WP/18/65

IMF Working Paper

Central Counterparties Resolution —An Unresolved Problem

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Monetary and Capital Markets Department

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Authorized for distribution by Gaston Gelos

March 2018

Abstract

Recovery and resolution regimes are being developed for central counterparties (CCPs). We analyse current resolution tools in the context of policy, which is to restore the critical functions of a failed CCP. We conclude that the toolkit is insufficient to avoid the costs of resolution being borne by taxpayers, and propose alternative policy suggestions for addressing the problem of a failed CCP.

JEL Classification Numbers: G21, G28, F33, K22, G18, G15

Keywords: CCP resolution and recovery; VMGH; collateral; NCWO; FSB; ISDA

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[1] The draft paper was presented at the Dutch Central Bank's Financial Market Infrastructure Conference, in Amsterdam (June 2017), and benefitted from suggestions made at the event. The paper was published in the special edition of the *Journal for Financial Market Infrastructures*, and incorporates comments from two anonymous referees. The paper benefitted from the discussion at the MCM policy forum within the IMF. Remaining errors are our own. Dermot Turing is now a consultant (former partner) to Clifford Chance, London.

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INTRODUCTION

Central counterparties (CCPs) are now at the center of risk management in the financial markets. In the decade or so before the financial crisis, some CCPs had begun to accept "over-the-counter" (OTC) derivatives positions for clearing: that is to say, transactions entered into in an unorganized marketplace. Those CCPs were judged to have performed well during the crisis, so one of the precepts which emerged in the post-crisis settlement was that clearing of standard OTC derivative products should be made mandatory.

It has more recently been acknowledged that the combination of mandatory clearing and concentration of counterparty risk into a central infrastructure increases the risk of failure of the infrastructure itself. This issue arises for the largest CCPs, which clear OTC derivative products in accordance with the new mandates, on which we focus.[2] Accordingly, policy attention has turned to the question of how a large CCP should be prepared for the worst: an event which is so serious that it not only consumes the margin layer and the default fund, but also threatens the viability of the CCP itself. This paper assesses the policy settlement which is emerging from that debate.

We describe the current policy for recovery and resolution of CCPs (which, we observe, has difficulty in distinguishing the two concepts). We also assess the toolkit for "resolution" of CCPs, that is, the options available when the CCP's own efforts to restore itself to health ("recovery") have not succeeded. We show that the classic approach to resolving a *bank* has little chance of success with a CCP, and that the other tools which are ostensibly for resolution are effectively forms of recovery. We then draw conclusions as to what would be left in the toolkit, if the various efforts at recovery (regardless of how they are categorized in the confused taxonomy applicable to troubled CCPs) fail.

A clutch of initiatives in recent years has set out the policy thinking on recovery and resolution of CCPs (Credit and Liquidity and Market Infrastructures–CPMI, 2014; FSB, 2014; FSB, 2016; FSB, 2017), which supplement wider efforts to increase the resilience of CCPs through international standards. There is a proposal in Europe (the "draft EU Regulation") for CCP recovery and resolution legislation (European Commission, 2016).[3] The private sector has also written extensively on recovery and resolution of CCPs, including the recent JP Morgan white paper (2017), LCH (2014), ISDA (2013b, 2017a).

This paper is structured as follows. Section I outlines the role, structure and economics of CCPs. Section II describes the function of CCPs and sets the economic scene. Section III reviews the need for, and content of, recovery and resolution regimes for CCPs. Section IV

[2] It is accepted that different failure scenarios and different outcomes may arise for smaller CCPs, such as those that clear domestically-issued equities only. This paper's attention is only on the large OTC derivatives CCPs, which are systemically important for financial stability.

[3] The position in the United States (U.S.) may be less clear, as debate continues as to whether CCPs should be subject to Title II of the Dodd-Frank Act, and indeed whether Title II is to continue in force for banks. The U.S. Treasury noted in October 2017 that the FDIC may be the resolution authority for designated FMUs under Title II.

examines the policy thinking behind current proposals and specific resolution tools. Section V proposes an alternative approach, and concludes.

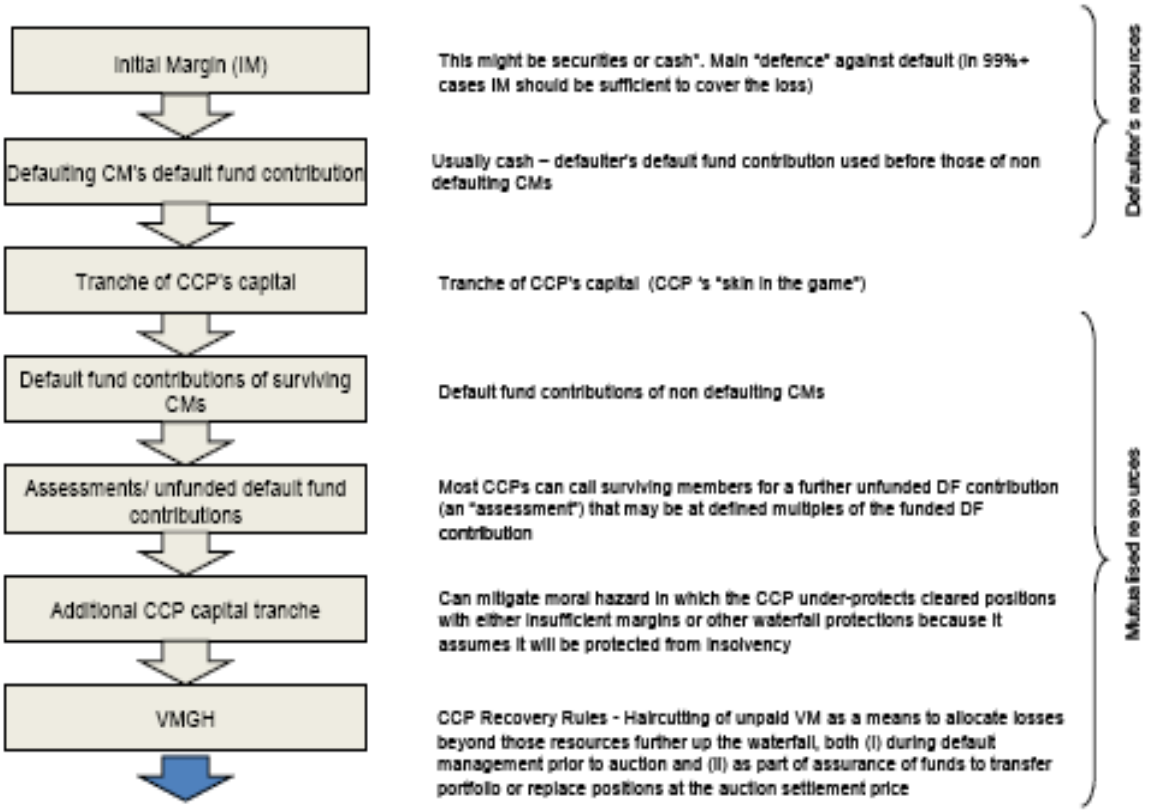
I. Role, Structure and Economics of CCPs

The function of CCPs is now well-understood: the CCP becomes the central counterparty (buyer to every seller and vice versa) in the marketplace, taking margin and a contribution to its default fund to manage the risk it thereby assumes. Counterparty risk materializes when a clearing member (CM) defaults, leaving the CCP with the obligation to continue performance to the non-defaulting participants, and, in order to fulfill this duty, to replace the defaulter's positions (to "re-balance its book").

There is broad consensus as to how losses arising from defaults should be borne. A "waterfall" of resources is available to CCPs to fund the re-balancing (see Box 1). First, the CCP will use the margin provided by the defaulter. The next line of defense for the CCP is a default fund together with some own resources contributed by the CCP itself ("skin in the game").

Box 1. A Hypothetical Waterfall Situation

After the contributions of surviving CMs are utilized, the "end of the waterfall" is reached, and other contributions are needed.



Source: ISDA (2013a).

Much effort has gone into devising a safe, robust waterfall, which ought to contain default losses. However, it is now widely understood that some risk remains that a default on an unpredicted scale could run through the whole waterfall, so that end-of-waterfall scenario analysis is desirable. This is the situation in which recovery and resolution arrangements for CCPs come into play. The risk event may be very rare indeed, but the size of the catastrophe which brings it about necessitates careful planning.

The discussion which follows on the question of recovery and resolution of CCPs assumes a crisis scenario has materialized. A default, or combination of defaults (i.e., "Cover 2" principle), has wiped out all the financial resources comprised in initial margin, default fund and skin-in-the-game. What should happen at the end of the waterfall depends on the policy for recovery and resolution of CCPs.

Managing defaults is challenging, particularly where the waterfall may be insufficient to meet the default-related liabilities of the CCP (see Box 2). Our focus is on losses which stem from default of a CM, and their consequences. Various other types of disasters might befall a CCP, such as computer systems failure, terrorist incident, or loss of business; but these ought to be readily managed through the capital buffer which a CCP is obliged to maintain in accordance with regulatory standards.[4] As to such non-default losses, which are not our focus, see Box 3.[5]

Box 2. Some Characteristics Where the CCP's Waterfall Resources may be Inadequate

1. The CCP calls upon non-defaulting CMs to take over elements of the defaulter's book of positions through an auction process. (To be clear, the "auction" involves each bidder specifying the *lowest* price at which it will accept the loss-making positions of the defaulter.) An auction fails if the lowest prices bid exceed the available financial resources of the CCP.

2. Meanwhile, unless the CCP has been shut down, it must continue to pay its obligations on cleared contracts (variation margin) and continue to register new transactions. The CCP must also rebalance its book.

3. Whether a CCP is technically "insolvent" may be an academic question, since a CCP's inability to meet its obligations when due ("illiquidity") can in practice be the same thing as "insolvency," since the CCP—unlike a bank—has no long-term assets to call in.

Box 3. Non-Default Losses

The origin and quantum of non-default losses may be extremely hard to model. Research in this area emphasizes the limited value of network theory and related loss-distribution models for such events (Glasserman and Young, 2017). Debate also continues on access to central bank liquidity. However, non-default losses do not impugn the risk model of the CCP. Consequently, a "lift-out"—a transfer of the CCP's entire clearing operation to a clean vehicle which is liberated from the losses—may be a feasible way forward. The toolkit for resolution (on which we comment, in relation to default losses) may prove more effective in such cases, though solutions which oblige CMs to bear the cost of "operational" (non-counterparty) losses are controversial.

[4] CFTC rules, §39.11; European Union (EU) Commission Delegated Regulation 152/2013.

[5] We do not analyze or criticize the proposed resolution toolkit as applied to CCPs sustaining non-default losses.

Stakeholders, Incentives, and Economics

By dint, inter alia, of post-crisis rules obliging users of OTC derivatives to clear trades at CCPs, the clearing function may now be seen as a public good: an "essential function," to adopt the parlance of policy documents on recovery and resolution (e.g., FSB 2017). However, CCPs are not owned or capitalized by public sector entities, or indeed by their participants (Cox and Steigerwald, 2016). Moreover, a utility typically has two characteristics: (a) a government backstop but (b) provided at negotiated "economic rents." In the CCP space these characteristics are not observed.

As to (a), we argue that the policy objective of avoiding a government backstop is incompletely achieved by current proposals. As to (b), the revenue and benefits from OTC derivatives come from three sources: the origination fee, plus netting on books, plus the clearing fee. In a cleared environment, banks will keep the entire origination fee plus some of the netting (from OTC derivatives that do not clear). So, for CCPs to be utilities, all three revenue elements (which comprise the total economic rent) should be negotiable. But banks will never let go of the origination fee or netting— these are key pieces. The comparison of CCPs as utilities is not apt unless it spans the full spectrum of "economic rents."

The interplay of the financial intermediaries, including CMs, the operators and owners of CCPs, and the government/taxpayer creates a mix of incentives, the outcome of which is hard to predict, particularly when the system comes under stress. Proposals for resolution of CCPs need to be sensitive to these tensions.

II. RECOVERY AND RESOLUTION FOR CCPS

The objectives of CCP resolution are set out by the Financial Stability Board (FSB):

> "CCP resolution should have as its objective the pursuit of financial stability and ensure the continuity of critical CCP functions in all jurisdictions where those functions are critical and without exposing taxpayers to risk of loss."[6]

In analysing the policy for recovery and resolution of CCPs, it is appropriate to have clarity on the definitions of "recovery and "resolution" of a financial institution (whether a bank, a CCP, or some other type of entity).[7] *Recovery* is a process by which a bank which is in trouble, but not fatally injured, is restored to health. Recovery is frequently about capital transfusion, or having liabilities equitized or written off, to improve the solvency of the bank. Recovery requires advance planning and the ability to implement the plan in reasonably short order to eliminate the risk that something fatal happens while the bank is wounded. *Resolution* is different. The need for resolution arises when efforts at recovery have failed or are deemed to be pointless. The fate of nonfinancial companies at such a juncture would ordinarily be to put them into liquidation, but for banks that process is usually detrimental to

[6] FSB (2017), section 1.

[7] The descriptions of recovery and resolution which follow should not be read as exhaustive analyses or criticism of these flexible and varied processes. The purpose is to identify typical features of large-bank recovery and resolution procedures so as to contextualize the following discussion which is about CCPs, not banks.

the wider economy and the daily lives of citizens, so an alternative model for swiftly protecting the economy and the citizens is needed. Resolution, therefore, is a way of achieving end-of-life for a totally failed bank, picking out of the wreck what is needed to achieve the wider social and economic objectives. The objective of resolution is to preserve the critical *functions* of the institution by separating them from the *causes* of the failure.

The model for recovery and resolution for banks is thus reasonably well developed. But CCPs are not banks[8] (Hughes and Manning, 2015): CCPs do not take deposits, they do not make loans, they do not trade for their own or their customers' account, and they do not carry out a role which is in any wise analogous to that of commercial banks. These differences mean that the toolkit which has been assembled for resolving banks is of limited use for troubled CCPs. Furthermore, CCP resolution may have to take place much more rapidly than resolution of a bank. In the world of CCPs, the distinction between recovery and resolution is not so clear. The FSB's Guidance says that "CCP resolution should have as its objective … the continuity of essential CCP functions" and that continuity will be achieved by "restoring the ability of the CCP to perform its critical functions as a going concern" (FSB, 2017).

With a bank, continuity of the critical functions is typically achieved through a "lift-out" of the uncontaminated critical functions from the wreck, as we discuss below. We show that, because the cause of failure of a CCP which has suffered a catastrophic default loss is failure of its risk model, for a CCP a lift-out of a clean business is nigh impossible. We also show that, failing lift-out, the only option for restoring the CCP's critical functions—restoring it as a going concern—is for correction of its balance sheet. "Restoring the ability of the CCP to perform its critical functions as a going concern," the stated purpose of "resolution," is not, without a successful lift-out, to achieve "resolution" but "recovery." We are left with the thought that to specify continuity of critical functions as the objective of resolution is to treat "resolution" as a second round of "recovery." In the case of CCPs, the concepts have, it would appear, become merged.

III. Review of Policy for CCP Resolution

In assessing the broad shape of policy, it is appropriate to examine the notion that "resolution" of a CCP should lead to its full reinstatement as a business. This leads to a review of the governance and ownership of CCPs and where the "responsibility" for resolution should lie. It is shown that (so long as current capital arrangements remain in force for CCPs) CMs must bear the end-of-waterfall costs. Thirdly, the mechanisms for loss-allocation—in particular, variation margin gains haircutting (VMGH)—are studied. Finally, the principal check-and-balance operative in relation to bank resolution regimes—the "No Creditor Worse Off" (NCWO) principle—is considered, to understand its value as a normative force in the implementation of CCP resolution.

[8] Formally, CCPs may be structured as banks in some countries in the EU.

A. Recovery and Resolution Ought to be Different Concepts

The conflation of objectives of recovery and resolution for CCPs is open to criticism.[9] By deciding that the objective of "resolution" of a totally failed CCP is "continuity of critical functions" it seems to be implied that, however flawed its risk model and however insolvent and un-rescuable it has become, a CCP should not be allowed to fail. That outcome, it is submitted, is wrong in principle, and a more nuanced approach to the different intentions of "recovery" and "end-of-life" would be desirable.

At the end of the waterfall, a CCP will be confronted very suddenly with unpredicted financial losses. During and after the financial crisis of 2008, a consensus emerged that clearing of derivatives was desirable and should be made mandatory. That policy has become closely entwined with the idea that clearing of derivatives is a critical function, and so to the conclusion that cessation of clearing of derivatives would lead to market disruption. This paper does not analyze the question whether disruption would follow from clearing ceasing to be mandatory; it is open to debate how to determine when clearing is "critical," but it can be assumed that for products for which clearing is mandatory, there is a close association between criticality and the existence of the clearing service.

Thus, what is not contemplated in the regulators' and legislators' proposals is the possibility that the catastrophic failure of the CCP should result in the closure of the CCP. Resolution, in a case of closure, could be focused on the reduction of systemic shock and the smooth operation of the financial system—but (to give an example) there are no provisions in the EU's draft Regulation directed to that end. It might be too difficult to get that type of resolution off the ground, in which case self-initiated liquidation would seem to be the only option left for a failing CCP. But that conflicts with another policy objective, which is preservation of the critical function of clearing. The policy implications inherent in that conclusion are that taxpayer support might, if CMs' ability to absorb losses is limited, be needed to engineer a recovery, and that liquidation must inevitably be destabilizing. However, there has been little debate around these questions.

Preserving the CCP might not be a wrong outcome. One would expect, though, that the stakeholders responsible for a CCP's failure should be those that bear the pain of restoring it to health. In this respect, another difference between banks and CCPs needs to be examined.

B. Governance and Stakeholders in CCP Resolution

For banks, the capital providers are not the users of the bank. Accordingly, in a bank resolution, bondholders and equity owners are expected to take a hit; depositors and other wholesale creditors may suffer a loss; but retail depositors would be protected. For CCPs, which have no retail customers, it is otherwise, and CMs are expected to foot the bill.

The governance of CCPs is in the hands of the equity providers—the shareholders—not the CMs. Although CCPs have risk committees[10] which may have influence over these matters such as margining and default fund size, the owners set the prices and have the final say on

[9] In terms of implementation, a distinction exists: "recovery" is the province of the CCP, whereas "resolution" is the prerogative of the Resolution Authority.

[10] EU Regulation 648/2012 (EMIR), Article 28.

the risk model. in the short term, the powerful incentives will be costs of margin and clearing fees, rather than the theoretical possibility of a devastating default (Huang, 2017). As the shape of CCPs' risk models is in the hands of shareholders, one might expect that the costs of model failure (the losses at the end of the waterfall) would be borne by the equity-capital providers and not CMs.

For CCPs special capital arrangements apply, illustrated in Table 1. CCPs must ensure their owners have "skin in the game"—a slice of equity which is at risk in a default—but the size of this stake has been criticized as inappropriately low (Albuquerque et al, 2016). (It is also argued that a low level of skin in the game helps to incentivize CMs to bid appropriately in a default auction, but we prefer robustness ex-ante, not ex-post.) It is also apparent that the total capital provided by equity investors is limited. It would not matter if CCPs were mutually-owned organizations, but CCPs are in fact owned by persons other than their members (Cox and Steigerwald, 2016). What this means is that, by and large, the capital investment of the shareholders need not be put at risk in a default, if the backup financing provided by CMs is adequate to enable the CCP to recover from an unexpectedly large default. The example of KRX (Korea) is a case in point: when Hanmag Securities, a futures broker, defaulted in December 2013, the capital of KRX was at risk only after the non-defaulting members' default fund contributions.[11]

While regulatory capital rules for CCPs do not oblige shareholders to contribute more than the statutory skin-in-the-game amounts shown in Table 1, there is probably little choice over this: the CMs (or taxpayers) will have to pick up the bill. Several obstacles stand in the way of the CCP's parent company taking a greater role, not least:

- Convertible instruments are not likely to have been issued by the parent of a CCP. CCPs tend to be subsidiaries in infrastructure groups. Where the parent is itself another infrastructure, or is a source of financial strength (capital provider) to other group entities which are infrastructures, regulators will be reluctant to implement resolution scheme which exposes the remainder of the group to the losses of the CCP.

- Resolving the parent of the CCP would likely involve too small a financial sum to contain an extreme catastrophic loss that blew out the default fund of the CCP.[12] Table 1 provides further illustration by comparing the size of default risk (as measured by default fund size) and the available debt issuance which could potentially be bailed-in at parent level.

[11] However, it should be noted that KRX had not (at the time) implemented the CPSS-IOSCO Principles for Financial Market Infrastructures, which are now explicit on this point.

[12] Net open interest position (or exposure a CCP carries that is "margined") can be divided by central bank capital to see how quickly taxpayer support may be called upon. For LCH.Clearnet Ltd, NOIP would dwarf the capital of the Bank of England.

On the other hand, it is evident that infrastructure groups can, and do, issue long-term debt, and it would therefore appear to be feasible to expect such groups to issue loss-absorbing capital in a similar manner to banks.[13]

On balance, although additional capital would help, it would appear that shareholders are not the answer, at least under present regulatory capital rules, to recovery and resolution of CCPs. The CMs (or taxpayers) will bear the costs in some way. The proposed tools for stabilizing a CCP which has reached the end of the default waterfall are the next topic for analysis.

Table 1. Comparison of Debt Against Default Fund Size of CCPs in Large Groups

Measure (In millions of U.S. dollars)	London Stock Exchange Group/LCH	Deutsche Börse/Eurex	CME Group	Intercontinental Exchange/ICE Clear Europe
Market capitalization	12,450	15,180	39,510	6,757
Long-term debt	1,253	19,250	2,231	6,305
Default funds of CCP[14]	7,460	3,479	6,426	2,657

Source: Ycharts.com and CPMI reports.

C. Resolution Tools

The options proposed for "resolution" of CCPs, as set out in various official papers,[15] are briefly surveyed in Table 2. Some of them—in particular VMGH and cash calls—are also available to the CCP without the need for intervention by a resolution authority, and can be viewed as "recovery" options as well. There remains ambiguity in official sector circles on what is viewed recovery and what is defined under resolution.

In the case of a bank, the principal tool for resolution is the "lift-out" of a viable business from the mess of failure. The viable business will consist largely of the good-quality loans and assets of the old bank, together with the "priority" liabilities represented chiefly by retail depositors, and the essential service of providing continuing access to payment systems. What is left behind are bad loans and low-priority creditors, and the expectation is that this rump may be liquidated. CCPs are, of course, different: they have no loan book (no "good

[13] EU Bank Recovery and Resolution Directive, Directive 2014/59 of May 15, 2014, Article 45.

[14] CPMI-IOSCO Reports for Q3 2016, data item 4.1.4, aggregated across all sub-funds where relevant, converted to U.S. dollars at January 13, 2017 rates.

[15] In particular Article 27 of the draft EU Regulation.

assets") and no "priority" creditors. They also have only one function, which is to clear. It is thus *a priori* difficult to describe a "lift-out" in the case of a CCP: what would be left behind?

What CCPs do is calculate their potential loss in the event of member default, and call for margin and default fund contributions to cover that loss. If a member default has given rise to losses which are so large that the margin and default fund were not able to contain them, there was something wrong with the way that the CCP was doing its business—its only business. That would, then, suggest that reviving the CCP (with its old, failed, risk model) would be a false decision.

Lift-out to a private buyer or to a bridge CCP must overcome this challenge. A bridge CCP would have no ready-made risk model of its own. A private buyer, if it were an existing CCP, would have a risk model, but *ex hypothesi* its model will be different, creating practical challenges. We must also remember that time will not be on the side of those making the decisions: the failing CCP is continuing in business, and every day the problem gets more difficult (see Box 2). This leads to a paradox: if lift-out is unachievable in practice, the policy objective of restoring the critical function of CCPs in resolution seems to oblige the resolution authority to perpetuate a failed risk model.

The remaining tools for resolution of CCPs are all means of allocating losses among survivors—in other words, "recovery" options. Of these tools, VMGH may appear to be the least unattractive, and is discussed further (below). Assuming taxpayers are not the answer, we need to work backwards from this premise which then converges towards a heavy-handed tool under "recovery" (i.e., in the CCP's domain), that is likely to reshuffle the losses.

Table 2. Survey of Tools Proposed for CCP Resolution

Tool Proposed for CCP Resolution	Observation
Bridge CCP	Where the risk model of the CCP has proved wanting (*ex hypothesi* in a case of resolution caused by default losses) the bridge CCP would inherit all the "bad" as well as the "good"—there is no realistic means of separating them.
Sale of business to competitor CCP	This option would allow a different CCP with a robust risk model to take on the positions of the non-defaulting members, avoiding the conceptual difficulty facing a bridge CCP. But the following practical issues would still need to be addressed: • balancing the book (replacing the defaulter's side on the transferred contracts) • readjusting the margin and default fund contributions needed, and the membership eligibility criteria under the transferee CCP's rules • "sale" being a misnomer, quantifying and sourcing the cash or cash-equivalent sum needed by the transferee CCP to take over a net loss-making book. Unless the taxpayer steps in, it is not clear who will pay for this.
Position and loss allocation: Write-down (tear-up) of contracts	Each of these options below will reduce the losses of the CCP by obliging non-defaulting members to neutralize or cancel their cleared positions. Such an outcome would allow the CCP to survive, but with the following consequence: the function of the CCP, namely to ensure counterparty performance, is disregarded. That would appear to contradict the stated policy that clearing of the contracts (guarantee of counterparty performance) is a critical function.[16]
VMGH	While we argue that VMGH is the least troublesome tool currently under consideration for resolution of CCPs, repeated rounds of VMGH or time-unlimited VMGH are open to objections similar to those relating to position allocation and tear-up. Furthermore, uncontrolled VMGH creates moral hazard.[17]
Cash call	This is a legitimate tool, but it belongs in the "recovery" phase. Cash calls can be made on shareholders as well as on clearing members. There may be limits to what shareholders are willing to contribute in a practically-workable timeframe; and clearing members will usually have a cap on their contribution liability. We assume that these options have been exhausted when the CCP enters the "resolution" phase.

[16] Market commentators have noted other adverse effects (ISDA, 2017a; Turing, 2016, sections 14.15(5) and (6)).

[17] JP Morgan (2017); Turing (2016), section 14.15(3).

D. Variation Margin Gains Haircut

The Variation Margin Gains Haircut (VMGH) spins out of the idea that CCPs keep pace at least daily with the movement in market price on the contracts they clear. So, if the value of what the buyer has contracted to buy has risen, the buyer has made a gain which the CCP collects as "variation margin" from the seller and hands on to the buyer. The VMGH occurs when the CCP withholds the on-payment of gains to gainers, while continuing to demand the payment of variation margin (market losses) from losers.

Limited-use VMGH has various advantages: it can keep the CCP afloat, with limited risk to the CMs (Heath et al, 2015; Gibson, 2013).[18] The VMGH also addresses the "blur" between *liquidity* support to CCPs, which central banks are content to back up, and the *solvency* of CCPs.

The net open interest positions of the largest CCPs are sizable.[19] The size of the issue facing a CCP entering resolution can be viewed in relation to the GDP of a CCP's home country. Taking European CCPs, the two largest clearers of interest rate products are Germany's Eurex Clearing AG (US$1.7 trillion open interest position) and U.K.'s LCH.Clearnet Limited (US$164 trillion open interest position); in the U.S., CME Clearing, has an open interest position of US$16 trillion open interest. [20] The numbers can also be compared to Germany's GDP of US$3.4 trillion, United Kingdom's GDP of US$2.5 trillion, and U.S. GDP of US$20 trillion respectively. (Singh, 2013, Box 3). Therefore, steps are needed to reduce the size of open interest positions in a crisis. Tear-up may be an option (see Table 2); variation margin haircutting provides an additional buffer before taxpayer involvement becomes implicated. As an example, if a pension fund has a swap/futures hedge and has a gain on its swap position but a loss on its futures position, then there may be a variation margin haircut on its swap receivable, but this would ignore the loss on the pension fund's futures position. (This outcome also translates into more asymmetry between those exempted from clearing and those that are mandated to clear, since clients of CCPs (such as a hedge fund) may have to contribute towards CCP resolution and recovery to avoid a CCP default.)

Of course, the VMGH tool is not an unmitigated boon. Market participants (who may be hedgers rather than speculators) will suffer loss—*but ex-ante the VMGH dice is unbiased.* CMs may be tempted—if the VMGH is used during the "resolution" phase—to anticipate the danger, and alter the balance of their house portfolios, leaving the VMGH burden to be shouldered by clients' positions. Another troublesome aspect is the potentially open-ended nature of the VMGH and the specter of moral hazard which it implies, for the VMGH is a license to a CCP to continue to trade: unlimited VMGH "could be viewed as forcing

[18] These studies cited indicate that the VMGH is potentially able to sustain a failed CCP indefinitely. However, when interpreting these studies, one must recall that CCPs clear products where deliveries take place; so not all payments going through a CCP are in the nature of "variation margin gains." Modeling for survival needs to take account of such other payments.

[19] Net open interest may be criticized as an approximate measure, given that the actual losses are stressed positions minus margin, skin in the game and default fund contributions. A CCP in resolution may have been able to close (through tear-ups or ordinary default management processes) some of the open positions, though continuation of functions implies only limited change to open interest notwithstanding a default.

[20] The source is from Clarus Financial Technology.

participants to support a CCP when they no longer have confidence in its management" (JP Morgan, 2017). VMGH might reinforce a price spiral (JP Morgan, 2014; Wendt, 2015). However, economically it can be viewed as an *ex-post "catch up" to the ex-ante shortfalls in the default fund*, and we expect resolution authorities to be wary of extended rounds of VMGH.

In our view, the best balance is a single round of haircutting which is not subject to a financial cap. However, in an extreme case, that might not plug the gap which the CCP needs to fill. Additional checks and balances are needed to bring the scale and period of loss-allocation to an end in a reasonable timescale and with reasonable fairness for all stakeholders.

E. No Creditor Worse Off (NCWO)

One principle in bank resolution is to ensure that any resolution tool should leave "no creditor worse off" (NCWO) than if the resolved entity had been put into liquidation. It is therefore important to preserve the option for CMs, as creditors of the CCP, to liquidate the CCP. This may be difficult if the CMs are obliged to accept write-downs of their entitlements: if their debt is no longer legally in existence, they are not creditors, and cannot liquidate the CCP, even if the bargain they originally had has changed through the CCP's unilateral act.

A robust liquidation option is thus essential to breathe vigor into the NCWO test. CCPs could have an alternative fate to perpetual motion: to be wound-down, with creditors receiving what they would have had in a regular insolvency; with new management put in place with a new risk model; and with fresh capital to enable a fresh start. The discipline of this option will ensure that ailing CCPs make sensible choices (cf. Blackrock, 2016).

But liquidation of CCPs is not officially contemplated. In fact, it seems that liquidation might never happen, since it is inconsistent with continuity of the CCP's functions if lift-out is not achieved. That is wrong in principle. Creditors, even CMs, ought always to be allowed to wind up their debtor and retrieve whatever is possible from the insolvency process. Stakeholders ought not to be forced to continue to support a failed enterprise with a failed risk model. If there is no liquidation option, and the CMs are unequal to the task of recapitalizing the CCP, who will pick up the tab? If the answer is that only the state—the taxpayer—is left, the entire policy objective of resolving CCPs without recourse to public funds will have been thwarted.

F. Overview of CCP Resolution

We have shown that the lift-out approach for resolving failed banks will not work easily for CCPs. That leaves the resolution authority with a collection of loss-allocation tools which will allow the failed CCP to recover at the cost of the CMs it serves. None of those tools is overwhelmingly attractive, since none of them addresses the central failure at the heart of the problem: the failure of the CCP's risk model. In all scenarios except a lift-out to a competitor, the critical functions will remain encumbered by the causes of failure. Moreover, these tools are intended to be used when the formal "recovery" efforts have been exhausted, and the appetite for further cash injections and loss-sharing to support the ailing CCP may have diminished. The implications are unwelcome. The incentives to achieving a successful outcome of resolution of a CCP should be examined. The CMs, on whose cooperation the

default management process depends, may be unwilling to back the continuation of the CCP whose model has failed. Yet it is upon the CMs (or taxpayers) that the burden of financial "resolution" will fall. They may decline to participate, or at any rate to do so within a timescale which is workable, or indeed they may be unable to do so in view of the size of liabilities involved.

One result of imposing mandatory clearing on the OTC derivative markets has been to concentrate counterparty risk into the hands of the CCPs. CCPs thus become focal points for risk, and critical infrastructures. The size of the concentration into CCPs will go on increasing, as will interconnectedness.[21] Concentration is also happening at the level of CMs, at the same time as cleared volumes are growing. Over a 10-year period to 2015, the number of Futures Commission Merchants (FCMs) registered in the U.S. fell by approximately 60 percent. Although the number of SwapClear CMs at LCH. Clearnet Limited grew four-fold (over 80 new members) in five years during the lead-in to mandatory clearing, the top ten clearing brokers clear 97 percent of the market (top five, 70 percent). Meanwhile customer assets held by U.S. FCMs grew 45 percent between December 2007 and March 2015, and the BIS reports an ever-rising turnover in single-currency interest rate derivatives (Solum and Calypso, 2015; Giancarlo, 2015; FIA, 2015; BIS, 2016). In conclusion, a smaller number of CMs is being expected to shoulder a greater volume of risk. It is not obvious that the quantum of potential loss could actually be absorbed by the CM community—implying that the taxpayer may be asked to come in.[22]

Consequently, if recovery fails, there is no viable means of "resolution" left to the authorities. That leaves the alternatives of insolvency proceedings or bail-out. If insolvency proceedings are a non-viable route, a taxpayer bail-out (with the burden falling on the taxpayers in the place where the CCP is based, despite the international nature of its service) may be the only option left. These arguments all point towards a need for policy-makers to reassess their current approach.

IV. A Revised Policy Approach

In this section, an alternative vision of how the problems of failing CCPs could be managed is put forward, with new tools proposed.

A. The Clearing Obligation Should be Relaxed

The policy *fait accompli* of mandatory clearing of OTC derivatives contracts is not something which is challenged in this paper. But some softening of the policy to address the peculiar circumstances of a CCP failure is desirable, especially as mandatory central clearing

[21] Due to regulatory demands, collateral needs will create further interconnectedness in the financial system. In general, central banks, sovereign wealth funds and long-term asset managers desire collateral that is of low volatility and high quality. On the other side, banks, hedge funds and mutual funds have drastically shifting needs for highly liquid assets. So, a market for collateral transformation (and interconnectedness) is likely.

[22] Dodd-Frank Act sections 802–806.

is not always risk-reducing.[23] The options include: (a) suspending the clearing obligation in cases of CCP difficulty, as proposed by FSB (2016), but on a global rather than a local basis (not along the lines proposed in the draft European Union (EU) Regulation)[24]—in other words, the bilateral clearing option, or portability, or other alternatives should not be precluded;[25] (b) automatically cancelling the clearing mandate for products where a CM default has blown through the default fund layer of the loss waterfall for the product concerned, regardless of whether there was a "recovery" or "resolution" of any CCP that cleared the product, and not reinstating the mandate until the causes of risk management failure have been understood and remedied; and (c) ensuring that CMs are not thwarted in their own ability to manage losses when a CCP difficulty becomes manifest by inability to register offsetting trades CCPs' reserves policies should be strengthened and the loss waterfall revised. See also Box 4.

From a monetary policy perspective, implementation of EU regulations on variation margin for uncleared trades (generally posted in cash) was postponed earlier this year. Dealer banks prefer clients like pension funds and insurers not to post non-cash collateral as it has it costly to their balance sheet. So typically, the banks will do a repo with such client's non-cash collateral to provide them cash funding, and then the clients would post the cash to the bank. The cash ends up as excess reserves at the central bank—so we need to be cognizant of the dealer bank's balance sheet constraints (Singh, 2017). More fiat push of derivatives to CCPs, aside from destroying the netting bundles in dealer banks book etc., also ends up building a large central bank balance sheet (which in times of post-QE normalization, is not desired).

[23] Duffie and Zhu, 2009; Pirrong, 2014; Pirrong, 2010; Ghamami and Glasserman, 2017; Roe, 2013, among other papers suggesting that the mandatory clearing of OTC derivatives is not inevitably risk-reducing.

[24] Article 80 of EU Proposal foresees a suspension, and possible amendment to EMIR regulation.

[25] FSB (2016): "*However, there are a number of policy and operational issues regarding the practical implementation of this, including: whether authorities would be able to agree ex ante or in crisis to conditions under which a suspension would be acceptable; the scope of the authorities that would need to be involved in the decision; the impact on client clearing mandates and capital implications for market participants if transactions cannot be centrally cleared elsewhere*."

Box 4. Should Mandatory Clearing be Relaxed?

- A key incentive for moving OTC derivatives to CCPs is higher multilateral netting, i.e., offsetting exposures across all OTC products on SIFIs' books—intuitively, the margin required to cover the exposure of the portfolio would be smaller in a CCP world. However, if there are multiple CCPs that are not linked, the benefits of netting are significantly reduced, because across-product netting will not take place, since almost all CCPs presently offer multilateral netting in the same asset class and not across products (Duffie and Zhu, 2009).
- There is ambiguity[26] on the amount of collateral posted in the OTC derivatives space. There may be a shortfall of up to US$3–4 trillion,[27] (Singh, 2010, 2017). However, these figures may not pick up the full extent of collateral shortfall since only variation margin is typically captured in financial statements. Furthermore, International Swaps and Derivatives Association (ISDA, 2017b) sources indicate about US$1.0 trillion of collateral dedicated to the bilateral market (and unrelated to bilateral clearing deficiency, about US$400 billion to the CCP market). However, this collateral is fungible across all pledged collateral lines of a global bank's business including prime brokerage, repo and securities-lending. Furthermore, if we use a reuse factor of 2.0, and as CCPs' rights of re-use of initial margin are curtailed, significant additional collateral will have to be posted to bridge the shortfall.
- Regulations have not mandated reducing residual derivative payables. There are other avenues to removing OTC derivative risk from the large banks' books with similar underlying economics and perhaps lower collateral needs. For example, a levy on residual derivative liabilities (i.e., after netting and after whatever collateral is posted) is a more transparent approach than moving OTC derivatives to CCPs, especially if the costs of bailing out CCPs are to be funded by taxpayers (although there is now an increased focus on VM haircuts that may avoid taxpayer bailout). If a levy is punitive enough, then large banks will strive to minimize their residual derivative liabilities—this, not the levy, is the primary objective. This would minimize systemic risk via the OTC derivatives markets if a large bank fails. More importantly, as a by-product of such a levy, the residual derivative assets would tend to fall towards zero.

B. CCPs Should Widen Sources of Capital, and Build Reserves

CCPs which do not contribute proportionately to default management discourage clearing by shifting the cost to CMs. In fact, the arithmetic to support that there are incentives to clear via a CCP than bilateral clearing, is weak. A recent paper concludes *"The cost comparison does not necessarily favor central clearing, and, when it does, the incentive may be driven by questionable differences in CCPs' default resources"* (Ghamami and Glasserman, 2017).

CCPs should be encouraged to add in further sources of default backing into the waterfall before non-defaulting members' default fund contributions are utilized. In addition to debt instrument issuance, CCPs could consider default insurance, to contribute liquidity and

[26] It is somewhat unclear how collateral is being reported. BIS statistics report "gross market values after taking into account legally enforceable netting agreements," which presumably takes into account title transfer and re-used collateral. (BIS, 2016, page 13, footnote 4).

[27] For accounting purposes, banks' annual statements show collateral received and posted.

absorb losses before the incidence falls on CMs. Official policy underlying the quantification of "skin in the game," and whether parent companies of CCPs should issue debt capable of bail-in, should be revisited. In this context, it has been suggested that at present "skin in the game" may not be primarily intended to have a loss-absorbing function. The following statement, which appears in CPMI-IOSCO policy guidance, has been interpreted in that sense (JP Morgan, 2017):

> "[A] CCP should determine and expose an amount of its own financial resources to absorb losses resulting from a participant default […] [The] amount and characteristics […] of a CCP's own contribution to absorb potential losses […] can enhance confidence among participants with respect to the risk management at the CCP and with respect to the alignment of interests between the CCP and its participants."[28]

We suggest that the responsibility for failed risk models can legitimately be shared more widely than now, and that implies an enhanced layer of loss-absorbing capital (Carter and Garner, 2015).

Furthermore, and to redress the imbalance between shareholders and CMs, CCPs should be required to develop reserves, and to declare publicly their reserves and dividends policy in relation to the default waterfall. Immediate distribution of profits to shareholders rakes out of a company a natural buffer which could cushion shocks. CCPs are not obliged by law to develop reserves, though it is recognized that reserves have a useful function as loss-absorbing shareholders' funds. CCPs which fail to build reserves and then experience defaults which involve extreme losses could be required to claw back profits distributed irresponsibly.

C. Failed CCPs Should be Scrutinized

A CCP which has failed so drastically that its financial resources, as laid down by law and approved by its risk committee and its regulators, proved insufficient, was a CCP which mis-managed its risks. As the modeling of risk for the purposes of quantifying margin and default fund size is not wholly within the control of the CCP, the causes of the failure may have implications for other CCPs or the clearing of other products. For that reason, the risk aspects of a CCP failure need to be investigated. The inquiry should be done by a person other than the resolution authority, and the results should be published so that lessons can be learned.

V. Concluding Remarks

It is important for financial stability to have a robust infrastructure for clearing financial markets, particularly where its use is mandated by law. The amount of financial underpinning is also set by law, and if the amount has been misjudged, it is right that there should be a simple, predictable, practical plan for what happens next when the funds run out.

The present policy on CCP resolution is also strongly based on the premise that the only persons who can and should bear the costs of CCP resolution are borne by the CMs or taxpayers. The present risk/reward model for CCPs is unbalanced, and care should be taken to ensure that the resolution policy does not turn the imbalance into distortion.

[28] CPMI-IOSCO (2017), paragraph 6.2.1.

The toolkit proposed for resolving CCPs is too closely modeled along the lines of the toolkit for failed banks. CCPs are not banks and hence the need to be approached differently. Many of the tools proposed for resolving CCPs might prove to be unusable in a crisis or even worsen the crisis. Additional tools are needed; some of those would demand that regulators accept that the existing policy belief—in particular, that mandatory clearing must carry on under all circumstances, may not hold valid in a crisis.

The draft EU Regulation is a valiant legislative attempt to lay more detail around the FSB's outline paper on CCP resolution. The CPMI-IOSCO and FSB should modify their recommendations so that other lawmakers do not assume that a resolution model which works for banks will be suitable for CCPs. It is not too late for action to improve policy on failing CCPs.

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