Optimal Margining and Margin Relief in Centrally Cleared Derivatives Markets

Radoslav S. Raykov

Bank of Canada
Financial Stability Department

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1The views contained in this presentation are the author’s and do not necessarily represent the views of the Bank of Canada.
The New Financial Landscape: Central Clearing

- The G-20 reforms require that standardized OTC derivative transactions should be centrally cleared by clearinghouses, also known as central counterparties (CCPs).
- CCPs are regulated entities with proper risk management standards, using many risk-mitigation measures such as collecting collateral (margin).
- A policy challenge posed by clearinghouses is that their collateral requirements can rise sharply in times of stress, reducing market liquidity and exacerbating economic downturns. (Brunermeier and Pedersen, 2009)
- To address this, international regulation requires clearinghouses to reduce the procyclicality of margin requirements (PFMI §3.6.10)
- Today I am going to talk about one of the more common approaches, known as through-the-cycle (TTC) margining.
Through-the-cycle Margining

- Regulatory authorities are concerned with procyclical margins because they believe jumps in margin requirements inhibit trading (markets freeze).
- Their proposed solution, therefore, is to smooth the margin requirement through the cycle: undercollect in bad times, overcollect in good times.
Why can TTC Margining be Challenging?

- Primarily, because it implies higher mutualized risk in times of stress: credit risk not collateralized by margin is shared through a common clearing fund.
- More risk sharing distorts incentives, could amplify risk-seeking behavior.
- Based on these concerns, member banks could either reject TTC margining or stop trading. Both are a challenge to regulators.
- Example: In 2008, a certain derivatives CCP proposed to its members a form of TTC margining, which was rejected with a majority vote from the members’ Risk committee.
- This example runs contrary to the intuition of regulatory authorities.
- This paper offers some answers why.
Main results

- TTC margining in stressed markets can increase as well as reduce trading activity; the outcome depends on financial market volatility and on the clearinghouse members’ risk aversion.

- When banks are not too risk averse, in high-volatility periods they are more concerned with collateral cost than with mutualized risk, and are willing to take advantage of margin relief.

- When banks are more risk averse, they may not want to take advantage of TTC margin relief, even when it is socially optimal. Risk considerations outweigh lower collateral costs.

- This creates a challenge for policy-makers: banks may reject “smoothed” TTC margins.

- Suggested policy tool to overcome the challenge: increase the opportunity cost of default (for example: non-conforming member penalties, deeper collateral haircuts).
Model: Economic Environment

- Economic environment similar to Santos and Scheinkman (2001)
- Two groups of risk-averse banks face uncertainty about their (random) endowments in a consumption good, and trade in a stylized derivative contract to hedge that uncertainty
- Two states of nature, $s_1$ and $s_2$, and 3 possible endowment outcomes: $y > x > z$. One bank gets $x$ for sure, the other gets lottery between $y, z$
Model: Central Counterparty

- Trading takes place through a central counterparty, which sets a margin requirement $\Phi \in [0, 1]$
- A bank can take either a positive (long) or a negative (short) position $\theta$ in the contract, pledging $|\theta|\Phi$ as collateral.
- In the event of default, $|\theta|\Phi$ is the minimum delivered amount to the CCP.
- Default losses accrue to the CCP, which redistributes them across the large number of remaining survivors.
- To finance the cost of defaults, the CCP delivers $K < 1$ per dollar of obligation to banks.
- Think of $K$ as the CCP’s delivery rate, net of expected clearing fund losses ($1 - K$). It is a measure of the protection provided by the CCP.
- The relationship between the delivery rate and collateral plays a key role for the results that follow.
Model: Concavity

- A key aspect: the tradeoff between margin and clearing fund is not linear.
- Low margin requirements are likely to incentivize members to take on more risk outside the CCP, resulting in higher default probabilities for members (moral hazard).
- As a result, more uncollateralized risk is held at the clearinghouse.
- Since clearinghouses mutualize credit risk that is not collateralized, this implies more risk sharing between clearing members in times of stress.
- This is similar to how in insurance, accident probability is commonly assumed a decreasing, convex function of the deductible.
**Model: Concavity**

- Moral hazard implies that the probability $\pi$ with which a member delivers fully its obligation to the CCP is increasing in the margin requirement $\Phi$.
- Or equivalently, that the degree of protection $K$ the CCP provides members is increasing, concave in the margin requirement $\Phi$.

![Graph showing the relationship between $\pi(\Phi)$, $K(\Phi)$, and $1 - \pi$](image)

- $K(\Phi) = \pi + (1 - \pi)\Phi$
- $\pi(\Phi) = \text{concave in } \Phi$
- $\pi(0) = \pi$, $\pi(1) = \bar{\pi}$
- $\pi'(0) = \infty$, $\pi'(1) = 0$
Model

- Taking into account the $K(\Phi)$ relationship, each bank chooses an optimal trading position, $\theta$, and an amount $D(\cdot)$ to deliver in each state $x, y, z$

$$\max_{\theta, D} EU = \frac{1}{2} \left[ u(c_x) - \lambda \max\{-\theta - D(x), 0\} \right] + \frac{\pi}{2} \left[ u(c_y) - \lambda \max\{\theta - D(y), 0\} \right] +$$
$$+ \frac{1 - \pi}{2} \left[ u(c_z) - \lambda \max\{\theta - D(z), 0\} \right],$$

where

$$c_x = x - D(x) + \max\{\theta, 0\} K$$
$$c_y = y - D(y) + \max\{-\theta, 0\} K$$
$$c_z = z - D(z) + \max\{-\theta, 0\} K,$$

subject to the constraints

$$z \geq \max\{\theta, 0\} \Phi; \quad x \geq \max\{-\theta, 0\} \Phi;$$
$$D(y), D(z) \geq \max\{\Phi \theta, 0\}; \quad D(x) \geq \max\{-\Phi \theta, 0\}.$$
Proposition

The relationship between trading volume $\theta$ and margin $\Phi$ is non-monotonic.

a) Trading volume $\theta$ is increasing in margin $\Phi$ at low levels of margin and decreasing at high levels of margin.

b) There exists an interior level of margin $\Phi_M \in (0, 1)$ where trading position $\theta$ is maximal and where $(d\theta/d\Phi)|_{\Phi_M} = 0$. 
Results

a) $|y - z| = \text{high}, \; R_A < 1/z$

b) $R_A > 1/z$

Proposition

a) Given sufficiently high volatility $|y - z|$, and sufficiently low absolute risk aversion $R_A < 1/z$, the bank-optimal margin is to the left of the volume-maximizing margin level ($\Phi_B < \Phi_M$).

b) Given and sufficiently high absolute risk aversion $R_A > 1/z$, the bank-optimal margin is to the right of the volume-maximizing margin level ($\Phi_B > \Phi_M$).
Privately vs. Socially Optimal Margin

- But where does the bank-optimal margin $\Phi_B$ fall with respect to the socially optimal margin $\Phi_S$?
- Assume regulators want the margin at the socially optimal level
- Socially optimal includes spillovers (costs of default and benefits of trade)

**Proposition**

*If the following conditions hold:*

1) Risk aversion is sufficiently high so that $R_A > 1/z$.

2) The social benefit from trade exceeds the expected social cost of default on a per-dollar basis, so that $b > c(1 - \pi)(1 - \Phi)$.

*Then there exists a sufficiently large value of $b > 0$ for which $\Phi_B > \Phi_S$.*

- This is a challenge for policymakers. In this environment banks will either reject TTC margining, or stop using the CCP.
Policy Challenge

- Member banks often have substantial influence over the clearinghouse’s collateral policy.
- When the bank-optimal margin exceeds the socially optimal one, banks will reject TTC margining.
- Alternative policy tools are needed to motivate clearinghouse members to agree to smoothed margins in stressed periods.
- Something must compensate the banks for their increased mutual risk exposure through the clearing fund.
Suggested Solution

- Clearinghouses have significant ability to control how costly it is to default for a member.

- They can confiscate pledged resources, impose additional fines, force close out positions, apply deeper haircuts to collateral.

- Recall the “disutility from default” term in the bank’s EU function, \( \lambda \max\{\ell - D(x), 0\} \), where \( \lambda \) is the default penalty (the marginal disutility from a dollar defaulted)

- The parameter \( \lambda \), therefore, is under the CCP’s control and can be changed over the cycle.

- TTC margining increases bank risk exposures through the CCP’s clearing fund in times of stress, but increasing the opportunity cost of default \( \lambda \) mitigates risk-taking incentives, as default becomes more costly.

- Therefore increasing \( \lambda \) should help bring down the bank-optimal margin (banks agree to margin relief)
Suggested Solution

**Proposition**

*Increasing the default penalty $\lambda$ will motivate member banks to agree to margin relief (a reduction in $\Phi_B$), provided that the bank’s non-default probability $\pi$ is sufficiently elastic to changes in $\lambda$:*

$$\pi'(\lambda) \geq \frac{1}{\lambda}.$$
Suggested Solution

- Suitably varying $\lambda$ over the cycle may be the appropriate policy to mitigate the increased risk sharing that TTC margining causes in stressed periods.
- For practical implementation, the clearinghouse must have enough discretion to change $\lambda$.
- Communication with regulators is essential to get the right result:
  - Changes to risk management require regulatory approval
  - Recall that margin relief could depress trading if implemented without discretion
- TTC margining should not be implemented without a careful survey of market volatility and clearing members’ risk attitudes.