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, taking into account the benefits of netting and the potential for the emergence of default-risk shifting through systemic interdependencies. 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) and a Maximal bilateral position constraint (to model bilateral risk tolerance or conservative compression). Our model features non-linear preferences, which allow for a tractable model that incorporates nonpayment from defaulting agents. 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Model

我们考虑一个规划者的问题：最小化预期违约数，同时满足两个可选约束：对每个银行的净头寸设定了一个目标（可以实现交易压缩而不改变净头寸）和一个最大双边头寸限制（可以实现双边风险容忍度或保守压缩）。

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.

Numerical Comparison to Central Clearing

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

**Low-risk System**

- Similar expected number of defaults to central clearing
- Heavy use of intermediation

**High-risk System**

- Fewer expected defaults than with central clearing
- 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.

References


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