows that a LRR reduces the moral hazard which is associated with internal ratings based requirements because it reduces the profit that may be obtained by giving unrealistically low internal ratings to loans.

[4] There have been no major changes in the risk-weighting system of the IRB capital requirements when moving from Basel II to Basel III; the risk-weights are determined by the same function of the default probability of loans in both frameworks (Basel Committee on Banking Supervision, 2006, p. 64; Basel Committee on Banking Supervision, 2011, p. 39). See Basel Committee on Banking Supervision (2005) for an intuitive explanation of the way in which the Vasicek (2002) model is applied within the Basel II and Basel III frameworks.

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shall consider a competitive banking sector with loans of two types, called low-risk and high-risk loans, whose risks are determined by the Vasicek model. Such a setting has previously been used by Repullo and Suarez (2004) to study the allocational and welfare effects of the Basel II requirements.

As Repullo and Suarez (2004) have shown, when the IRB requirements are the only capital requirements in the model, banks have an incentive to specialize in either low-risk or high-risk lending. This is because – as banks have the obligation to use not just their capital but also their interest income for covering the losses from the defaulting loans – there is a positive probability that one of two specialized financial institutions fails and the other one does not.[5] In this case the owners of a "mixed portfolio" bank would have to use income from high-risk loans for covering losses from low-risk loans or vice versa. Hence, in order to take full advantage of limited liability, banks prefer to specialize. We view the specialized banking market, as described by Repullo and Suarez (2004), as a simplified representation of a real world banking sector where some banks have a portfolio which is sufficiently risky so that the LRR is irrelevant for them, while for other banks the LRR turns out to be a binding constraint.[6] We generalize Repullo and Suarez (2004)'s specialization result to our setting with the LRR by showing that some banks will hold a fixed ratio of low-risk and high-risk loans while the other banks hold only either low-risk loans or high-risk loans, depending on the type of equilibrium.

The key insight from these results is that banks can adapt to a relatively low LRR without a significant impact on loan interest rates, by simply reshuffling loans among themselves. In particular, banks previously specialized in low-risk loans, facing the LRR which would otherwise raise their funding costs, can maintain their (zero-)profitability by adding some high-risk loans to their portfolios. Banks previously specialized in high-risk loans will adopt some low-risk loans so that consequently, low-risk loans will be held by a larger number of banks and there will be fewer banks specializing only on high-risk loans. In the absence of model risk this will increase both welfare and bank stability. Such an adjustment through reshuffling of low-risk and high-risk loans works for LRRs which are lower than or equal to the average risk-based capital requirement of all loans in the banking sector.[7] For higher LRRs, both the reshuffling strategy of banks and loan interest rates would have to adjust and the aggregate amount of bank capital would have to increase. In this case, the welfare benefit from increased bank stability would have to be weighed against the welfare loss from increased capital costs of banks.

When discussing model risk we assume that economic agents (regulators, banks, and loan customers) base their actions on common estimates of the loan default probabilities, and we define model risk as the possibility that the common estimates might turn out to be false. More specifically, we assume that some bank loans turn out to have much higher default probabilities than expected by any agent in the economy; i.e., that they unexpectedly turn toxic. Our approach can be motivated by the model of Gennaioli et al. (2012), in which a bias which is called "local thinking" may make economic agents neglect some rare risks. Empirical examples of such shocks to default probabilities may be provided by the US subprime crisis and the European sovereign debt crisis.

We find that the reshuffling of loans induced by a leverage ratio requirement may be a double-edged sword because it causes both a positive diversification effect and a negative contamination effect. If, e.g., loans that have been taken for "low-risk loans" turn out to be riskier than the high-risk loans and the LRR lies within the range in which it does not force banks to increase their aggregate amount of capital, then the "reshuffling" has the consequence that each bank which originally specialized on "low-risk loans" now holds also high-risk loans. High-risk loans are now relatively less risky, but still subject to a higher capital requirement. Hence the diversification tends to make banks originally specialized on low-risk loans more stable. On the other hand, the reshuffling also has the consequence that the number of banks which have some "low-risk loans" in their portfolios (and are contaminated by them) grows larger. The policy implication suggested by our numerical results is that welfare is likely to be increased if the LRR is set at the highest level at which the banking sector can still adapt to it by reshuffling of loans, without having to adjust loan interest rates much. In our model with two loan risk categories, this LRR level equals the average IRB capital requirement of all the loans in the banking sector.

The rest of the paper is organized as follows. In Section 2 we recapitulate the main features of the Basel II IRB framework and present a generalized framework in which banks are also subject to a LRR. In Section 3 we discuss the two kinds of equilibria that the generalized model may have. In Section 4 we present a welfare function for our model, to be used in making some policy suggestions on the basis of our numerical results. In Section 5 we present the calibrated version of our model with which we analyze loan interest rates and bank stability both in the absence and in the presence of model risk in Section 6. Section 7 concludes.

2. Model

We assume that there are two kinds of firms, called low-risk (L) and high-risk (H) firms, a competitive banking sector, and a government which regulates banks. There are just two periods, $T = 0$ and $T = 1$ (see Fig. 1). At time $T = 0$ each bank first collects capital from its owners and deposits from depositors, and lends them out to the firms as loans of size 1.

The low-risk and high-risk firms invest in low-risk and high-risk projects, respectively. The projects are of size 1, and their only source of funding are the bank loans. The number of firms of type $\eta(\eta = L, H)$ is assumed to be a constant, denoted by n_η. Hence, we implicitly assume that the demand for loans is inelastic and independent of interest rates.[8] We refer to the loans to the two

[5] The equilibrium interest income of banks depends, not just on loan risks, but also on the market structure of the banking sector. Hence, if one wanted to construct capital requirements which would make the actual bank failure rates – rather than just the probability that bank capital suffices for unexpected losses – identical for all banks, one would have to make the capital requirements depend on the market structure of the banking sector. Repullo and Suarez (2004) discuss such capital requirements in the context of a perfectly competitive banking sector. However, they also show that the capital requirements which harmonize bank safety do not maximize welfare.

[6] As detailed bank portfolio data is not publicly available, it is difficult to judge how often banks actually are affected by the additional LRR. However, differences in banks' general risk profiles are nevertheless evident, indicating some degree of specialization. For instance, the share of net loans to customers in relation to trading assets (often seen as riskier business) may vary greatly (for a sample of leading European banks, see Liikanen, 2012, Table A3.2). There is also evidence that banks may focus on either corporate or retail loans, the former of which are normally seen as riskier. For instance, in a sample of the largest Nordic banks, we find variation in the ratio of corporate and commercial loans to residential mortgage loans in the range of 50–150%.

[7] Hence, the critique by e.g. some low-risk lending institutions in Europe against the LRR that the LRR will unjustly raise their cost of capital is not necessarily generally justified.

[8] Like in any model with the assumption of inelastic demand, which we adopt for simplicity, inelasticity can be given a variety of interpretations. For example, we may think of the firms as small firms run by entrepreneurs who are competent only in running a low-risk or a high-risk firm. In this case the number of firms may be thought of as being determined by the differing opportunity costs that being an enterpreneur has for different individuals, e.g by the different salaries w that the entrepreneurs could earn elsewhere in the economy. The case of a constant number of firms can then be viewed as a case in which the opportunity cost w is so low for all the considered entrepreneurs that an increase in the interest rate does not reduce their number. With inelastic loan demand, firms make positive profits in our model. We have also extended our model to the case of elastic loan demand, but the main results stay the same. The extended results are available from the authors upon request.