Compression as an Alternative to Central Clearing

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Abstract

We study the ability for trade compression, defined as the reduction of gross trades in a market through bilateral or multilateral netting, to reduce default risk in an over-the-counter (OTC) asset market using a tractable model that incorporates nonpayment from the worst-performing financial institution in each state of the world. Although compression reduces capital costs for participants, we show that maximal compression is generally inefficient from a systemic risk perspective. We show that a social planner trying to minimize total defaults will want to compress out any trade cycles but will also want to incorporate some intermediation to help absorb potential losses. Our numerical simulations suggest optimal trade compression can perform similarly well to a centrally cleared market and may outperform central clearing in the presence of highly risky market participants by shielding safer participants from the collapse of riskier participants. Our results suggest that trade compression, when performed to reduce risk rather than simply to reduce gross notional, may be a viable alternative to central clearing for markets where central clearing is infeasible or undesirable.

Background

Central Clearing: A system where bilateral (derivatives) contracts are routed through a central counterparty (CCP). That is, a trade between Bank 1 and Bank 2 is replaced by two contracts (novation): one between Bank 1 and the CCP, and the second between the CCP and Bank 2. The CCP is the counterparty to all trades, sets margin requirements, guarantees payments, and absorbs and distributes losses. Trading through the CCP also nets all payments. Central clearing has been touted as a way of reducing (systemic) risk, and after the 2008 financial crisis, the G20 leaders agreed that all standardized over-the-counter (OTC) derivatives should be centrally cleared.

Trade Compression: A process of effectively tearing up offsetting contracts between over-the-counter (OTC) market participants. Compression is used primarily as a way of reducing gross notional in derivatives markets (to simplify books and reduce regulatory requirements), and academic studies have focused primarily on reducing gross notional (D'Errico and Roukny, 2021) rather than reducing risk.

The Problem: Central clearing is not perfect.

- Different CCPs in different assets can impose excessive margin and generate inefficient netting (Duffie and Zhu, 2011), made worse by directional traders and systemic risk factors (Kubitza et al., 2019).
- Central clearing also reduce the incentives to acquire information and monitor, may favor trading by riskier market participants, and favors derivative claims in bankruptcy (Pirrong, 2009).
- Central clearing may also be infeasible for cross-border or non-standardized derivatives.

Common theme: central clearing removes the benefits of a bilateral structure.

Our Paper: We look at the ability for trade compression, which does maintain bilateral positions, to reduce risk in OTC derivatives markets. We show that optimal compression is often not maximal compression as this removes too much valuable intermediation. Our numerical results suggest that optimal compression with intermediation can result in similar risk to central clearing.

Model

Our model has:

- *n* banks (dealers), each of which has clients external to the model
- 1 OTC asset, with positive or negative payoffs for long position
- 2 time periods: before and after payoff is realized

We consider a planner's problem: minimized expected number of defaults subject to two optional constraints:

- Net position targets for each bank (to model trade compression that leaves net positions unchanged)
- Maximal bilateral position constraints (to model bilateral risk tolerances or conservative compression)

Key innovation: our model features non-repayment by only the most fragile bank in each state of the world. All payment functions have only one kink, and default probabilities can be calculated in closed form. This overcomes the problem of analytical intractability (Eisenberg and Noe, 2001) while still realistically featuring the consequences of the most important defaults.

Optimal Compression

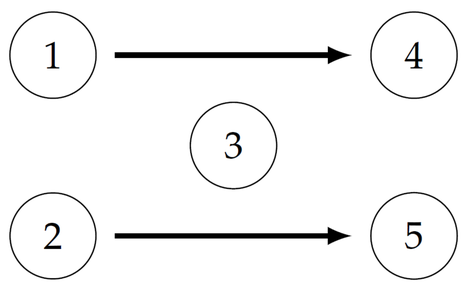
We can prove several results:

Proposition 1: For all the social planner's problems, optimal bilateral allocations feature no cycles. (That is, we do not have that Bank 1 is long with Bank 2, Bank 2 is long with Bank 3, …, Bank *m-1* is long with Bank *m*, and Bank *m* is long with Bank 1.)

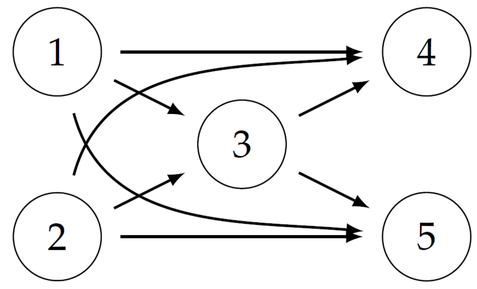
Proposition 2: If net exposures are sufficiently small, allocations are transitive. That is, if Bank 1 is long with Bank 2, and Bank 2 is long with Bank 3, then Bank 1 is long with Bank 3 (as long as no position limits bind).

More importantly, any optimal allocation has a directional structure. Banks are ordered by their (equilibrium) marginal default probability with respect to their own net exposure. Any trades have the lower marginal probability bank as the long party. Furthermore, if all net exposures are not too large, all pairs with different marginal default probabilities trade. This leads to the following key result.

Remark: Maximal compression is generally not optimal.



Suboptimal maximal compression.



Optimal directional compression. No loops, but some diversification and intermediation.

Maximal compression (left) would not use Bank 3's equity as a buffer. Instead, it is optimal (right) to diversify and to increase the gross notional by having some trades intermediated through Bank 3.

Numerical Comparison to Central Clearing

From (currently uncalibrated) numerical exercises, we have different behavior for optimal compression depending on how risky market participants are.

Low-risk System	High-risk System
Similar expected number of defaults to central clearing	Fewer expected defaults than with central clearing
Heavy use of intermediation	Light use of intermediation (shield non-directional agents from risk)
"Normal" comparative statics: trade less with riskier participants	"Saddle point" comparative statics: direct trading increases between riskier agents to shield others

Next Steps

- Calibration to market data.
- Analytical characterization of the optimal position in the network.
- Analysis of effects on information incentives.

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