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Credit derivatives, capital requirements and opaque OTC markets

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ABSTRACT

In this paper we study the optimal design of credit derivative contracts when banks have private information about their ability in the loan market and are subject to capital requirements. First, we prove that when banks are subject to a maximum loss capital requirement the optimal signaling contract is a binary credit default basket. Second, we show that if credit derivative markets are opaque then banks cannot commit to terminal-date risk exposure, and therefore the optimal signaling contract is more costly. The above results allow us to discuss the potential implications of different capital adequacy rules for the credit derivative markets.

1. Introduction

This paper investigates the optimal design of credit derivative contracts when banks have private information about their loan portfolios and are subject to capital requirements. The need for this study comes from two main events that have characterized the last decade.

First, in most jurisdictions around the world bank capital regulations are changing from Basel I[1] to Basel II. While in the former capital requirements depend on asset risk buckets and credit derivatives are not considered, in the latter capital requirements are based on maximum losses due to loan default.[2]

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[1] See BCBS (1988).

[2] This is the Value at Risk approach. See BCBS (2005).

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Second, the recent advent of credit derivatives has provided banks with a range of flexible instruments for selling loans and transferring loan risk. For example, pure credit derivatives, such as plain vanilla credit default swaps (CDSs), allow banks to buy protection on a single exposure or on a basket of exposures. Similarly, portfolio products, such as Collateralized Debt Obligations[3] (CDOs), enable banks to sell risks from their entire loan portfolio.[4] One main advantage of these new instruments over the traditional forms of credit risk transfer is their flexibility, which helps mitigate informational problems. Banks differ in their abilities to screen their loans, which are unobservable by the credit risk-buyers. Consequently, they face an asymmetric information problem when they want to sell risks from their portfolios. Banks with superior abilities design credit derivative contracts to signal their quality in order to overcome the adverse selection problem generated by the asymmetry of information. However, as the recent sub-prime crisis has highlighted, the growth in volume and diversity of credit derivative products has not mitigated the problem of the lack of transparency in such markets.[5] Market opacity may affect the design of credit derivative contracts since it prevents banks from credibly committing to retain part of the risk of their portfolios.

The debate over the sub-prime crises raises two policy-relevant research questions that have not yet been considered in the literature. First, how do the different institutional settings—namely, the introduction of new regulatory capital requirements based on maximum loss—influence the optimal design of contracts that banks may offer to signal their own types? More specifically, is the equity tranche holding, largely used by banks in recent years, an optimal signaling contract under the new Basel II regulatory framework? Second, how does the opacity in the credit derivative markets affect the design of the credit derivative contracts? Our analysis allows to answer both questions by determining the optimal security design.

We show that the optimal signaling contract when banks are subject to maximum loss capital requirement is a binary credit default basket (Binary CDB), i.e., a credit default basket where the payoff is a fixed amount that can be considered a penalty payment when defaults are above a certain level. Accepting exposure to loss is a credible signal that a bank's probability of loss is low. When banks can commit to loss exposure and capital requirements impose a dissipative cost of exposure based only on maximum losses, the cheapest way for banks to signal their superior ability is to increase exposures while minimizing the maximum losses. This leads to equal exposures across states and thus to the binary CDB contract. In contrast, if a bank cannot commit to terminal-date risk exposure because of opacity, it must signal its superior ability with its initial-date price. However, since a high-type bank does not have any competitive advantage over low-type banks in burning its money with underpricing, such signaling is very costly, much more than signaling under transparency.

The above results allow us to investigate the potential implications of different capital adequacy rules for the optimal separating contracts, and whether existing contracts are consistent with our predictions. We show that the optimal contracts are largely dependent on bank regulation and argue that in the future we will observe an evolution of different credit market instruments. The introduction of Basel II may prevent the use of the equity tranche as a signaling device, as it requires all first loss positions to be deducted from bank capital. We suggest that, under mild conditions, contracts like Binary CDB are optimal. However, the opaqueness in the credit derivative market could make the use of these signaling contracts quite expensive. The recent implementation of Basel II does not allow us to empirically test predictions of our model. Nevertheless, we investigate some credit market innovations that are in line with them, such as the BISTRO product and credit derivative product companies.

The paper is organized as follows. The next section describes the related literature. In Section 3 we present the basic model and we analyze the benchmark case with symmetric information. In

[3] A CDO is an asset-backed security whose underlying collateral is typically a portfolio of bonds or bank loans. A CDO cash-flow structure allocates interest income and principal repayments from a collateral pool of different debt instruments to a prioritized collection of CDO securities, usually called tranches. A standard prioritization scheme is known as simple subordination: senior CDO tranches are paid before mezzanine and lower-subordinated notes, with any residual cash flow paid to an equity tranche.

[4] Surveys of BBA (2002, 2006), BIS (2003, 2005) and Minton et al. (2006) show that the volume of trade in credit derivatives has seen a huge increase in recent years.

[5] For the role of transparency in credit derivative markets during the recent sub-prime crisis, see BIS (2007).