

Enhancing CCP resilience and recovery

*Financial stability and collateral efficiency
from post-trade risk reduction*

White paper

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1 Executive summary

The capacity of CCPs to re-establish matched books following a member default lies at the heart of their role in financial stability.

Unmatched CCP book risk is rightly a focus for ongoing international work addressing the resilience, recovery and resolution of CCPs.

It is important that this work gives as much focus to how unmatched book risk can be *reduced* without adding additional loss absorbency to the system, as it does to reflections on potential additional layers of loss absorbency or whether supervisors and markets have the necessary toolkit for the orderly recovery and resolution of these financial market infrastructures.

If unmatched book risk in a CCP can be reduced for a given derivatives portfolio without changing the portfolio's overall market position, it presents a substantial strengthening of financial stability and enhancement of collateral efficiency:

- Existing CCP default waterfall resources would be extended, as these resources would be consumed less rapidly in the event of a member default
- CCP default management would be more orderly as reduced volatility in the open positions of the defaulting members reduce hedging demands on the CCP
- Collateral demands across the system would be lowered as reductions in overall risk would lead to less collateral being locked up as initial margin
- The pro-cyclical secondary order effects of a CCP's own market interventions to hedge open positions of defaulting members would be dampened resulting in reduced market volatility

Why is this the case? CCP unmatched book risk is a key driver for consumption of the default waterfall, default management disruption, higher initial margins reflecting higher future market risk and amplification of market volatility.

CCP unmatched book risk is driven by the sensitivity of the defaulting member's derivatives portfolio to changes in underlying market parameters. Market volatility interacts with this sensitivity, leading to swings in the value of the portfolio.

In normal market conditions these swings in portfolio value are covered by daily transfers of variation margin between the counterparties.

In the event of a default, the ensuing swings in market exposure created by the defaulting member's open positions in the CCP need to be re-hedged. The difference between the market value at the time of default and the value at the time of re-hedging the positions is what consumes the initial margin and, if insufficient, the subsequent layers of the default waterfall.

If this market risk sensitivity of the derivatives portfolio can be reduced substantially without changing the overall market sensitivity of clearing members – then the CCP unmatched book risk will have been substantially reduced for the system as a whole.

Reduction of this portfolio market risk sensitivity can be achieved through “portfolio rebalancing” - a form of post-trade risk compression:

- Portfolio rebalancing takes as input, on a multilateral basis (including one or more CCPs), the sensitivity of the derivatives portfolio exposures of counterparties to one another as a result of changes in a given underlying market parameter such as interest rate risk
- Through a multilateral all-or-nothing compound transaction between the counterparties (including the CCP) these counterparty risk exposures are rebalanced by offsetting the current portfolio sensitivity. The compound transaction is designed to minimize the portfolio sensitivity (and therefore exposures and collateral flows) while leaving the overall market value and sensitivity across counterparts of each counterparty unchanged (the transaction in this operation nets down to zero and is market risk neutral)

By rebalancing counterparty relationships in this multilateral and recurring manner, the counterparties can have as flat a counterparty risk exposure to one another as possible – meaning that in case a default occurs, the unmatched book will already be substantially hedged and the open risk exposure minimized.

Such risk compression is a complement to existing portfolio compression but would not be the same form of post-trade risk reduction.

As context, portfolio compression has as its primary objective the reduction of operational risks arising from the build-up of offsetting buy and sell transactions of the same derivative class in a counterparty's portfolio – and can also as a secondary objective reduce counterparty risk as a result of this process. The compression cycle eliminates legacy contracts and then introduces a multilateral all-or-nothing replacement transaction to maintain the net risk position of the participants. To illustrate the scale of portfolio compression's role in systemic risk reduction, this process has eliminated more than \$ 740 trillion of gross notional from the global derivatives inventory – exceeding the total outstanding volume today.

Portfolio rebalancing has as its primary objective, by contrast, the rebalancing of counterparty risk exposures for the entire derivatives portfolios in order to minimize the portfolios' overall market risk sensitivities, i.e. risk compression. The constituent parts of this multilateral all-or-nothing compound transaction arising from portfolio rebalancing enters the nettings sets of each of the counterparties to the rebalancing process, and the transactions can subsequently be subject to portfolio compression.

Risk compression can be seen as compression of net equivalent outstanding notional as opposed to portfolio compression that reduce gross outstanding notional. The net equivalent outstanding notional is a much more accurate representation of the true risk in the system.

Today's G20 derivatives framework lacks an overall framework for governing the regulation and supervision of post-trade risk reduction activities such as portfolio rebalancing. In the absence of such a framework, the market risk neutral multilateral all-or-nothing transactions arising from the post-trade risk reduction process are in jeopardy of being mis-categorized as secondary market, price forming, trading transactions.

In the event of mis-categorizing these transactions, these post-trade risk reduction activities are not able to take place. The derivatives trading and clearing mandate block the transaction's market risk neutrality and their counterparty netting set allocation.

This leads to risk build up in the system, contributes to collateral scarcity and means that measures, such as those to reduce CCP unmatched book risk, cannot occur.

These challenges have already been recognized by a number of policy-makers around the globe, and different measures have been pursued to provide piecemeal relief, guidance or exemptions to address issues as they have arisen.

In the short term legal clarity is required concerning regulatory treatment of the multilateral transaction which implements the post trade risk reduction activity. This needs to reflect its legal status as a single all-or-nothing transaction and must not lead to it being decomposed into sub-transactions. Such clarity will ensure the transaction's market risk neutrality and its counterparty netting set allocation remains as required for risk reduction.

In parallel however, work is needed to develop international principles governing the regulation and supervision of "post-trade risk reduction" activities, to ensure horizontally consistent and appropriate supervisory oversight, provide clarity for market participants and safeguard future reduction of risk in our financial system.

2 Introduction

2.1 CCP unmatched book risk

A CCP acts as the buyer to every seller and the seller to every buyer. Under normal conditions, the CCP has a perfectly matched book with back-to-back transactions and therefore has no market risk.

After the default of a clearing member, the trades between the CCP and the defaulted member are canceled. Suddenly, the CCP book is no longer matched and **the CCP becomes exposed to market risk equal to the market risk of the defaulted member – so called unmatched book risk.**

The current market value of the defaulted member's portfolio is covered by variation margin, so there is no immediate loss to the CCP after the default. However, **the CCP quickly needs to get back to the original state of having a perfectly matched book.**

This is done in the default management process, where initial “macro hedges” are made to stabilize the value of the book and then an auction process is initiated to transfer the unmatched book positions to one or more of the surviving members. This whole process can take up to several weeks, and during that time the value of the unmatched book may change due to movement in market prices and rates. **This is referred to as “potential future exposure” (or “PFE”).**

To protect the CCP against losses due to potential future exposure, all members post initial margin, and the initial margin of the defaulted member is used to cover losses incurred by the CCP during the default management process. There is no guarantee that the initial margin posted by the defaulted member will suffice, and if it does not, further loss absorbing resources are required as specified in the default waterfall of the CCP.

The key risk of an unmatched book is therefore its sensitivity to movement in market parameters (interest rates, fx-rates, credit spreads etc.). **The potential loss is the product of this sensitivity multiplied by the volatility in market parameters after the default.**

The experience from the Lehman's Brothers default shows that market volatility increases dramatically after a major default and liquidity in the market dries up, making it difficult to hedge the market risk of the unmatched book.

An unfortunate procyclical feed-back loop may arise when the CCP, which is forced to hedge the unmatched book risk, steps into the market to execute those hedges and thereby further increases the volatility and stress in the market.

$$\begin{array}{c}
 \text{CCP potential loss} \\
 = \\
 (\text{Market risk sensitivity of defaulting member's} \\
 \text{portfolio}) \\
 \times \\
 (\text{volatility of market parameters post-default})
 \end{array}$$

2.2 Default management process in OTC Derivatives

The liquidity and structure of the OTC derivatives markets are very different from the markets where CCP clearing has traditionally been used. The OTC market is concentrated on much fewer participants, the OTC trades lack the same level of standardization, the turnover in terms of number of trades is much lower, and there is generally no exchange where the CCP easily can trade out of open positions.

This difference in market structure also means that the default management process is quite different for OTC derivatives compared to standardized futures positions.

As the first step in the default management process CCPs second traders to the CCP to help manage the default. The traders start by analyzing the market risk of the unmatched book and try to put on “macro hedges” to stabilize the value. The CCP then sends out the details of the hedged portfolio to surviving members in an auction process where the survivors submit bids for the portfolio. The auction process is generally split by currency and/or product. The highest bidder wins the auction and any losses incurred between the auction proceeds and the variation margin posted by the defaulted member need to be covered by the default waterfall (initial margin and default fund contributions).

This default management process worked well after the Lehman's default where LCH successfully managed to auction out the Lehman's portfolio to the survivors, and any losses were covered by the initial margin posted by Lehman's.

However, it should be noted that in the period between the Lehman's default and the successful LCH auction, tax payers had stepped in to save AIG, the Federal Reserve had given securities firms access to the Fed's central bank liquidity and an ambitious bailout program had been announced to support the financial institutions in distress.

A further complication is that since the Lehman's default, the number of CCPs clearing OTC derivatives has increased dramatically, from one (LCH) in 2008 to 15, many of them clearing the same products. **All of them rely on seconded traders from the surviving clearing members for their default management process.**

In today's new market structure, the surviving clearing members would now have to second traders to 15 different CCPs and take part in *15 different auctions*, creating significant operational stress and uncertainty.

The clearing members would also face significantly increased market risk, since they would not know how many of the auctions they may win and might inadvertently exceed their limits if winning more than one auction. To mitigate this it is likely that surviving banks would be more conservative in their bidding – further exacerbating consumption of the default waterfall.

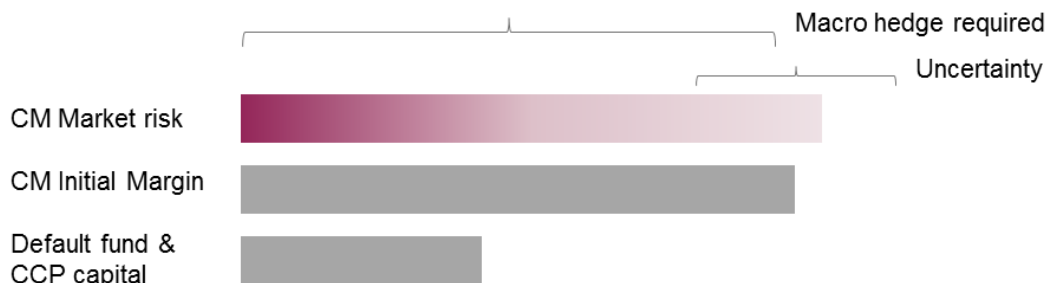
2.3 The default waterfall of a CCP

The default waterfall of a CCP is the loss absorbing resources following a default and the order by which these resources will be consumed. Generally, the default waterfall consists of the initial margin posted by the defaulting member, the default fund and the CCP's own capital. Further loss absorbing resources are sometimes available.

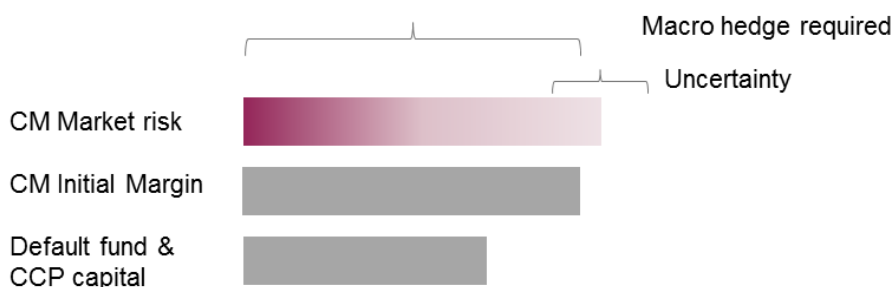
Below we elaborate how the potential losses incurred by the default waterfall can be reduced and existing loss absorbing resources can be made to last longer.

The key here is to reduce the market risk in the portfolios of existing clearing members proactively and repeatedly. By continuously minimizing such risk, the unmatched book risk would also be minimized should a default occurs. The implications for the CCP loss absorbency is illustrated in the diagram overpage.

High market risk of defaulting clearing member:



Low market risk of defaulting clearing member:



By reducing the market risk of a member's portfolio, the initial margin posted by the members will go down, and so will the uncertainty of whether the initial margin will suffice. The other steps in the default waterfall thereby have a much greater chance of covering any shortfall, so ***the loss absorbing capacity of the existing default waterfall increases.***

Furthermore, this also leads to a reduction in the amount of collateral needed due to the significant reduction in potential future exposure, which will alleviate collateral scarcity pressures.

Another significant risk reducing effect is that the macro hedging required after a default is reduced, meaning that ***any vicious circle in terms of adding to market volatility and stress is reduced.***

3 Portfolio rebalancing – how it works

3.1 Overview

The key insight to understanding how portfolio risk rebalancing works is to realize that when looking from the perspective of a single counterparty to all their other counterparty relationships, in some relationships the portfolios will be “long” (i.e. have positive market risk) and in other relationships the portfolio will be “short” (i.e. have negative market risk).

By undertaking a *multilateral risk rebalancing* exercise, such long positions can be offset against short positions in such a way that each participant in aggregate across all its counterparts does not change its overall market risk. Whilst the participant remains market risk neutral overall, the potential counterparty credit risk, i.e. the market risk of the various bilateral portfolios, is however brought closer to zero. This process is explained in more detail below.

3.2 How portfolio rebalancing works

A portfolio rebalancing service takes the form of a series of regularly scheduled cycles running to a defined timeline typically lasting about a week.

As a first step, participants sign up to a service provider to indicate their intent to participate in the cycle.

All participants then submit to the service provider their bucketed current risk exposures (DV01) per counterparty versus each of the other participants in the cycle, including the CCP(s). The current risk exposure should be the sum of DV01 across all trades in the various netting sets.

The DV01 of a 100mEUR 5 year receiver swap would be approximately +50 000 EUR. An equivalent payer swap would have a DV01 of -50 000 EUR. Since two such swap with the same counterparty belong to the same netting set, it is only the net DV01 per maturity bucket that is relevant from a counterparty credit risk perspective. It is possible to express the net DV01 in terms of equivalent net outstanding notional between two parties. It is important to realise that banks trading OTC derivatives are managing their risk on a net basis and not on an individual trade basis.

The service provider then calculates the portfolio rebalancing result using an optimization algorithm resulting in the reduction of counterparty risk exposure of cleared and non-cleared positions whilst at the same time keeping each participant market risk neutral in aggregate over all counterparts within predefined tolerances.

The portfolio rebalancing output results in one multilateral compound transaction consisting of multiple risk reducing bilateral transactions, in the form of:

- A limited number of new, unique bilateral complex structured swaps which reduce outstanding bilateral counterparty risk exposure (DV01) of non-cleared portfolios

- New cleared transactions which manage the outstanding DV01 exposures against the CCP(s)

And / Or

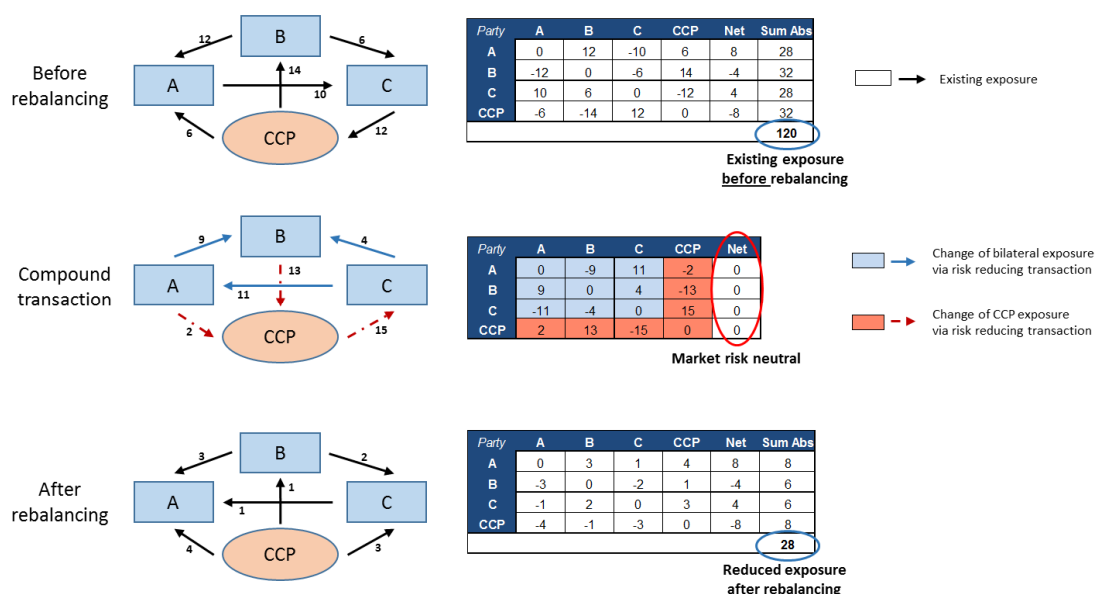
- Compression of cleared transactions which manage the outstanding DV01 exposures against the CCP(s):
 - Fully compressed transactions
 - Notionally revised transactions, which can either increase or decrease the notional amount

The aggregate mark-to-market value and sensitivity for each participant in a portfolio rebalancing proposal is close to zero (within modest tolerances) meaning that current market exposure is not affected.

The risk reducing bilateral transactions that are part of the portfolio rebalancing result cannot be executed individually, since they are entirely contingent on each other for keeping each participant market risk neutral overall within the predefined tolerances. They are therefore collectively described as a single multilateral all-or-nothing compound transaction.

Once a portfolio rebalancing proposal has been executed, the bilateral transactions become a part of the bilateral netting sets, and are margined jointly with the preexisting trades.

The illustration below shows an example with three banks and one CCP. A compound transaction consisting of risk reducing transactions is executed to reduce outstanding risk exposures between participants and manage outstanding risk exposure against the CCP, while keeping all constituents market risk neutral.



3.2.1 Reducing risk exposures vs. bilateral counterparties

The portfolio rebalancing algorithm is designed only to allow for bilateral DV01 exposure reductions. This is achieved by generating a set of risk reducing transactions which introduce new, bilateral, complex, structured swaps between each of the participants in the currencies of the cycle.

These new swaps are based on valuations supplied by each of the participants (mark-to-market and risk vectors per currency) for a predefined set of maturity points along the curve against all parties in the cycle.

These maturity points are downloaded from the service provider in a format which can be fed into each participant's trading system to generate mark-to-market and risk vectors.

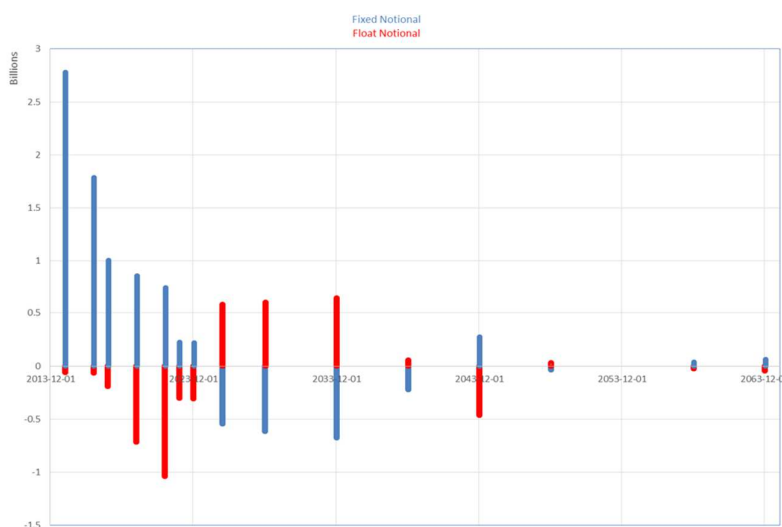
The portfolio rebalancing algorithm then utilizes this data to propose new, bilateral, complex, structured swaps that are designed solely to reduce the outstanding bilateral DV01 exposure between participants.

A bilateral, complex, structured swap is a series of cash flows customized to reduce the risk exposure in a bilateral netting set while keeping participants market risk neutral overall within predefined tolerances.

Key characteristics of a bilateral, complex, structured swap:

- Notional amounts will be different between the fixed and the floating leg of the swap and will also change with an irregular schedule over time.
- The pay and receive direction as well as the fixed coupon rate may vary over the life of the swap.

This illustration shows an example of how the notional amount and the pay/receive direction of a bilateral complex structured swap may change over its life time.



In subsequent portfolio rebalancing cycles, the existing bilateral complex structured swaps will be replaced by new bilateral complex structured swaps between the same two counterparties. Therefore, only one complex structured swap exists per bilateral relationship per currency, preventing unnecessary trade aggregation and increases to gross notional, as well as promoting transparency.

Since the risk management and valuation of a swap portfolio is done on a net basis and that all trades are broken down to constituent cash flows, the addition of a structured swap like this does not complicate or alter the risk and valuation process within a bank. This also applies to an unwind situation where a whole portfolio is put up for sale which is then analysed on a sum-of-cash-flow basis by all bidders.

3.2.2 Establishing DV01 current exposures

Each participant is required to submit its current aggregate risk exposure against each bilateral counterparty and CCP (i.e. each netting set) participating in the portfolio rebalancing cycle. Current bucketed and aggregated DV01 exposures per netting set and currency are extracted and submitted to the service provider by each participant.

Portfolio rebalancing has built-in control features ensuring that only the common, mirrored bilateral risk exposure (DV01) is targeted for risk reduction. This prevents an increase in the absolute bilateral risk exposure (DV01) of non-cleared trades between participants based on their risk submissions.

Example:

Participant A submits a DV01 exposure of \$ -5mm versus participant B, but participant B only submits a DV01 exposure of \$ +4.5 mm versus participant A.

- Both participants could reduce their DV01 exposures towards zero, leaving participant A with \$-0.5 mm and participant B with \$ 0 mm.
- Participant A could reduce its DV01 exposure to \$ 0 mm if participant B allows its DV01 exposure to change i.e. from \$ +4.5 mm to \$ -0.5 mm.

3.3 Portfolio rebalancing legal framework

The result of a portfolio rebalancing cycle is a multilateral compound transaction that is presented to the participants in the form of a portfolio rebalancing proposal providing all the details of the risk reducing transactions. The whole transaction is governed by the portfolio rebalancing protocol framework, to which all participants must adhere.

All participants in a portfolio rebalancing cycle must accept the proposal produced in the cycle in its entirety. They do so by signing the respective acceptance notifications and returning those to the service provider.

If any of the participants fail to accept the proposal then none of the risk reducing transactions will become effective and the proposal is null and void.

4 Portfolio rebalancing – regulatory & supervisory framework

4.1 Current policy framework

In January 2015 the International Organization of Securities Commissions (IOSCO) finalised a set of **Risk Mitigation Standards for Non-centrally Cleared OTC Derivatives**¹ which it had developed in consultation with the Basel Committee on Banking Supervision (BCBS) and the Committee on Payments and Market Infrastructures (CPMI).

These nine standards included “Standard 6” addressing portfolio compression. As described earlier – while portfolio compression is not the same as portfolio rebalancing – it does fall into the same category of post trade risk reduction or compression activity. This is because portfolio compression relies upon a non-price-forming multilateral all-or-nothing market risk neutral transaction to achieve its risk reduction outcome.

The IOSCO standards recognised the benefits of compression and stated that “covered entities should establish and implement policies and procedures to regularly assess and, to the extent appropriate, engage in portfolio compression”.

However, to date no standards exist at international or national level establishing a specific category for the authorisation and supervision of portfolio compression activities or service providers, nor does a specific category exist for the provision of post-trade risk reduction services.

Instead the activities have been regulated:

- Indirectly - as the participants to the risk reduction activity have been licensed financial firms; and
- Directly, but inadvertently - by introducing broker provisions in investment service law which governs the responsibilities of bringing together multiple counterparties to a financial transaction

In addition regulators have made important accommodations through piecemeal relief, guidance or exemptions to address specific issues as they have arisen.

However this absence of a tailored regime for post-trade risk reduction activities consistently leads to unintended consequences.

In the absence of piecemeal fixes, the market risk neutral multilateral all-or-nothing transactions arising from the post-trade risk reduction processes are consistently mis-classified as secondary market, price forming, trading transactions.

As such their risk reduction effect is put into jeopardy – for example:

- The derivatives trading mandate can lead to the transaction having to be executed in a live market trading environment – meaning a perfectly balanced and market risk neutral outcome cannot take place

¹ <http://www.iosco.org/library/pubdocs/pdf/IOSCOPD469.pdf>

- The clearing mandate can override the counterparty netting-set allocation required to ensure a balanced outcome – meaning counterparty risk cannot be flattened

This leads to risk build up in the system, contributes to collateral scarcity and means that measures, such as those to reduce CCP unmatched book risk, cannot occur.

4.2 Future regulatory and supervisory framework

The systemic risk reduction objectives sought by G20 leaders and pursued through current international policy work require establishment of a formal category for “post trade risk reduction” services.

As evidenced in this paper – the path to materially reducing CCP unmatched book risk with no additional loss absorbing resources is an immediate and clear example of the potential for such systemic risk reduction.

Developing an internationally consistent regulatory set of principles is needed both for future reduction of risk but also for guarding against emergence of regulatory arbitrage risks for the G20 trading and clearing mandates.

The key attributes and regulatory perimeter of post trade risk reduction activities, including distinctions from trading activities, are set out below:

- **Market risk neutral** – the transaction must be designed not to change the directional market risk of the portfolios concerned, but rather reduce **secondary order portfolio risks** - counterparty, operational, mismatch or other systemic risk - in respect of existing derivatives transactions
- **Non-price forming** – counterparties to the risk reduction must not be able to post bids or offers, and no price negotiation must take place. Transactions can be recorded at stale prices away from market prices - market risk neutrality meaning the price level is not relevant
- **Non-continuous and non-real-time** – risk reduction “cycles” must take place intra-day/over-night according to pre-published schedules (participants cannot unilaterally select timing) on non-live price curves
- **Non-discretionary** - the post-trade risk reduction service provider's methodology determines the overall output of the market risk neutral risk reduction transaction. Participants cannot “cherry pick” constituent risk reducing transactions
- **Single multilateral compound transaction** – the risk reduction cycle must be binding on an “all-or-nothing” basis across all cycle participants and the transaction components recorded as a single compound multilateral legal transaction.

Such a categorisation captures the common defining features of post-trade risk reduction activity – whether it be portfolio compression or portfolio rebalancing. The standards would need to be set out in broad principles in recognition of the range of methods available to achieve post-trade risk reduction.

Common supervisory parameters would also need to be established for the activities:

- **Transparency** - the multilateral transaction should be reported to trade repositories and clearly marked with a common identifier which can tie the constituent transaction back to the multilateral compound transaction and a given risk reducing “cycle”
- **Market risk neutrality** - aggregate overall output as well as the aggregate output per participant can be overseen by supervisors as netting down to zero and should be reported to relevant supervisors as part of each risk reduction cycle
- **No increase in bilateral risk** – supervisory reporting should demonstrate that for each risk being reduced overall, there is no risk increase in any bilateral relationship

These standards would complement existing CPMI-IOSCO Principles for financial market infrastructures and IOSCO Risk Mitigation Standards for Non-centrally Cleared OTC Derivatives by harmonising minimum requirements for post-trade risk reduction activities across jurisdictions.

5 Conclusions and next steps

As international policy reflections proceed with addressing CCP unmatched book risk, an important workstream needs to address the opportunity for risk reduction which can be achieved through portfolio rebalancing.

By proactively reducing unmatched book risk in a CCP without changing the existing portfolio's overall market position, portfolio rebalancing presents a substantial strengthening of financial stability and enhancement of collateral efficiency:

- Existing CCP default waterfall resources will be extended, as these resources will be consumed less rapidly in the event of a member default
- CCP default management will be more orderly as reduced volatility in the open positions of the defaulting members will reduce hedging demands on the CCP
- Collateral demands across the system will be lowered as reductions in overall risk will lead to less collateral being locked up as initial margin
- The pro-cyclical secondary order effects of a CCP's own market interventions to hedge open positions of defaulting members will be dampened resulting in reduced market volatility

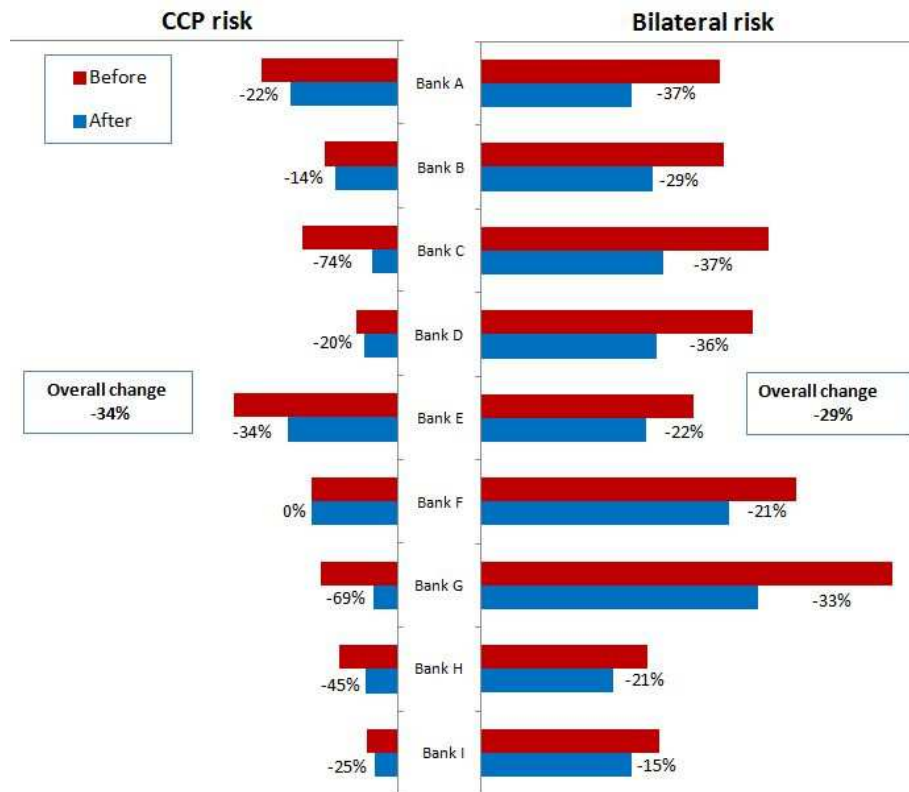
In order to carry this work forward, two parallel areas of work are necessary:

- In the short term detailed guidance is needed to provide legal clarity for regulatory treatment of the multilateral transaction which implements the post trade risk reduction activity. This needs to reflect the transaction's legal status as a single all-or-nothing transaction and must not lead to it being decomposed into sub-transactions. Such clarity will need to ensure the transaction's market risk neutrality and its counterparty netting set allocation remains as required for risk reduction.

- In parallel, work is needed to develop international principles governing the regulation and supervision of “post-trade risk reduction” activities, to ensure horizontally consistent and appropriate oversight, provide clarity for market participants and safeguard future reduction of risk in our financial system.

6 Appendix - Portfolio rebalancing test results

Nine major clearing members participated in a portfolio rebalancing pilot, focusing on USD and EUR interest rate swap risk. The objective was to reduce bilateral risk between clearing members as well as risk exposure versus LCH SwapClear. The risk reduction was then measured using a similar methodology as LCH use when determining initial margin.



The overall system risk reduction in this case was 30%. The risk reduction rates increase with more participants, since the chances of finding off-setting risks will increase.