

How CCPs allocate default losses on non-defaulting members ?

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1. How CCPs allocate default losses on non-defaulting members ?

Disclaimer: Zeliade Systems provides independent model validation for CCPs in the context of EMIR and PFMI/IOSCO. This post is exclusively based on publicly available material.

Since the 2008 financial crisis, the Central Counterparty clearing houses (CCPs) gained more and more importance in the financial system. Their main mission is to alleviate the impact of the default of a clearing member (CM), imposing margins calls per CM and a mutualized (default) fund filled by all the CMs as resources for the replacement costs.

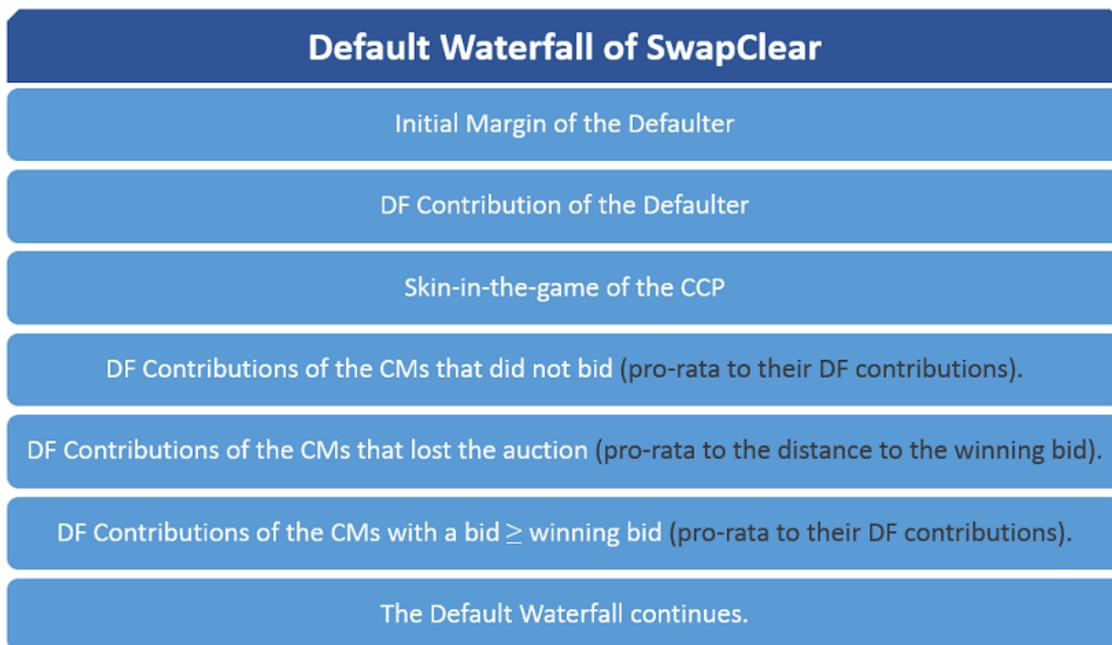
In the case of the default of a clearing member, the losses induced by the liquidation of the defaulter's portfolio will be covered by the CCP, first, using the margins posted by the defaulter, followed by its contribution to the default fund, and then a portion of the CCP's capital (aka skin-in-the-game). If these resources are insufficient, the subsequent losses will be allocated to the default fund contributions of the non-defaulting members.

We focus on this post on the way those losses are allocated among the non-defaulting CMs. To do this, we investigate the public documents specifying the default rules for four CCPs: SwapClear (LCH Ltd), Eurex IR Derivatives (Eurex), OTCC (HKEx) and ICSG (ICE).

For all four CCPs, the liquidation of the defaulter's portfolio is executed through an Auction process, and the liquidation losses are allocated depending on the auction bids of the CMs. The main goal of the CCP is to set up the most serious and competitive auction process as possible. This goal is achieved through incentives for the CMs to submit competitive bids to the auction.

1.1 SwapClear, LCH Ltd

The first CCP we examine is SwapClear (LCH Ltd) provides clearing for OTC interest rate swap market, a segment that is dominated by SwapClear. The loss attribution is detailed in the public document *Default Rules* of LCH Ltd [2] (Section 2.6 *Loss Attribution Related to OTC Auction Portfolios*). We summarize the loss attribution, up to the Default Fund contributions, in the following graph:



We give more details on the loss attribution corresponding to the non-defaulting CMs.

1.1.1 Members that did not bid

If the Initial Margin (IM)+Default Fund (DF) contribution of the Defaulter and the skin-in-the-game of the CCP are not sufficient to cover the default losses, then the DF contributions of the Clearing Members (CMs) who were expected to participate in the auction but did not provide a bid, are used firstly. The losses are dispatched between those CMs on a **pro-rata** basis. This means simply that a CM expected to participate in the auction but did not bid will pay a fraction of the loss equal to:

$$\text{Loss allocated to a CM} = \frac{\text{DF contribution of the CM}}{\text{Sum of DF contributions of non-bidding CMs}} \times \text{Losses to be allocated}$$

1.1.2 Members with a short bid

The subsequent losses will be attributed to the CMs that lost the auction, excluding the bids that were better than the winning bid but were not retained by the CCP. The losses will not be dispatched pro-rata, but rather using the distance of the short bid to the winning bid. The fraction of the losses to be allocated to a CM with a short bid is equal to the ratio of (distance between the short bid to the winning bid) and (the sum of distances between all the short bids to the winning bid).

$$\text{Loss allocated to the CM} = \frac{\text{Bid of the CM} - \text{Winning Bid}}{\text{Sum of all the distances (Bid of a CM} - \text{Winning Bid)}} \times \text{Losses to be allocated}$$

This formula incentivizes the bidding members to give a seriously calibrated bid, since the farther they are from the winning bid, the larger the portion of their used collateral will be. Note that the previous formula could yield an attributed loss for a member that is greater than his contribution to the DF. In such case, another round of loss allocation is performed on the remaining losses, using the ratio of the bids.

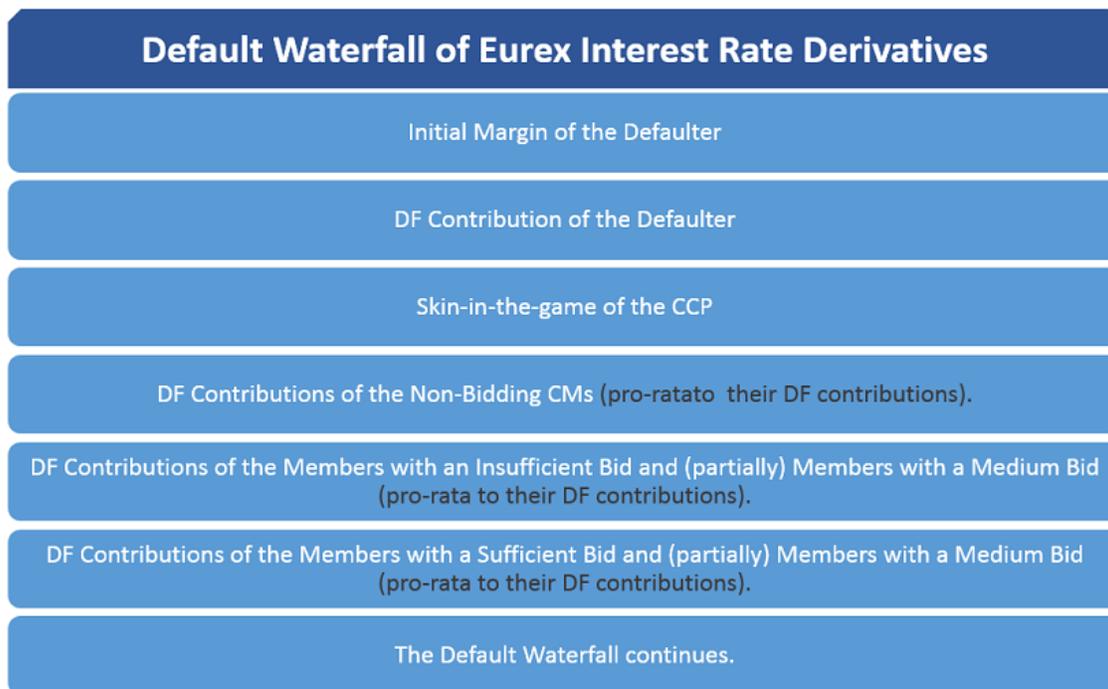
1.1.3 Members with a bid better or equal to the winning bid

The subsequent losses will be attributed to the CMs with a bid equal or better than the winning bid (including the winning bidder). The losses will be dispatched **pro-rata** to their contributions to the Default Fund.

$$\text{Loss allocated to the CM} = \frac{\text{DF contribution of the CM}}{\text{Sum of DF contributions of all CMs with a bid} \geq \text{winning bid}} \times \text{Losses to be allocated}$$

1.2 EUREX OTC Interest Rate Derivatives

We examined now the loss attribution for the EUREX OTC Interest Rate Derivatives. The loss attribution is detailed in the Chapter I of the *Clearing Conditions* of Eurex Clearing AG (*General Provisions*) [4]. The default waterfall is as follows:



1.2.1 Non-Bidding members

After the skin-in-the-game of Eurex for IR is fully consumed, the remaining losses are covered, firstly, using the DF contributions of what the Eurex General Provisions calls *Non-Bidding* members.

The *Non-Bidding* members are members that did not bid, or provided a non valid bid (i.e. a non economically reasonable bid), knowing that a bid is economically reasonable if the member provides two bids: one for the portfolio and one for the opposite positions of the portfolio, and if the spread between the two bids is less than a threshold. Note that Eurex will not disclose to the bidders which of the two portfolios if the auction portfolio, this in order to incentivize to give tight bids. They are also subject to a financial penalty.

The losses beyond the DFs contributions of the *Non-Bidding* members are covered using the DF contributions of the members with a valid bid, following an order that depends on the distance to the Winning Bid. The Valid Bids are classified into three classes:

- Sufficient Bid: if the difference between the bid and the Winning Bid is equal or smaller than 0.5 times the IM of the auction portfolio.

$$\text{Sufficient Bid} - \text{Winning Bid} \leq 0.5 \times \text{IM}$$

- Medium Bid: if the difference between the bid and the Winning Bid is equal or smaller than 1.5 times the IM of the auction portfolio and greater than 0.5 times the IM.

$$0.5 \times \text{IM} < \text{Medium Bid} - \text{Winning Bid} \leq 1.5 \times \text{IM}$$

- Insufficient Bid: if the difference between the bid and the Winning Bid is greater than 1.5 times the IM of the auction portfolio.

$$\text{Insufficient Bid} - \text{Winning Bid} > 1.5 \times \text{IM}$$

The priority order is as follow:

1.2.2 Members with an Insufficient Bid and (partially) Members with a Medium Bid

After the Non-bidding members, the subsequent losses will be covered using the DF contributions of members with an Insufficient Bid, and a fraction of the DF contributions of the members with a Medium Bid. The loss attribution between this set of members is **prorated**. The fraction of Medium bidders' DF contributions to be used simultaneously with the Insufficient bidders is computed as

$$\frac{\text{Medium Bid} - \text{Winning Bid} - 0.5 \times \text{IM}}{\text{IM}} \times \text{DF contribution of the Medium Bidder}$$

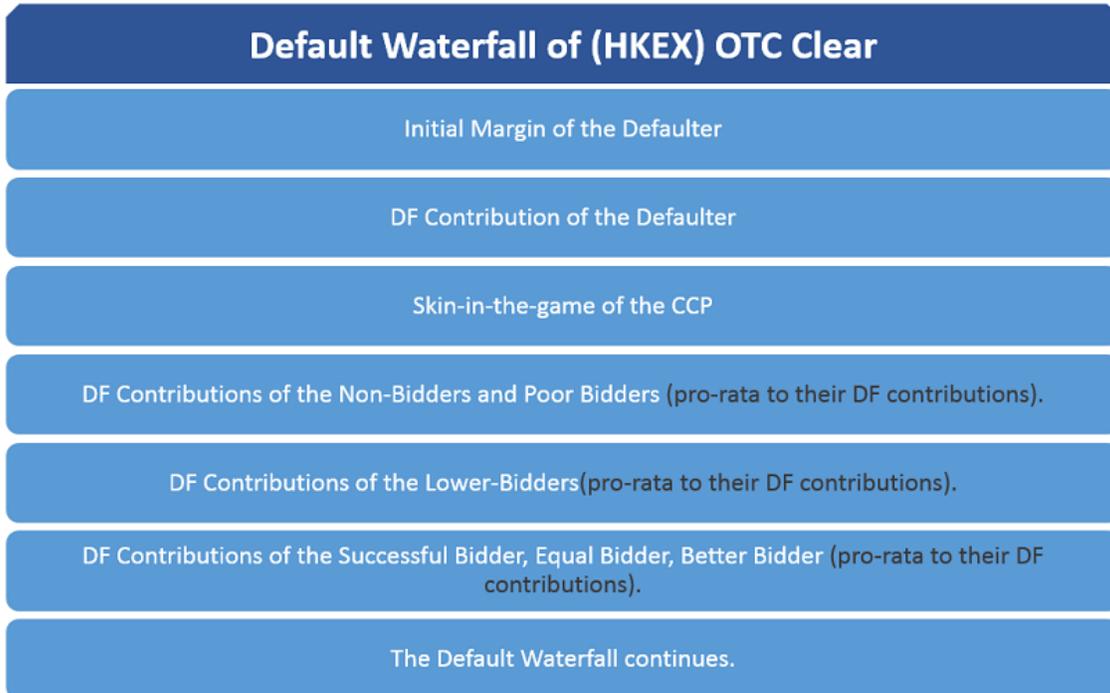
So, the closer a Medium Bid to be insufficient, the larger this fraction becomes. If it is an almost Insufficient Bid, the fraction is almost equal to 1. This formula has an effect similar to the way SwapClear allocates losses between bidding members, prorata to the distance to the winning bid.

1.2.3 Members with a Sufficient Bid and (partially) Members with a Medium Bid

The subsequent losses will be covered using the DF contributions of members with an Sufficient Bid, and the remaining fraction of the DF contributions of the members with a Medium Bid. The loss attribution between this set of members is **prorated**.

1.3 HKEX OTC Clear

We examined now the loss attribution for the HKEX OTC Clear. The loss attribution is detailed in the public document *OTC Clear Rates and FX Derivatives Clearing Rules* [5]. We summarize the loss attribution, up to the Default Fund contributions, in the following graph:



1.3.1 Non-Bidders and Poores Bidders

After the skin-in-the-game of the CCP is fully consumed, the remaining losses are covered using the DF contributions of

- Non-Bidders: Non-Defaulting members who are required to bid for an Auction Portfolio but fail to do so;
- Poor Bidders: Non-Defaulting members that submitted a bid less than the Successful Bid minus a quantile representing the riskiness of the auction portfolio, e.g. the IM.

$$\text{Poor Bid} \leq \text{Successful Bid} - \text{IM}.$$

The relevant losses will be attributed between these members **prorata** to their DF contributions.

1.3.2 Lower-Bidders

The subsequent losses will be covered using the DF contributions of Lower-Bidders. Lower Bidders are Non-Defaulting members that submitted a bid greater than the Successful Bid minus a quantile representing the riskiness of the auction portfolio, e.g. the IM.

$$\text{Lower Bid} > \text{Successful Bid} - \text{IM}.$$

The loss attribution between this set of members is **prorated**.

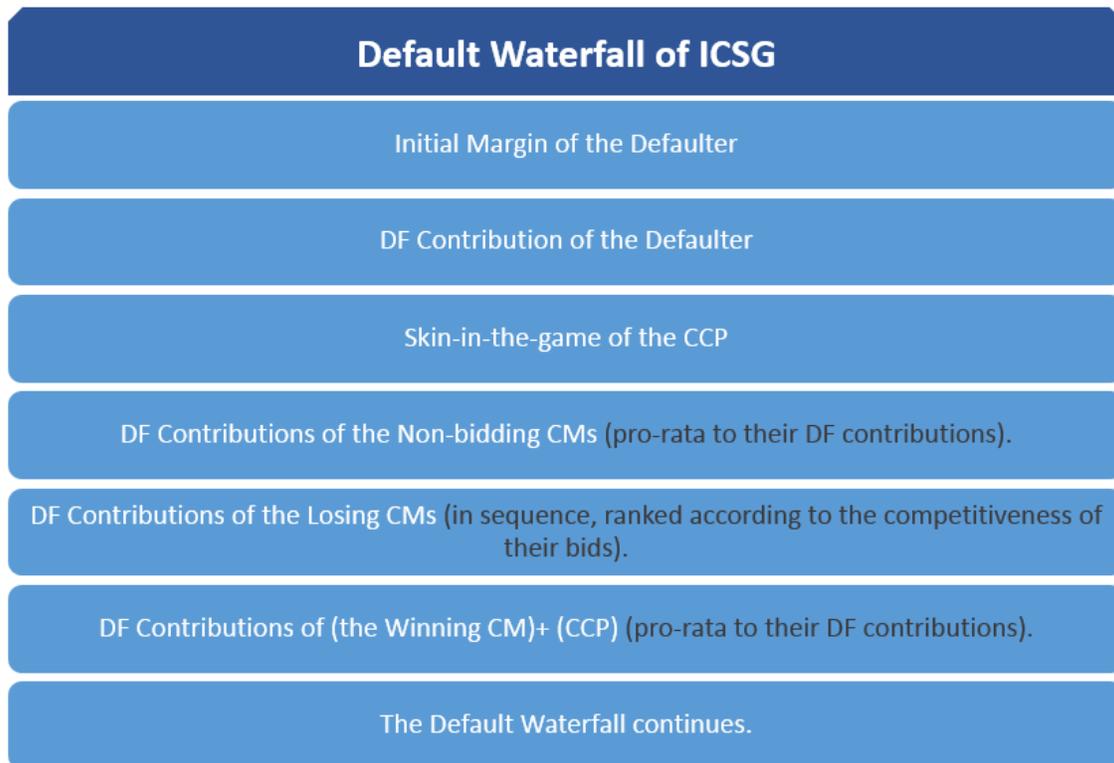
1.3.3 Successful Bidder, Equal Bidder, Better Bidder and No Position NDCM

The subsequent losses will be covered using the DF contributions of the Successful Bidder, Equal Bidders, Better Bidders and No Position NDCMs. The Equal Bidders (resp. Better Bidders) are the members that submitted a bid equal to (resp. greater than) the Successful Bidder. The No Position NDCM are members that do not have positions on contracts similar to the ones in the auctioned portfolios.

The loss attribution between this set of members is **prorated**.

1.4 ICE Clear Singapore

We conclude with the loss attribution for the ICE Clear Singapore (ICSG). The loss attribution is detailed in the public document *ICE Clear Singapore Default Auction Procedures* [3]. We summarize the loss attribution, up to the Default Fund contributions, in the following graph:



1.4.1 Non-Bidding members

After the skin-in-the-game of ICSG is fully consumed, the remaining losses are covered, firstly, using the DF contributions of the CMs who are expected to participate in the auction but did not provide a bid. The losses are dispatched between those CMs on a **prorata** basis.

1.4.2 Losing bidders

The subsequent losses will be covered using the DF contributions of the members that participated in the auction other than the winning bid. The losses will not be attributed **prorata**, but instead shall be applied **in sequence**, with such members with less competitive bids in the Auction having their DF contributions applied prior to members with more competitive bids, the competitiveness being measured by the weighted average price per unit of each member's bids (a member can submit several bids with different sizes).

$$\text{Weighted average price per unit} = \frac{\sum \text{Price Sign} \times \text{Unsigned Price}}{\sum \text{Size}}$$

1.4.3 Winning bidder and DF contribution of the CCP *pari passu*

After applying any such DF contributions of losing bidders, the DF contribution of the Winning Bidder and the DF contribution of the CCP is used on a **prorata** basis.

2. Concluding remarks

- Eurex requires two bids from the members: one for the auctioned portfolio and one for the opposite portfolio, and the members do not know which one of the two is the auctioned portfolio. The members that submit wide bids with a wide spread will be juniorized. This in order to incentivize to give tight bids. They are also subject to a financial penalty.
- SwapClear and ICSG allocate the first losses (after the SIG) to the members that did not submit a bid (prorata to their DF contributions)
- Eurex IRS and OTC Clear add to this set of non-bidding members the ones who submitted a bid but was judged non-realistic.
- SwapClear uses a smooth allocation formula, i.e. the part paid by a member decrease smoothly with the competitiveness of its bid. The closer the bid is to the winning one, the less the member pays. The same remark is also valid for Eurex IR, but only for the medium bidders. However for the sufficient bidders, the part of their DF contributions that is consumed does not depend on their distance to the winning bid (as far as they stay inside the sufficient bid interval i.e. winning bid + 0.5 IM).
- ICSG applies a pure ranking among the losing bidders. The members that submitted a bid will be ranked and their DF contributions will be consumed successively. One could consider that this ranking has a undesirable binary feature: only the ranking matters, whether the members all provided very competitive bids, or unreasonable bids is not taken into account. The choice of the others CCPs studied here is more reasonable: either introduce a stratification of the bids and then allocate pro-rata (as for Eurex IRS and OTCC) or allocate with a weighting that corresponds to the distance to the winning bid (as for SwapClear).

To conclude, it seems interesting to us that so many flavours of the allocation of the losses to non-defaulting members are in production. Of course further investigations require auctions data and quantitative simulations.

References

- [1] CME Rulebook, Chapter 8-G Interest Rate Derivative Clearing, CME, Public document, 2017.
- [2] Default Rules, LCH Ltd, Public document, 2018.
- [3] ICE Clear Singapore Default Auction Procedures, ICE Clear Singapore, Public document, 2016.
- [4] Chapter I of the Clearing Conditions of Eurex Clearing AG - General Provisions, Eurex Clearing AG, Public document, 2018.
- [5] OTC Clear Rates and FX Derivatives Clearing Rules, OTC Clear, Public document, 2017.