Daisy Chains and Non-cleared OTC Derivatives

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The non-cleared over-the-counter (OTC) derivative market is estimated at $493 trillion [1]. One of the central triggers of the 2008 Financial Crisis was financial institutions' excessive exposure to counter-party risk. These exposures peaked at over $4.5 trillion in 2008 [1]. The response of the global regulatory community to the financial crisis has been to introduce regulations and standards aimed at reducing the amount of counter-party credit risk in the financial system. These initiatives gave rise, for example, to the introduction of mandatory clearing for certain common classes of derivatives (cleared derivatives) and more recently the introduction of similar standards for non-cleared derivatives [2]. The primary means promoted to mitigate risk are mandatory variation margin (collateral against today's value) and mandatory initial margin (collateral against the change in valuation in the event of default). The total amount of initial margin introduced as a result of these changes is estimated at $315 billion for US banks alone [3]. The regulatory expectation is that most derivatives classes will ultimately be subjected to mandatory clearing; however, the current volume and the slow rate of convergence toward mandatory clearing suggest that large volumes of derivative contracts will continue to be subject to the non-cleared OTC regime for the foreseeable future.

	Cleared OTC	Bilateral OTC
Counterparties	CCP Clearing Houses	Any Market Participant
Product Scope	Standardized IR Swaps and CDS	Non-cleared OTC Derivatives
Variation Margin	Yes	CSA
Initial Margin	IM posted to CCP	Bilateral Exchange from 2016
IM Methodology	Proprietary (Historical VaR)	ISDA SIMM

Figure 1: Treatment of cleared and non-cleared derivatives

The implementation of the initial margin regulations faces considerable legal, operational and quantitative challenges. One of the key responsibilities of any firm

is to maximize shareholder return. This mandate incentivizes financial institutions to minimize the collateral posted, subject to specified regulatory constraints. However, as a derivative is a contract between two or more parties, no one firm can do this alone. Inadvertently, hedging gives rise to inefficient trading, where the risk is moved around the system in a sub-optimal way, consuming initial margin, a scarce financial resource. This daisy-chain of hedging derivative contracts creates unnecessary counter-party risk. The over-connectivity of the financial system is exactly what lead to the down fall of several large banks: the firms' financial resources were insufficient to cover default risk, which set off a domino effect along the daisy chain of contracts. The search for efficiency seeks to eliminate unnecessarily long daisy chains and the overall amount of counter-party risk in the financial system.

No one financial institution can see the daisy chains throughout the system and set the optimal initial margin; therefore, there is a natural collective action problem to be solved. This problem can be solved by the anonymous pooling of risk sensitivities needed to compute initial margin. For example, if we look at a hypothetical portfolio of eight institutions sharing sensitivity positions, the application of optimization techniques can give rise to substantial reduction in initial margin and therefore counter-party risk.

In GLOS (2016) [4], we set up the collective action problem as a constrained optimization problem that seeks to minimize the global initial margin posted subject to the following constraints: 1) each institutions' net-risk position is unchanged; 2) some pairs are subject to "no trading" constraints; and 3) some pairs are subject to "reduce only" constraints [1]. The implication of this optimization can be seen in table 2 below

If counter-parties are unable to agree on a common initial margin, their trades would be subject to the default rate set by the standard rules, see for example [2], appendix A. This would set margin requirements to values estimated at 12 times higher than if they could cooperate and agree to use the SIMM initial margin that has been set forth by ISDA [2]. However, banks can do even better. If they optimize the number of downstream contracts, they could reduce the overall amount of collateral allocated to initial margin by 31 percent, as shown in table 2. [3]

Counter-party risk can never be completely eliminated from the financial system. The implication of this analysis is that optimizing initial margin and the subsequent daisy chain of down stream contracts would provide financial institutions with more financial resources to support client trading and serve as an interme-

[1] Reduce only constraints are such that the initial margin posted between two counter-parties does not increase

[2] ISDA SIMM is an industry proposal for a standard VaR based model to compute initial margin

[3] In a perfect world where banks did not face constraints and the net risk position is close to zero, then the optimal allocation should also be close to zero

IM Received

Institution	IM Before (USD M)	Constrained Optimized IM (USD M)	Unconstrained Optimized IM (USD M)	Constrained Reduction	Unconstrained Reduction
1	2,713	2,508	3,018	8%	-11%
2	3,594	2,202	825	39%	77%
3	5,286	3,324	530	37%	90%
4	3,774	1,575	708	58%	81%
5	3,319	1,990	371	40%	89%
6	2,280	1,762	1,708	23%	25%
7	5,264	4,440	2,243	16%	57%
8	5,333	4,093	1,192	23%	78%
	31,562	**21,893**	**10,595**	**31%**	**66%**

Figure 2: Initial Margin (IM) Optimization: 8 dealers, multiple constraints

diary of wealth creation for the wider economy, all at the same time reducing systemic risk.

References

[1] Bank for International Settlements, OTC derivatives statistics at end-December 2015. http://www.bis.org/publ/otc_hy1605.pdf

[2] Margin requirements for non-centrally cleared derivatives. http://www.bis.org/bcbs/publ/d317.pdf

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