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Optimal clearing margin, capital and price limits for futures clearinghouses

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Abstract

We provide a model for a futures clearinghouse to use for setting optimal levels of clearing margin, capital and price limits, which minimizes the costs to clearing firms and simultaneously protects the clearinghouse from default by clearing firms. We show how to estimate the capital requirement, which supports the clearinghouse's residual default risk that is not covered by the clearing margin. We apply our model to the Winnipeg Commodity Exchange and demonstrate that price limits reduce the sum of optimal clearing margin and capital to a level that is substantially lower than that required in the absence of price limits.

JEL classification: G29; G13; G32
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1. Introduction

Futures clearinghouses guarantee the open futures positions of clearing firms, and manage the default risk resulting from this guarantee, by requiring that

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clearing firms deposit margin, by marking open futures positions to market daily, and by calling for additional margin, if clearing firms' daily losses exceed their margin. If a clearing firm's loss is less than its margin, the clearinghouse simply transfers funds from the losing firm to winning clearing firms. However, if a clearing firm's loss exceeds its margin, and it defaults, the clearinghouse will have to fulfill its guarantee. Therefore, the clearinghouse requires a capital contribution from clearing firms, in the form of a security deposit (Chicago Mercantile Exchange, 2003), or as a contribution to a fund known as a 'guaranty' (New York Mercantile Exchange, 2003) or as a 'clearing' (Winnipeg Commodity Exchange Clearing Corporation, 2003; Canadian Derivatives Clearing Corporation, 2003) fund, or by a purchase of shares in the clearinghouse (Board of Trade Clearing Corporation, 2002–2003). If a clearing firm cannot meet its financial obligations to the clearinghouse and defaults, the clearinghouse will use the defaulting firm's margin and its capital, in that order, to meet its obligations. Capital contributions of $875 million in 2003 to the four largest futures clearinghouses in the US, and margin contributions many times larger in magnitude (Rosenzweig, 2003), attest that both margin and capital pose substantial costs to clearing firms. However, the near failure of the Hong Kong Futures exchange in 1987 (Cornford, 1996) because its clearinghouse had insufficient funds, emphasizes the need for adequate levels of margin and capital. Therefore, we investigate how a futures clearinghouse can set optimal levels of the clearing margin, capital and price limits, which will minimize the costs to clearing firms and, simultaneously, provide protection against default risk to the clearinghouse.

We use a framework introduced by Brennan (1986), who points out that competition between futures exchanges explains why very few of the many new futures contracts succeed, and concludes that successful contracts will minimize the total costs of futures trading. Brennan models an exchange's choice of the optimal margin and price limits that will minimize traders' total costs, which include the opportunity cost of the margin, the liquidity cost incurred if a price limit is hit and trading is interrupted, and the legal, reputation and other costs that a trader incurs if he reneges on his futures position. A trader has an incentive to renege if his daily loss exceeds his margin. In the absence of price limits, the exchange could minimize the probability of reneging and thus, the cost of reneging, by setting the required margin at high levels. Margin requirements could be reduced by imposing daily price limits. When a price limit is hit, the trader is unable to observe his 'true' loss, and is forced to conjecture what it is. If he believes that it exceeds his margin, he has an incentive to renege. Brennan explains that a futures contract can be made self-enforcing, a property under which all parties to the contract adhere to ''its terms without the threat of legal action'', by setting the margin and price limits, such that when a price limit is hit, the expected loss to the trader is less than or equal to his margin. Price limits thus act as a substitute for margin, which can now be set at reduced levels.

We extend Brennan's model to the problem that futures clearinghouses face and set the optimal clearing margin, capital and price limits, which will minimize clearing firms' costs. We describe Brennan's model and our extension in Section 2. The