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Anti-cyclical versus risk-sensitive margin strategies in central clearing ☆

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ABSTRACT

We examine the effects of different margin strategies on the loss distribution of a clearing house during various crises of different stock price trends, volatility expectations, bid-ask spreads, and funding liquidity. We simulate a hypothetical clearing house active on the US stock futures market 2008–2015, investigating its micro-level stability. We find that it might be optimal to replace the strict risk-sensitive margin strategy by more anti-cyclical ones. The extreme anti-cyclical strategy (full smoothing), however, was suboptimal on this sample. Our results may help institutions elaborate their margin strategies to develop risk management systems in line with new regulations.

1. Introduction

A central counterparty (CCP or clearing house) is an organization that reduces the counterparty risk for traders by becoming the counterparty to both the buyer and seller, guaranteeing the terms of a trade, even if one party defaults on the agreement. CCPs operate the daily clearing and settlement and a multi-stage guarantee system. The first stage includes margin accounts designed to cover clients' payment defaults. Each client is obliged to keep a minimal level of margin on his/her account. If this margin account is insufficient to cover the client's loss and he/she fails to meet his/her payment obligation, then the second stage absorbs the loss via a collectively financed guarantee fund. Finally, the CCP's equity safeguards the payments of all trading partners.

This paper's focus is purely microeconomic. The effects of different margin strategies on the first stage losses of the CCP (due to the insufficiency of margin accounts) are analyzed and the optimal mechanism minimizing these losses investigated. This question has significant practical relevance, since most CCPs are just commencing adopting new rules into their risk management policies. We have thus disregarded the aspects of systemic risk, assuming that the investigated CCP is small. Hence, its activity should have no impact on the market prices.

We simulated the operation of a hypothetical clearing house active on the US stock futures market and investigated the optimal margin strategy between 2008 and 2015. In CCP models in the literature, the clearing houses' positions are given exogenously (Duffie et al., 2015; Heller and Vause, 2012; and Barker et al., 2016). A distinctive feature of our model is that the CCPs' positions stem from the simulation of trades, since the risk exposures are endogenously determined by modeling the clients' trading activity considering overall market conditions (stock price trends, volatility expectations, bid-ask spread,

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and funding liquidity). The anti-cyclical margin strategies can be optimal not only for the regulator representing the entire community's interests, but also for a clearing house aiming to minimize its losses. Anti-cyclical margin strategies perform especially well in minor crises like the flash crash.

In Section 2, we summarize the literature. In Section 3, we describe the general model used for the agent-based simulation and define four different margin strategies. In Section 4, we analyze the impacts of the margin strategies on the clearing houses' loss distribution. Finally, in Section 5, we derive conclusions.

2. Literature review

The CCPs' economic use and operation were detailed by Pirrong (2011). Kiff et al. (2009, 2010), Cont and Kokholm (2014), Loon and Zhong (2014), and Heath et al. (2016) focused on the effects of central clearing from a macroeconomic perspective, examining whether CCPs really contribute to reducing systemic risk.

Another important research line takes a microeconomic approach, and the concept and rationale of margining are investigated for a single asset under a given price process. Figlewski (1984) found the margin levels of the New York Stock Exchange to be too high in his analytical model. Brennan (1986), Fenn and Kupiec (1993), and Koeppl et al. (2012) examined efficient contracting for futures trading. Lam et al. (2004) compared the performance of three margin setting methodologies based on prudentiality and opportunity cost. These models focus on bilateral trading without modelling the operation of a clearing institution.

Barker et al. (2016) modelled credit and liquidity risk considering a feedback mechanism between the clearing members' default and market turbulences. Their CCP model shared several similarities to ours: more clearing members, a value-at-risk (VaR) based margin setting, and the investigation of the generated loss. However, they focus on the risks associated with central clearing and the feedback effect and do not consider different margin strategies.

Several authors argued to modify the margin system to consider the risk derived from the joint distress of the clearing members (Lopez et al., 2017) or the additional risk of crowded trades (Menkveld, 2017). In our model, the joint distress of the clients is incorporated by assuming the probability of the default to depend on a common factor which is the overall funding illiquidity measured by the LIBOR-OIS spread (i.e. by the difference between the London Interbank Offered Rate and the Overnight Indexed Swap rate). The problem of crowded trades, however, does not occur, since clients are supposed to be uninformed noise traders. Furthermore, the price is given exogenously, i.e., independently of trading activity. These are reliable assumptions if the clearing house is small relative to the market. This setting lets us focus on how clearing houses can balance between the confronting requirements of micro-level prudency and anti-cyclicality.

As the global financial crisis of 2007–2008 shed light on the serious impact of counterparty risk, the importance of CCPs has grown significantly. To strengthen the international financial system, the G20 leaders agreed at the 2009 Pittsburg Summit that "all standardized over-the-counter derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest" (G20, 2009, 13). By 2016, approximately 60% of over-the-counter derivatives were centrally cleared (Wooldridge, 2016). Therefore, the risk management of CCPs is crucial for the financial systems' stability. In Europe, the European Market Infrastructure Regulation (EMIR, 2012) regulates the trading of over-the-counter derivatives and the CCPs' activities.

Furthermore, the global financial crisis has drawn attention to the problem of pro-cyclicality. Before the crisis, the regulation concentrated on the micro-level financial stability. Financial institutions were motivated to invest heavily in sophisticated risk management systems to become as risk-sensitive as possible. Risk-sensitivity implies that the required collaterals (capital buffer, haircut, margin, etc.) are closely linked to the expected short-term (2–10 days) volatility. However, Danielsson et al. (2001), Brunnermeier and Pedersen (2009), and Danielsson et al. (2013) pointed out the pro-cyclical nature of this regulation. For example, suppose that due to an external shock, the prices drop suddenly, and volatility expectations increase. According to the risk-sensitive regulation, market players are then required to provide immediate additional collaterals. However, as this occurs frequently, market risk and liquidity risk coincide, and the funding liquidity is not fully available. This leads to the liquidation of positions and the fire sale of risky assets resulting in a further downward pressure on the prices. Therefore, risk-sensitive regulation is pro-cyclical: it increases the volatility and makes systemic risk endogenous.

Recently, new anti-cyclical risk management techniques have been introduced in many fields, including CCPs. These margin strategies aim to smooth out the margin requirements over time. For practical implementation, EMIR (2012) offers the three following options:

(a) applying a margin buffer at least equal to 25% of the calculated margins which is allowed to be temporarily exhausted in periods when calculated margin requirements are rising significantly;
(b) assigning at least 25% weight to stressed observations in the lookback period calculated by Article 26;
(c) ensuring that its margin requirements are not lower than those that would be calculated using volatility estimated over a ten year historical lookback period.

It is clear that anti-cyclical margins contradict the primary purpose of the margin itself, i.e., ensuring sufficient coverage in any given market circumstance. This creates a trade-off between the principles of risk-sensitivity and anti-cyclicality