

Cleared margin setting at selected CCPs

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Introduction and summary

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Since the financial crisis of 2008–09, considerable attention has been given to the financial resources required to guarantee performance of various counterparties in financial transactions or contracts. Direct bilateral counterparties to dealer-to-dealer and dealer-to-end-user transactions are now required to exchange collateral as performance bonds, also known as margin. Clearing members of central counterparties (CCPs) are similarly subject to minimum margin requirements as set by the CCP. End-user clients face margin requirements set by their clearing member agents that are equal to or higher than the CCP minimum.

Regulatory reforms since the financial crisis have mandated the use of CCPs for the clearing of over-the-counter (OTC) derivatives when possible (based on their degree of standardization, among other factors). This mandate, plus the increased use of listed derivatives generally, has resulted in additional scrutiny being given to the margin-setting methodologies used by CCPs.

The purpose of this study is to examine the regulations, principles, rules, policies, procedures, and best practices that cover the setting of derivatives margin by CCPs.¹ Source materials for this study include publicly available documents and data, such as the rules of the CCPs and publicly disclosed margin material. We have conducted extensive interviews with senior CCP personnel who have responsibility for margin policies and their implementation. In all, we interviewed people at six of the world's largest and most diversified CCPs. We gratefully acknowledge their cooperation, as well as input and comments from staff members of the Federal Reserve Bank of Chicago's Financial Markets Group. In addition, we reviewed national regulations and international standards and principles as they apply to the adequacy of the financial resources of CCPs generally and margin levels specifically.

The financial resources available to CCPs vary by regulation and by the CCP's commercial structure. Some CCPs are organized for profit with fiduciary responsibility to their shareholders (who may or may not be clearing members), while other CCPs operate as at-cost utilities.

Regardless of their corporate structure, all CCPs rely on their “risk waterfall” of financial resources to cover a financial deficit (that is, the insufficiency of financial resources available to cover a CCP's obligation to clearing members, caused by the default of one or more of its clearing members). A CCP will use the financial resources in the order of application as defined by its rules. Typically, the first level of claim by a CCP is the margin and default fund contribution of the defaulting clearing member, followed by resources including a portion of the CCP's capital, the remainder of the default fund, assessments applied to the surviving clearing members, and additional CCP resources, if necessary.² The priority of the defaulter's margin in the waterfall makes clear the different roles of margin and the default fund (also known as a guaranty fund). The default fund is separate from margin, contributed by clearing members (in a pro rata amount) and, importantly, is mutualized—a draw-down of default fund resources will affect all nondefaulting clearing members. It is therefore of concern that the initial margin be set correctly in order to minimize the need to utilize the remaining layers of the waterfall.

The balance between margin levels and default fund contributions is important because less of one implies the need for more of the other. A larger default fund might allow for lower margin requirements, but at the cost of making the use of mutualized resources more likely. Clearing members expect the CCP, acting on their behalf, to set margins at levels high enough to cover CCP settlement risks without drawing on the default fund. Because all clearing members make contributions to the default fund, they are sensitive to the free-riding and moral hazard implications of possibly relying too much on mutualized resources.

In practice, default funds are almost never used because they are designed to cover only extreme tail events that margins might not cover. For example, the financial consequences of the default of Lehman Brothers in 2008 were covered several times over by Lehman's margin resources held by the affected CCPs. As a result, there was no need to use the mutualized default fund.

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While the advantages of mandating robust margin levels are clear, there are also consequences associated with excessively high margins. CCPs have strong incentives to set margins at levels that avoid possible reductions in market liquidity and capital and hedging efficiency that could occur should margins be set too high. A very conservative approach to margining might set the levels above what is needed to cover the risks as measured or perceived by the CCP. The optimal level therefore represents a balance between too little and too much margin.

It should be noted that *margin* (deposit, standing or maintenance, also known as performance bond) is the *amount* of financial resources that must be deposited with a CCP by a clearing member or between other counterparties in order to secure a financial contract through time. In contrast, *collateral is the financial instrument* (cash, securities, other property) that is used to satisfy the margin requirement.

In addition to operational considerations, regulation plays an important role in determining the margining policies of CCPs. The international principles covering the organization, management, and resources of CCPs are put forth in the *Principles for Financial Market Infrastructures* (PFMIs).³ The fundamental framework for margin policies is contained in principle 6 of the PFMIs, which states that “a CCP should cover its credit exposures to its participants for all products through an effective margin system that is risk-based and regularly reviewed.” The PFMIs elaborate on this general principle stating key considerations and explanatory notes.⁴

In the following sections, we review the historical development of CCPs and provide an overview of the basics of margining. Next, we discuss margin-setting frameworks and methodologies, drawing on considerations listed in the PFMI and identified in interviews with CCPs and in their written disclosure documents. We then discuss some CCP-level considerations in margin setting that are based primarily on how a CCP views the risk of its clearing members. Finally, we outline some challenges and policy issues.

Brief history of derivatives margin setting

Early clearing constructs such as nineteenth century ring clearing, where differences were settled but no margins were held by a central counterparty, were basically devices to settle variation margin bilaterally between those who had open positions with each other. If netting occurred, it was directly between the bilateral parties, and each party had to settle or net with every other counterparty.

The ad hoc era

The modern functions of CCPs were developed and refined in the early twentieth century. By the 1920s, the margining of contracts cleared by CCPs was commonplace as clearinghouses started to act as central counterparties, moving beyond simply acting as netting and transfer agents. The margin methodologies were simple, based on recent price changes (in essence, recent volatility) that were observed on an ad hoc basis. Cleared derivatives at that time were primarily futures contracts (agricultural, metals, etc.) that were traded within daily price limits. Therefore, margins were often set at or near the level of daily price limits. Neither margin levels nor price limits would change very often, unless volatility persisted for more than several days. In concert with a margin increase, the price limit was often expanded as well. When prices returned to less volatile conditions, both the margin and limits would be reduced to longer-term trend levels, although typically not as fast as they were raised as volatility increased.

In this era, the futures markets were often the “basis” market, setting the base price for many commodities. The various “cash” markets would use the futures prices as the key reference in setting their local cash market prices. As a result, CCPs regarded cash prices as less economically significant than the prices of the futures contracts they were clearing, because the cash prices were typically derived from the futures price.

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Volatility-based margins

The commencement of trading in listed stock options and advances in computing power in the early 1970s enabled a more systematic approach to volatility measurement. CCPs could agree with their members on a margin-setting methodology based on volatility as measured by agreed parameters. This allowed for an end to the ad hoc approach and provided a more objective methodology for setting margin levels. Often, margins were set above the values suggested by the volatility-based calculations.

With regulatory approval for derivatives covering financial indexes and securities, CCPs had to perform more extensive data analysis of the underlying markets. Complicating the analysis was the fact that futures and options markets were not the basis markets for the underlying securities and indexes. Instead, the price of the underlying securities determined the value of the derivatives. For example, stock prices directly determine stock index prices, and stock prices are a key input to setting options margins. Since securities markets do not have price limits, CCPs had to calculate margin for financial derivatives without relying on daily price limits as a benchmark.

Additionally, the relationship between price changes in the underlying market and the derivatives market were nonlinear. Changes might include jump effects due to cost-of-carry factors, index composition

substitutions, corporate actions, interest accruals/payments (coupon and discount), and dividends. The clearing of financial derivatives called for CCPs to include such factors in their margin methodologies.

For commodities derivatives, CCPs managed seasonal effects and delivery effects through margin adjustments that utilized the knowledge gained from recurring event experience.

General considerations of derivatives margin

Derivatives margin constitutes the first line of financial resources available to guarantee performance of a counterparty to a derivatives position and to cover loss if that counterparty defaults. In some circumstances, margin may be used to dampen speculation by making trading (holding of positions) more expensive, thereby reducing leverage.

The overriding principle of derivatives margin is to assure commitment to the position taken by the side giving the margin and to assure that the defaulter pays in the event of its default. This principle applies to bilateral OTC margin as well as margin required by CCPs for centrally cleared positions. CCPs use margin to protect against extreme but plausible events (defaults) to ensure continuity of contracts.

OTC margins

OTC margins are the focus of working groups, such as the Working Group on Margin Requirements (WGMR), a joint initiative of the Basel Committee on Banking Supervision (BCBS) and the International Organization of Securities Commissions (IOSCO) (BIS/BCBS/IOSCO, 2015). Regulators are developing rules for their jurisdictions consistent with the final framework of the margin policy adopted by the WGMR in September 2013 (revised in March 2015) (Canadian Securities Administrators' Derivatives Committee, 2016).

CCP margins

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The baseline for derivatives CCP margining is the maintenance level set by the CCP that clears the derivative contract. As the term implies, the maintenance level is the minimum amount of margin that must be covered by the deposit of appropriate collateral in order to satisfy the margin requirement. Failure to do so could result in the counterparty being declared in default (failure to pay a financial obligation when due), or suffering liquidation of the derivatives contract, or both, depending on the rules of the CCP. Clearing members of the CCP are the CCP's counterparties, and they in turn are the intermediaries between the CCP and end-user customers (hedgers and speculators). Some clearing members also clear their own proprietary accounts. Clearing members can charge their customers higher margin rates than the maintenance margin level, based on their assessment of the creditworthiness of their customers, as well as other factors such as related service offerings.

At least daily, and typically more often, CCPs collect variation margin from clearing members for losses on positions and pay the gains with finality to those clearing members with positions that have a net increase in value based on marked-to-market prices, actionable quotes (from clearing members), or modeled prices as appropriate. Variation margin is not paid directly from any specific clearing member or customer counterparty to another as a pass-through transfer.⁵ Rather, variation margin is a netted cash flow from a clearing member to or from the CCP.

Because variation margin keeps the margin value of positions at current (or nearly current) prices, maintenance margin is effectively the financial coverage held against possible losses until the next cycle of variation margin. Of course no one knows what the next price will be, so CCPs use retrospective data and other inputs to set maintenance margin levels.

CCPs have developed analytical methods to translate data into margin levels that they believe will cover likely risks going forward. Due to the discipline of mark-to-market calculations that result in regular variation margin payments, the time horizon that maintenance margin seeks to cover ranges from a few hours to as much as a trading day or a weekend/holiday period.

Margining frameworks: Rules-based versus risk-based

Basics of the risk-based approach

The straightforward contract-by-contract margining approach, described in the preceding section, is rules based, in that the margin rate is set with little (or no) consideration of possible risk offsets that might be available from other positions in a portfolio. Risk-based margining was a key evolutionary step in developing a more capital-efficient approach to setting margins. Risk-based margining takes into account the overall risk of the positions in a portfolio by recognizing that some of the risks offset others. Regardless of how the offsets are matched, the CCP still has to set margin levels for outright positions, spread positions, and hedged positions. The adding or netting of margin offsets then follows by defining allowed offsets and the degree of margin relief that can be granted.

If CCPs are not yet using entirely risk-based margin systems, they are innovating in that direction. In particular, the OTC clearing mandate requires central clearing of more complex products, many of which can be paired with listed futures and options to achieve risk, and hence margin, offsets. Indeed, many complex products can be replicated synthetically by combining certain listed products, thereby mimicking customized OTC products.

Risk-based portfolio margining itself faces the risk that the correlations it uses change and possibly become unidirectional rather than offsetting. At least one CCP applies a buffer to its margin to cover such risk and adjusts the buffer if the correlations change substantially.

Spread margining

One traditional type of offset adjusts margins for spreads within a product or asset class, recognizing that one of the legs of the spread will typically have price changes contrary to the other, perhaps one-to-one or in some stable ratio of price changes. The most common of these are “calendar spreads,” which involve different delivery dates, maturities, or expirations for derivatives covering the same underlying instrument. Over time, more complex offsets were used, along with defined-spread offsets, such as the crack spread for petroleum products and the crush spread for soybeans and refined products, where the spreads involve the value added by the industrial processes that refine petroleum products from crude oil and soybean meal and soybean oil from soybeans, respectively.

Options

The trading of options also required sophisticated portfolio approaches, including strategies that combined option positions with positions in the underlying instrument, puts versus calls, as well as vertical (exercise price), horizontal (expiration date), diagonal spreads (exercise price and expiration date), and so forth. Synthetics such as conversions, reversals versus futures, and box spreads (that are essentially financing transactions borrowing or lending cash to the market) also require complex margin methods.

An early approach to margining these sorts of portfolios involved adding up the option deltas.⁶ This simple approach proved to be inadequate: It could not account for changes in the delta over time or sudden increases in

volatility. Further, the delta of an option is highly sensitive to whether the option is in or out of the money. This sensitivity can lead to step-type price changes over very short periods.

The solution to this problem of margin calculation for option portfolios was the creation of systems, such as SPAN, TIMMS, STANS,⁷ and their variants, which directly compute the effects of within-portfolio correlations on portfolio risk. In addition to taking a portfolio approach to margins, each of these systems applies stress to the calculations by using parameters to create price risk scenarios. Monte Carlo scenarios allow for 10,000 or 20,000 cases, thereby comparing a worst case with the margin level.

Margin-setting methodologies

Margin changes for any single product or class of products are relatively infrequent events. However, large, diversified CCPs set margins for perhaps thousands of derivatives. Therefore, there are likely to be changes to some margins fairly often. The margin levels are set to cover the individual product risk, but the use of risk-based margining can potentially link the margins of different products.

There are several characteristics that are common across products and play a role in determining the appropriate size of the margin required. Notable among these are volatility, correlation risk, concentration risk, and possible procyclical effects.

Volatility

It is not surprising that CCPs view volatility as the key input in determining margin levels. The assumptions and methods that go into measuring volatility are the focus of regulatory principles, such as principle 6 of the PFMIs, and are of direct interest to regulators and CCP users. Most CCPs use realized or historical volatility. The realized price volatility of any traded financial instrument (whether securities or derivatives) is necessarily retrospective and dependent on the sampling methods used. Near-term volatility can be unstable, and its effect on margin is influenced by the weighting chosen for any set of prices.

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CCPs seek to cover at least 99 percent of price changes, but they employ different look-back periods in their volatility estimations. CCPs generally cover at least the previous trading year (250 days, plus or minus). Some use look-back periods of several years; even ten-year look-backs are not unheard of. By using longer data samples, CCPs hope to better capture periods of price stability as well as volatile periods. However, the risk in choosing a fixed sample is that extreme price observations might be missed. More generally, there is a trade-off in deciding how far back to reach for data in estimating volatility: A longer look-back period reduces parameter uncertainty *if* there is no discrete difference in the volatility levels of the new data in the new period, but lengthening the look-back period can bias the parameter estimates if there is a discrete difference in the volatility levels of the new data.

The treatment of exceptional price changes or outliers varies by CCP, but several seek to include certain days from the financial crisis of 2008–09 and even price changes observed in the stock market around the 1987 market break. While such events might be considered extremely rare (for example, a once-in-50-year event), some CCPs argue there is no clear reason why such an event might not occur again. Importantly, the weighting applied to such outliers determines the influence that the data point has on the volatility estimator.

Similarly, CCPs may apply additional weights to seasonal and larger price variations, such as the largest 20 percent of price variations within a chosen period. Greater weight might also be applied to prices observed in the most recent quarter of the year. Implied volatilities from options prices can also be used when available.

All CCPs routinely (even daily) conduct back tests to determine their models' fit with real prices. They also routinely stress test their models to answer "what if" questions. Sensitivity analysis is also used to determine the impacts of small changes in parameters on the output of volatility models.

Based on our discussions with CCPs, it appears that volatility determines about 90 percent of margin requirements. Nonetheless, additional risk factors, including correlation risk, concentration and liquidation risk, procyclicality, credit risk, and jump risk, are also of significant concern to CCPs.

Correlations

Fundamental to portfolio margining is the measurement of correlations among positions in real or hypothetical portfolios that allow for margin offsets. Regulatory principles allow portfolio margining across product classes that are significantly and reliably correlated. Calculating correlations across a range of products and market conditions requires accurate data and well-defined statistical methods. The PFMI are not strict standards, and they do not define significance and reliability measures for the correlations.

There are two key assumptions in using the correlations for margin offsets. First, it is assumed that the correlations are relatively stable and therefore can be used to margin positions through periods of months or years. Second, even if correlations do change over time, it is assumed that the risk of a set of correlations becoming all one-way (that is, a shift to correlations near unity) is very low, if not effectively zero. Jumps to highly positive correlations, however, have been known to happen—for example, during the financial crisis of 2008.

Concentration and liquidation risk

CCPs are alert to the distribution of positions held by clearing members ("open interest") and can apply a margin surcharge on positions that are overly concentrated at a single clearing member (or a small number of members). Alternatively, a CCP can order the clearing member to reduce the size of its position. Some CCPs set absolute percentage limits, so that no single clearing member can control more than a predefined portion of the market. Others address concentration risk on a case-by-case basis.

CCPs view concentration risk in multiple ways. First, there is the danger that the clearing member might have risk disproportionate to its capital. Second, the clearing member may be seen as inadequately diversified, thereby lacking potential internal portfolio offsets. Third, there may be concern about the possible need by the CCP to liquidate the clearing member's position: Can the listed market absorb the volume of liquidating trades at minimal cost? While a large, well-capitalized, and diversified clearing member might be able to manage the risks of a concentrated position, CCPs may be concerned that if liquidation (or transfer) of the positions would be needed in the event of a default by that clearing member, there might not be sufficient clearing capacity available at the other members to absorb such a large position quickly.

In futures markets, the ability of a CCP to liquidate a portfolio of futures contracts is generally assumed to be high, due to the existence of very liquid exchange-traded markets. These markets also provide transparent marking prices that aid in such liquidations, for example, by facilitating the auction process or by making it easier to hedge the portfolio. Therefore, some CCPs use a one- or two-day liquidation assumption for futures contracts. (In some jurisdictions, a two-day liquidation assumption is mandated by regulation.) In contrast, complex derivatives, in particular some OTC-traded, centrally cleared contracts, are typically assumed to have five-day liquidation periods. These assumptions regarding the liquidation period of risk directly affect margin levels.

In any case, when liquidating a clearing member's portfolio, CCPs are motivated to do so quickly, as a whole or in large blocks (as compared to liquidating a portfolio "line by line"), in order to restore rapidly the CCP's matched book. The costs of this rebalancing will include any bid-ask spreads, market losses (if any), and direct expenses such as brokerage or professional fees. All of these costs are expected to be covered by the defaulter's margin.

Procyclicality

Periods of high volatility tend to coincide with increased liquidity demand. It follows that any margin system that uses volatility as its key input is potentially procyclical with respect to its financial impact on cleared positions. Simply, when volatility increases, CCPs require additional margin. In addition, correlations are likely to increase at the same time that volatility increases. In response, CCPs will raise their margin requirements. Such margin calls are separate from any variation margin that is required due to the price changes associated with this increased volatility (although a clearing member's variation margin receivable from the CCP might net with an initial margin payable). These initial margin calls and variation margin demands can be cumulatively procyclical, requiring liquidity to cover the requirements exactly when market conditions make accessing such liquidity difficult.

A significant example of procyclicality is the volatility and margin changes experienced in October 1987 with respect to the Hang Seng futures traded at the Hong Kong Futures Exchange and cleared by the International Commodities Clearing House Hong Kong Ltd. Figure 1 illustrates the procyclical margin required in response to the extreme change in the price volatility of the futures contract. The blue line represents margin required from members paid to the clearinghouse, the green line represents maintenance margin, and the red line represents the margin requirement payable by clients to members. A procyclical jump in the margin required of clearing members (the blue line) occurs precisely at the time of the crash.

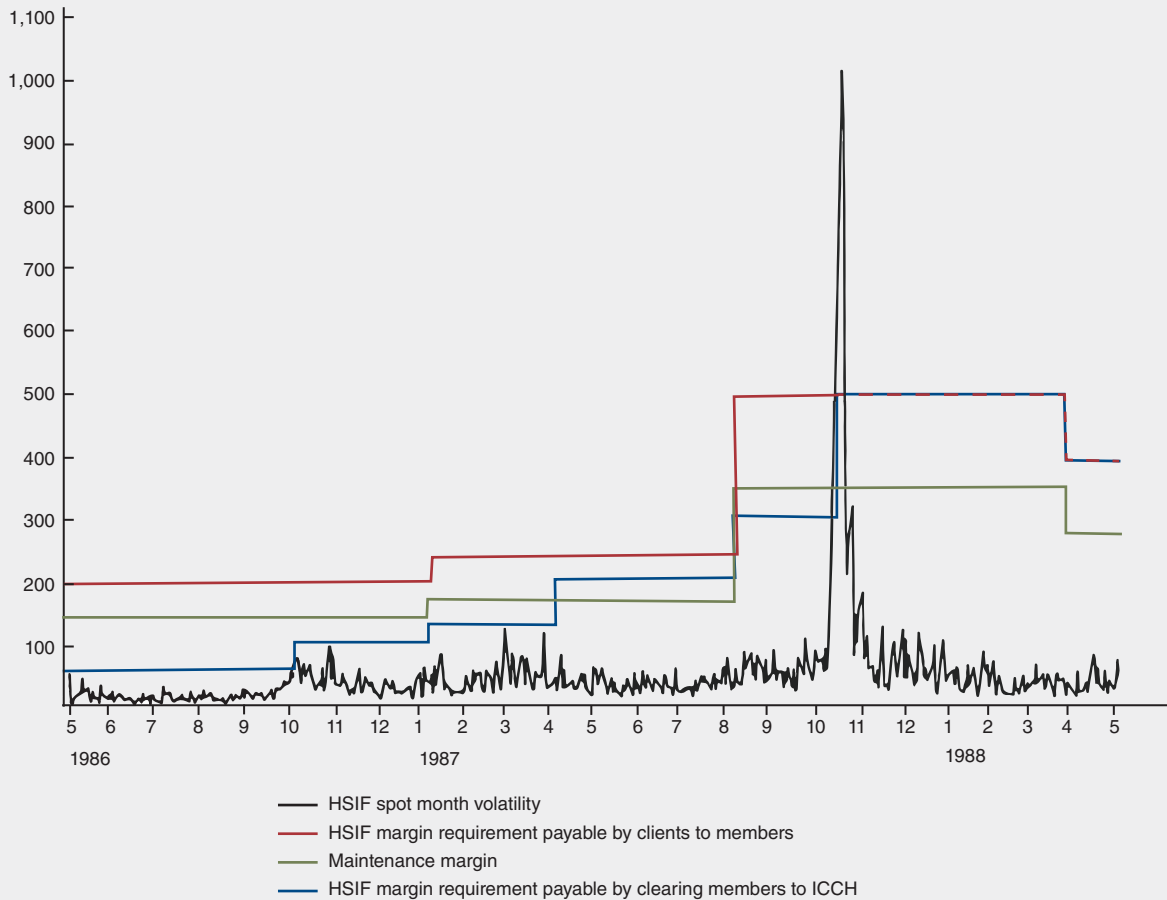
This example also serves to illustrate why default resources beyond initial margin are required if significant member default is experienced in an episode of extreme volatility. Initial margin covered volatility until the crash, but volatility completely overwhelmed initial margin during the crash.

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Market users and CCPs alike would like to avoid procyclical shocks and to have greater certainty and transparency regarding margin changes. A recent paper by Murphy, Vasios, and Vause (2016) analyzes five tools that might mitigate the procyclicality of margin requirements:

- Apply a margin buffer of 25 percent (or some greater percentage) of the margin, which can be used in periods when margin requirements are rising significantly;
- Assign at least 25 percent weight to extreme price observations in the margin look-back period;
- Use a blend of weights for extreme price observations;
- Establish a floor on margins based on a ten-year value-at-risk measure; and
- Set speed limits on how fast margins can be raised and some expectations on how quickly margins can be lowered.

In our recent discussions, CCPs described how they make adjustments to their margins in an effort to reduce the procyclicality inherent in volatility-based methodologies. Each CCP sets margin floors so that low volatility periods do not result in under-margining. They also apply extra weight to recent or immediate extreme price changes. However, they do not necessarily make discrete changes to margins based on any single observation. Rather, the extreme events and additional weight on such events are integral components

FIGURE 1**H.S. index future—Margin levels versus index volatility**

Source: Securities Review Committee, 1988, *The Operation and Regulation of the Hong Kong Securities Industry*, report, Hong Kong, May, p. 417, http://www.sfc.hk/web/doc/EN/speeches/public/consult/Report-Operation_and_Regulation_HK_Industry.pdf.

of their overall volatility measurement methodology, so inclusion of weighted data does not itself lead to discrete procyclical jumps. In addition, CCPs tend to round upward their margins, creating an additional small antiprocyclical buffer. Regardless of such attempts to dampen procyclicality, the CCPs report that they will not hesitate to raise margins in response to an extreme price spike.

Each of the CCPs we talked to tracks margin breaches when a price change exceeds the margin held from one mark-to-market to the next. A breach of a margin level does not necessarily lead the CCP to increase its margin requirement at that time. Some judgment by the CCP is required to assess the persistence of the margin breaches through time and the magnitude of the breaches observed. However, as noted earlier regarding price spikes, CCPs appear conservative in their approaches, preferring to react sooner rather than later to margin breaches (typically within one or two trading/clearing cycles). CCPs typically give some advance notice of margin changes (about two days), but can react faster and with less notice in response to extreme price moves or other situations, such as a crisis in the collateral markets (default by the issuer of debt securities, for example, or an increase in the haircuts on collateral).

Credit ratings

A CCP's margin methodology is applied uniformly to its members, regardless of their credit rating. That is, clearing members do not get a lower margin requirement if their credit rating is upgraded. However, they may be charged higher margins if their ratings deteriorate significantly. The reason for this apparent asymmetry is that each clearing member must have a rating high enough to satisfy membership or participation requirements set by the CCP and must continue to maintain an adequate rating. A notable example of a credit-rating effect on a clearing member's margins is the case of the firm MF Global. MF Global was a member of several CCPs. As its credit rating was downgraded, the CCPs increased MF Global's margin requirements (Heckinger, 2014). The effect was procyclical on MF Global (but not on other clearing members generally), because the firm also faced additional margin calls due to the deterioration in the quality of the collateral it used to satisfy its margin requirements overall.

Jump or step-function risk

Some margin methodologies must cover jump risks or step functions inherent in the products cleared. The most obvious jump risk is that associated with a determination of a credit event of a reference security in a credit default swap (CDS). In such an event, the seller of the CDS would face a large payment to cover the difference between the settlement price set by the determination committee and the par value of the securities covered by the CDS.

There also exist replacement risks associated with resetting index CDS following a credit event of one or more securities in the index. Similarly, there are risks associated with the rebalancing of certain contracts (for example, stock index contracts). Each can have step or jump effects on their prices that should be reflected in the margin levels for derivatives covering those instruments.

Another set of jump risks includes delivery period margin increases⁸ and maturity of securities cases, where full value of the underlying instrument is called for by the CCP. In the former case, the CCP could call for up to the full value of the underlying either as a performance bond on the delivery or as payment for the deliverable instrument when the delivery is consummated if the CCP acts as the delivery intermediary. The latter case applies most specifically to repo-to-maturity⁹ positions. Because there is a default risk of the issuer of the security used for the repo, the CCP will call for 100 percent (par) value of the securities at maturity of the repo minus two days (to align settlements). When the issuer pays back the value of the securities that have matured, the CCP will release the margin back to the clearing member.

CCP-level considerations

CCPs choose rules and procedures that reflect their views on counterparty risk vis-à-vis their clearing members. This section of the article examines these risk concerns of the CCPs and their impact on margins.

Gross versus net margin

Under a net margin system, a clearing member is allowed to offset the positions of each customer with those of its other customers when calculating its margin requirement. In contrast, a gross margining system allows no such offsets among customers. Rather, gross margining would require the clearing member to submit an amount equal to the sum of the initial margin amounts that would be required for each customer.

The merits of gross margin versus net margin methodologies have been debated for some time, but the question might be moot now that risk-based margin systems are used by most CCPs. Gross margin is essentially a

rules-based approach. It recognizes that one position long is not offset necessarily by one position short, especially with respect to customer positions. One element remains clear: gross margining supports the transfer of client positions in the event of a clearing member's default.

Wrong-way and agency risks

Wrong-way risk is defined by the International Swaps and Derivatives Association (ISDA) as the risk that occurs when “exposure to a counterparty is adversely correlated with the credit quality of that counterparty.”¹⁰ It arises when default risk and credit exposure increase together. The terms “wrong-way risk” and “wrong-way exposure” are often used interchangeably.

A significant wrong-way risk for CCPs is the congruent sets of clearing members as CCP clients and clearing members (or their close affiliates) as agents. For some dealings, clearing members might be the principals to CCP business transactions. This risk is particularly focused on bank, or bank-affiliated, clearing members.

Another case that could represent wrong-way risk would be where a clearing member bank is also the principal on debt as issuer or is otherwise the covered entity in a single-name CDS. (A degree of wrong-way risk would also be present if the member were included in an index CDS.) All of these cases raise the possibility that a bank could be the subject of a CDS credit event while also being expected to bid in an auction to take on the defaulted securities, which happen to be its own!

Agency and client risk issues arise because a CCP is not an all-purpose service provider, nor does it clear all of a clearing member's business. The agency functions might include banks as participants in a CCP's liquidity line of credit for the default fund, repo agent, agent or underwriter for commercial paper, and custodian for the holding of collateral or settlement bank for clearing members.

Data

CCPs require large data sets to measure volatility. Their sources for such data include the listed markets they clear, the cash (that is, underlying) market data, as well as OTC derivatives data. In addition to the data series that CCPs use to measure volatility, they also need data for marking prices to determine variation margins intraday and end of day. If these data are not available from listed markets, CCPs might use the services of a data vendor or alternatively, use modeled prices, surveyed prices, actionable quotes, or spread prices based on related (for example, cash) market prices.

Margin governance

Each of the CCPs we interviewed has a governance structure in place to manage margins. PFMI principle 2 requires that CCPs have such structures and disclose their attributes. The divisions of responsibility and authority vary among the CCPs, with the staff generally having more technical responsibility (they have both granular and aggregated data) and the clearing members, through the risk committee, retaining the authority to approve any changes in margin requirements. The balance ranges from the staff controlling the analysis with typically pro forma approval by a risk committee or board to a more iterative and interactive dialogue between staff and a risk committee or board.

Competition and innovation

CCPs compete for market share to achieve economies of scale and scope. One way they do so is by innovating their margin methodologies. It is not clear that such innovation necessarily attracts volume to CCPs, especially

in light of the OTC clearing mandate. Whether the margin methodologies are innovative or not, clearing members expect that margin methodologies are capital efficient and cover some agreed level of risk.

The setting of margin levels is also an area of competition and innovation among CCPs. Some CCPs compete directly in the clearing of derivatives contracts or compete in the clearing of close substitutes at other CCPs or the OTC markets. A more general form of competition is for market share, which leads to economies of scale and possibly economies of scope and diversification of risks. A diverse set of products cleared is assumed to be less risky than a narrow set of related products, because the correlation among products may be lower.

This has implications for portfolio margining, as it is based on the analysis of the correlations between positions in the product types. CCPs affiliated with an exchange typically do not have much choice about what they clear if the product is exchange traded. CCPs do have some choice of what OTC products they are willing to clear, and they seek volume and products that are complementary to their listed products. These complementary products bring the opportunity to offer portfolio margining as a robust risk-based margin approach, as well as product diversity. Product diversity spreads the business risk, as well as the clearing risks, across a wider base than a narrow set of products.

With respect to competition among CCPs, some have argued CCPs may engage in a “race to the bottom”—setting margin levels at low levels to attract business. This raises a broader question about the elasticity of demand for derivatives contracts with respect to changes in margin levels. If raising a margin requirement is assumed to dampen demand (to reduce speculation, for example), then it should follow that reducing margin levels would increase demand for derivatives.

Anecdotal evidence suggests that regulators, other CCPs, and clearing members take careful note of margin changes and comment to CCPs about their margin levels. However, evidence also includes instances of clearing members arguing for *higher* margin levels to better fit with their risk calculations and their customer-facing risk management.

12 Challenges and policy issues

CCP risk management, and margin methodology in particular, continues to evolve. Several items of interest were raised by the CCPs we surveyed that are currently being examined.

1. Half of the CCPs interviewed acknowledged that more work needs to be done to address *procyclicality*. The concern is driven in part by regulation. A key consideration is the desire not to overtax members’ resources in a time of stress, which in turn suggests a need to model members’ liquidity risk. A related issue is to understand which aspect of the margining process creates the most stress: In some cases, the variation margin requirements have dwarfed the impact of any increases in initial margin requirements.
2. Several of the CCPs identified *correlation risk* as a key concern, especially as it relates to portfolio margining. While noting that the benefits of portfolio margining are significant and important from a member and user perspective, CCPs see a need for more work on how the correlations are evaluated and employed, with recognition that they need to be seen as dynamic rather than primarily static. One CCP specifically called for the development of standard measures of correlation risk.
3. *Wrong-way risk* was often mentioned as an issue that requires more work.
4. *Timing of payments* is an issue of growing interest. One CCP is looking at the possibility of further reducing intraday risk with more frequent variation cycles, which would require more frequent payments.

5. Other issues include further development of *implied volatility* in margin calculations to enhance robustness on a forward-looking basis; greater research into *margin seasonality* for products that display pronounced seasonal fluctuations; and a reexamination of the trade-off between *model-driven and expert-judgment-driven margin setting*, especially given the role of model risk in the recent financial crisis and the inability of backward-looking models to anticipate potential political risk.
6. One CCP reported that it was looking at the efficacy of a more *client-specific margining regime*, based on the risk profiles of different client types.
7. Lastly, CCPs identified margin issues that stem from potential changes in the CCP business model. Driven by concerns over client access, in part due to regulatory capital requirements in the banking industry, some CCPs are contemplating a new form of clearing member that does not join the mutualized default risk pool. Exposure to such members would have to be covered with margin, thus prompting a substantial change in the margin components and magnitude for such members.

In this article, we have provided some background to facilitate discussion of the challenges and policy issues associated with the margining of cleared derivatives. Our review suggests that the setting of margins is not an absolute science. Judgment by CCP risk managers (staff and member representatives) is an active component in all aspects of setting margins. CCPs innovate and compete, but remain bound by international principles and national regulations. The degrees of freedom available to CCPs in setting margin levels are not unlimited. It is crucial that they remain vigilant and dynamic in their ongoing analysis of the market risks they manage and innovative in setting margin to manage those risks.

NOTES

¹The scope of this article is derivatives margin, and in particular, margin set by CCPs. Though the two are sometimes confused, derivatives margin is distinct from securities margin. Securities margin is the loan value allowed for securities as financial assets. Margining for derivatives at CCPs does not involve the extension of credit. For an overview of how CCPs work and definitions of terms, see the chapter on central party clearing in our online reference book, *Understanding Derivatives*, at <https://www.chicagofed.org/publications/understanding-derivatives/index>.

²In applying this waterfall, consideration is given for the segregated funds and positions of clients of the defaulting clearing member to allow transfer of such properties to surviving clearing members.

³The PFMI were developed in 2012 by the Committee on Payment and Settlement Systems (now the Committee on Payments and Market Infrastructures (CPMI)) and the Technical Committee of the International Organization of Securities Commissions (IOSCO); see Bank for International Settlements, 2012.

⁴Further review and guidance on margin practices can be found in subsequent reports by CPMI and IOSCO that focus on PFMI implementation practices, CCP financial risk management, and CCP recovery practices; see Bank for International Settlements, 2016a, b.

⁵The contracts have been novated by the CCP, and any original bilateral relationships from the trade have been replaced by a new contract between the clearing member and the CCP.

⁶The delta is the ratio of price change in the option versus a price change in the underlying instrument. Deltas can be positive or negative (+1 to -1), depending on whether the option is a put or a call versus the price change in the underlying instrument.

⁷The SPAN portfolio margin system was developed by the Chicago Mercantile Exchange and has been widely shared by license among other CCPs. TIMMS and STAN are margining systems developed by The Options Clearing Corporation.

⁸Delivery period margin is additional margin imposed on open contracts as the delivery period approaches. Delivery margin is typically imposed starting five days before the expiration date.

⁹In a repo-to-maturity, the term of the repo coincides with the maturity of the collateral.

¹⁰International Swaps and Derivatives Association, various letters and references, <https://www2.isda.org/functional-areas/risk-management/page/3>.

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