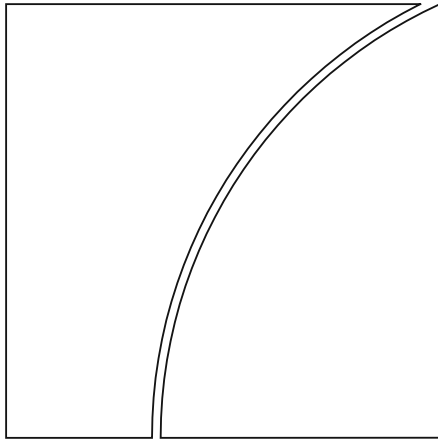


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## Margin dynamics in centrally cleared commodities markets in 2022

May 2023



BANK FOR INTERNATIONAL SETTLEMENTS



**IOICU-IOSCO**

This publication is available on the BIS website ([www.bis.org](http://www.bis.org)) and the IOSCO website ([www.iosco.org](http://www.iosco.org)).

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ISBN 978-92-9259-658-3 - (online)

# Margin dynamics in centrally cleared commodities markets in 2022

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## Executive summary

The Russian invasion of Ukraine in February 2022 resulted in a period of elevated market volatility, partly reminiscent of the early Covid-19 months in 2020. In contrast to that earlier event, market impacts were felt in a smaller set of derivatives products, primarily those relating to commodities such as energy and agricultural goods. In some of these markets, price moves were extreme, and, in response, the margin requirements imposed by central counterparties (CCPs) also increased rapidly.

The events in commodities markets in 2022 provide a useful new case study for investigating how margining practices in centrally cleared markets respond to extreme bouts of market volatility. This report seeks to build on the earlier BCBS-CPMI-IOSCO *Review of margining practices* (2022),<sup>1</sup> which focused on the effects of the early Covid-19 period on margin demands. The size and speed of the price and margin increases in commodities markets during 2022 have been extensively discussed elsewhere.<sup>2</sup> This analysis therefore focuses mainly on understanding CCP decision-making during the market stress, and on where CCPs may have adapted their ongoing risk management approaches or methodology in the light of market events. To this end, the BCBS, CPMI and IOSCO undertook a mainly qualitative international survey of 12 CCPs that clear commodities derivatives (“surveyed CCPs”). In addition, a workshop was held, jointly with the FSB, to gather the perspectives of end users of commodities derivatives, such as commodities trading houses.

The findings of the CCP survey support the conclusions of the *Review of margining practices* in relation to the current margining approaches across the international CCP population. They show that, in general, surveyed CCPs have approaches that are designed to respond to elevated volatility and can, if necessary, be adapted during stress events (for example, through the use of model overrides). In addition, the CCPs are sensitive to the stresses that margin can place on market participants, with many having measures which can help mitigate the procyclicality of margin calls through hard or soft targets for maximum initial margin (IM) increases and/or through one or more anti-procyclicality tools embedded in the model; these tools, when used, are balanced with other important risk management factors, such as ensuring adequate coverage of counterparty credit risks through the economic cycle. At the same time, there is a considerable variety of practices in this regard. These findings can help inform the policy development work in relation to evaluating the responsiveness of IM models and enhancing the transparency of margin requirements in centrally cleared markets. Further, the analysis finds that the commodities market events of 2022 were sufficiently unexpected as to induce several surveyed CCPs to review and modify aspects of their ongoing risk management approaches. These changes included the design of their stress test scenarios, especially in cases where observed market shifts exceeded those in the CCPs’ stress scenario suite. Such recalibrations of expectations around “extreme but plausible” events will be a continued area of interest to supervisory authorities and international bodies in the coming years.

The end-user workshop similarly reinforced various themes highlighted in the *Review of margining practices*, in this case around concerns over the transparency and predictability of margin changes from the perspective of clients of clearing members. These insights will similarly feed into the ongoing policy work on enhancing the transparency of margin requirements, including via margin simulation tools, taking account of both clearing members and end users’ perspectives. They also complement the FSB report on *The Financial Stability Aspects of Commodities Markets*,<sup>3</sup> which, drawing on

<sup>1</sup> Available on the BIS website ([www.bis.org/bcbs/publ/d537.htm](http://www.bis.org/bcbs/publ/d537.htm)) and on the IOSCO website ([www.iosco.org/library/pubdocs/pdf/IOSCOPD714.pdf](http://www.iosco.org/library/pubdocs/pdf/IOSCOPD714.pdf)).

<sup>2</sup> For example, see: FSB (2023); BoE (2022), Section 4; Board of Governors of the Federal Reserve System (2022b), Box 4.2.

<sup>3</sup> Available on the FSB website, [www.fsb.org/wp-content/uploads/P200223-2.pdf](http://www.fsb.org/wp-content/uploads/P200223-2.pdf).

the same workshop evidence (and other data sources), highlights the potential implications of the margin dynamics seen in 2022 for end users' hedging strategies and market behaviour.

## 1. Background and introduction

### 1.1 Purpose and structure of report

The Russian invasion of Ukraine in February 2022 resulted in a period of elevated market volatility, particularly in commodities-related physical markets and centrally cleared exchange-traded derivatives (ETDs), primarily those relating to energy and agricultural goods. In some of those markets, price moves were extreme, and, in response, margin requirements set by CCPs also increased rapidly. The events in commodities markets in 2022 provide a useful new case study for investigating how margining practices in centrally cleared markets respond to extreme bouts of market volatility. The BCBS, CPMI and IOSCO accordingly decided to explore margin responses to episodes of stress in centrally cleared commodities markets. This included considering the effects of margining practices on market participants who play a significant role in physical or financial commodities markets. This work is, in part, an extension of the broader analysis, which seeks to better understand the interactions between margined markets and other segments of the financial system, following the broad market stresses experienced during the early Covid period of March 2020 (see the *Review of margining practices* report (2022)). Analysis of the 2022 commodities shocks provides an opportunity to expand this understanding within a narrower context. In particular, it focuses on CCP decision-making and examines where CCPs may have adapted their ongoing risk management approaches in the light of market events. It also seeks to highlight where relevant dynamics may be specific to commodities markets. The analysis may provide further evidence relevant to some of the policy areas of note included in Section 7 of the *Review of margining practices*.

The analysis was conducted in close coordination with the FSB. This analysis complements the FSB's report on *The Financial Stability Aspects of Commodities Markets* with a specific focus on CCP-related dynamics.

The quantitative and qualitative analysis in this report is based on two data-gathering exercises. The first of these exercises was a primarily qualitative international survey sent to 12 CCPs that clear commodities contracts (potentially alongside other asset classes). The survey sought information on risk management practices going into 2022 as well as any reviews of these practices in the light of market events. The second was a workshop discussion, organised and conducted in collaboration with the FSB, with a diverse set of end users active in physical and financial commodities markets, focusing on the link between (or any mismatches in) liquidity demand and supply, as well as the effects of liquidity demand or other trading costs on the choice of hedging venue (eg ETDs vs OTC). The annexes to this report provide more detailed information on each of these outreach exercises.

The remainder of Section 1 provides the high-level conceptual background to the report and sets the scene with the market events seen in 2022. Sections 2 to 4 present an analysis of three of the themes explored in the CCP survey: IM modelling approaches, concentration risk management and stress testing. Each section highlights the impact of the 2022 commodities market turmoil on CCPs' practices in these areas. Section 5 presents the perspectives of end users on challenges stemming from increased margin requirements in 2022, based on the workshop discussion.

### 1.2 Overview of centrally cleared commodities markets

Commodities markets are often unique among financial markets, partly in that they encompass not just financial instruments such as futures, options, and swaps, where financial intermediaries and end users are

active, but also the physically settled spot and forward markets for the underlying physical commodities. This, at times, complex combination of contracts can often result in a similarly complex balance between (i) counterparty risks across a broad set of participants; (ii) market risks, possibly in highly fragmented physical distribution chains; and (iii) liquidity risks when ongoing or balloon-style collateral demands are met.

A range of commodities markets exist primarily to facilitate the transportation, transformation and storage of key raw materials on their journey from commodities-producing to commodities-consuming firms and households.<sup>4</sup> There are, broadly, three types of commodities markets:

- *Spot markets*: The simplest commodities transactions occur in spot markets, where a seller immediately delivers the physical commodity to a buyer for cash. During the transaction, unless a CCP is involved, each side is exposed to the possible lack of payment from the other until settlement.
- *ETD markets*: A proportion of trading in standardised commodities derivatives takes place on exchanges and is cleared through CCPs. These standardised transactions are principally futures contracts, used to establish a price and future date at which settlement (cash or physical delivery) will occur, and options contracts (which give a party the right, but not the obligation, to purchase or sell a specific asset at a certain price, often on a specific future date).
- *OTC derivatives markets*: Two or more parties may trade a commodities derivatives contract with the bespoke structures of these contracts often more complex, or more tailored to individual needs, than the traditionally exchange-traded products. They include forward contracts, which fix a price for future physical delivery on a specified date, and swaps. OTC derivatives can be centrally or bilaterally cleared.

The focus of this report is on centrally cleared commodities ETD markets and, in particular, on (i) the approaches CCPs have taken to risk management through the 2022 commodities market volatility; and (ii) end-user liquidity preparations for cleared market margin demands and challenges faced in practice during the recent actual stress. The outreach and analysis focused on CCPs that clear the commodities contracts most affected by the recent volatility: agriculture, electricity, emission allowances, metals, natural gas and oil, coal and petroleum distillates. The FSB report on *The Financial Stability Aspects of Commodities Markets*, by contrast, examines more generally the mechanisms through which stresses in commodities markets could propagate more broadly through the financial system.

#### *Counterparty credit risk management in centrally cleared commodities derivatives markets*

In centrally cleared markets, CCPs interpose themselves between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer and thereby ensuring the performance of open contracts. To manage counterparty credit risk, CCPs require IM to be posted to mitigate potential future exposure, and collect variation margin (VM) (that is, funds that are collected and paid out to reflect current exposures resulting from actual changes in market prices). CCPs also maintain pre-funded financial resources, in excess of the resources provided by the defaulting party (or parties), to cover losses in the event of a participant default (eg the default fund). Generally, CCPs require participants to post sufficient IM to cover a given percentage (eg 99%) of estimated potential price changes over a defined period of risk, typically one or two days for commodities futures, often longer for commodities swaps. Because the size of potential price changes can rise rapidly during volatile periods,

<sup>4</sup> See also FSB (2023), Section 2.

many CCPs set IM requirements above base model estimates when markets are calm, reducing the need to raise requirements during stress events.

VM requirements reflect a position's profit or loss in relation to current market prices. Consequently, significant price moves translate directly into commensurately significant VM requirements for participants who are "out of the money". CCPs typically collect required VM and pass on those funds to "in the money" counterparties. In this role, CCPs are critical in ensuring the timely and effective collection and pass-through of VM. IM requirements, on the other hand, (and associated "add-ons" to cover risks such as concentration risk and wrong-way risk) depend on the CCPs' own margin models and can vary depending on the CCPs' model design choices. Generally, when market volatility increases, IM requirements also increase. Since the prices of the underlying commodities are often more volatile, IM and VM increases can often be larger for commodities derivatives than for other derivative contracts.

Most commodities markets end users access centrally cleared markets through intermediaries that are clearing members<sup>5</sup> of a relevant CCP. End users accessing cleared markets via a clearing member generally do not have a direct relationship with the CCP. The clearing member is typically liable for all margin requirements the CCP sets on the clients' positions and must cover any margin calls their clients fail to meet. Clearing members generally manage their clients' portfolios by passing on the CCP's margin requirements to their clients, and may choose to charge clients more IM than is required by the CCP by applying an additional "margin multiplier".<sup>6</sup> Clearing members can apply margin multipliers for a range of reasons, including the client's risk profile and current market volatility. As a result, end users can face (sometimes significantly) higher IM requirements than those charged to the clearing member by the CCP.

### 1.3 Market events in 2022

Russia's invasion of Ukraine disrupted global trade in a number of physical commodities markets, leading to surging prices and heightened volatility in agriculture, energy (eg oil, electricity and natural gas) and the metals spot and derivatives markets. As examples of the volatility seen in commodities markets in 2022, Graph 1 provides a historical view of price movements across a few selected key commodities, focusing on agricultural (wheat) and energy (oil and natural gas) futures contracts where either production or transportation was often highly concentrated within the eastern European region. Prices of benchmark contracts for wheat and oil increased rapidly with the start of the conflict in Ukraine and were highly volatile through much of the first half of 2022 (Graph 1, panel A). Benchmark contracts for natural gas abruptly increased as early as Q4 2021, remaining highly volatile through the whole of 2022 (Graph 1, panel B). For some of the displayed products, price increases pushed levels to or near 20-year highs. In particular, the Dutch TTF benchmark registered an eight-fold increase at its peak, as compared with Q2 2021. To date, the stresses in commodities markets do not appear to have significantly disrupted broader economic activity or created substantial pressure on key financial intermediaries, including banks.<sup>7</sup>

<sup>5</sup> Note, the term clearing member(s) in this document is equivalent to references in the PFMI to direct participant(s) in an FMI when the FMI is a CCP.

<sup>6</sup> A "margin multiplier" (or "add-on") would be applied to the IM requirement for a given account, as defined by the CCP. So, for example, a multiplier of 1.5 would mean that a given clearing member would call for collateral equal to 150% of a CCP's IM requirement for that account.

<sup>7</sup> FSB (2023), p 25.

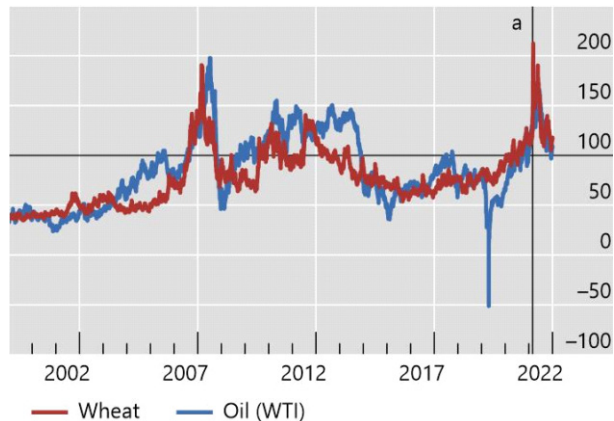


## Price dynamics of selected cleared futures<sup>1</sup>

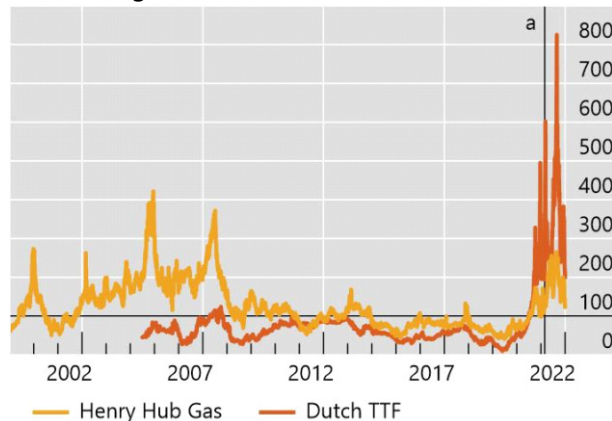
30 June 2021 = 100

Graph 1

### A. Wheat and oil



### B. Natural gas



<sup>a</sup> Start of the war in Ukraine on 24 February 2022.

<sup>1</sup> On-the-run front month contracts. Wheat (Chicago SRW) is traded on CBOT and cleared through CME. West Texas Intermediate oil (WTI) and Henry Hub Gas are traded on NYMEX and cleared through CME. Dutch TTF is traded on ICE Endex and cleared through ICE.

Sources: Bloomberg; BIS calculations.

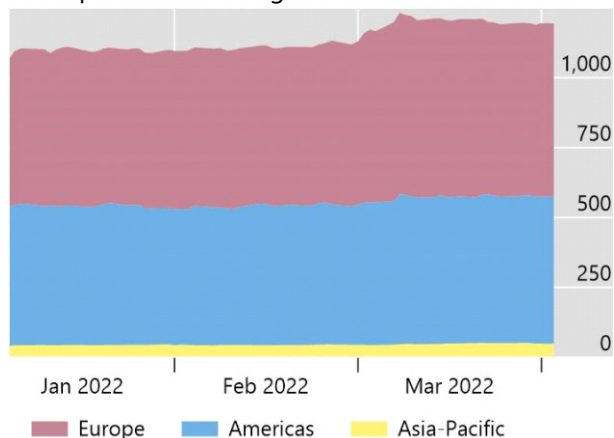
Reflecting the market volatility and dramatic price changes, IM and VM margin requirements on an aggregate basis increased significantly for some energy, agricultural and metals derivatives, with CCPs often calling IM and VM on an intraday basis. The rise of global IM requirements was driven primarily by the increase in IM in Europe (Graph 2, panel A). Similarly, VM demands were particularly elevated in Europe (Graph 2, panel B).

## Global margin requirements dynamics in early 2022<sup>1</sup>

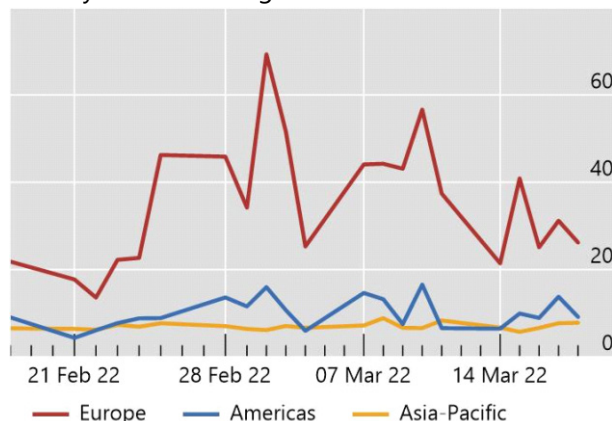
In billions of US dollars

Graph 2

### A. Required initial margin



### B. Daily variation margin calls



<sup>1</sup> This data collection represents only a subset of all global cleared margin data, and hence global trends in this figure cannot be used to infer the comparative size of IM in various regions.

Source: IOSCO Financial Stability Engagement Group's (FSEG) Data Working Group survey of CCPs.

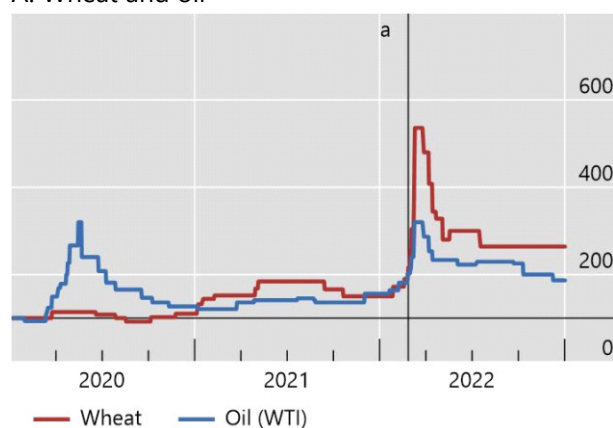
After the start of the war in Ukraine, IM requirements also increased substantially for some US-based commodities futures contracts. The IM requirements tripled for the primary wheat benchmark and rose to match the May 2020 peak for oil (WTI) (Graph 3, panel A). IM requirements subsequently narrowed but remained at levels substantially higher than in 2021. For natural gas benchmark contracts the increase in IM requirements was relatively more gradual as the runup started as early as the second half of 2021. Nevertheless, it was more severe: IM requirements quintupled for the Henry Hub contract and increased by a factor of 600 for the Dutch TTF contract, as compared with January 2020 (Graph 3, panel B).

## Initial margin requirements on selected cleared futures<sup>1</sup>

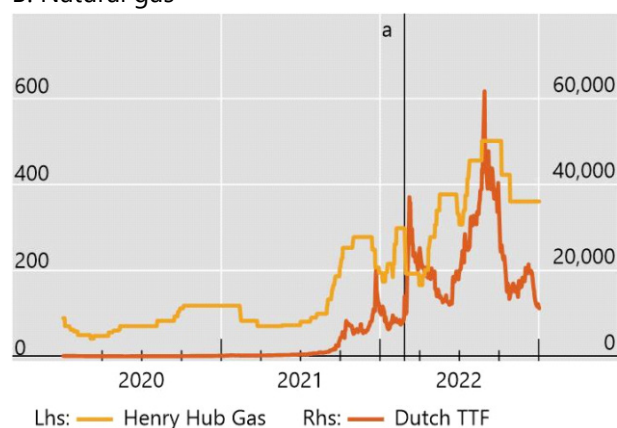
2 January 2020 = 100

Graph 3

### A. Wheat and oil



### B. Natural gas



<sup>a</sup> Start of the war in Ukraine on 24 February 2022.

<sup>1</sup> On-the-run front month contracts. Wheat (Chicago SRW) is traded on CBOT and cleared through CME. West Texas Intermediate oil (WTI) and Henry Hub Gas are traded on NYMEX and cleared through CME. Dutch TTF is traded on ICE Endex and cleared through ICE.

Sources: CME; ICE; BIS calculations.

## 2. CCPs' approaches to setting initial margin requirements under stressed market conditions

### 2.1 Background

Margin models should be designed to ensure appropriate coverage of a CCP's exposures in the case of a clearing member default, even in periods of market stress. As part of their preparations for these periods of stress, CCPs deploy a range of risk management mitigants within their margin model framework. These preparations, as well as "real-time" efforts by CCPs, aim to ensure adequate resource coverage and robust risk oversight. In addition, after periods of elevated market stress, CCPs review the responses of their IM models, working to identify whether model parameter or calibration changes are needed in the light of experience.

This section explores surveyed CCPs' approaches to setting IM requirements under stressed market conditions and actions taken as a result of the commodities market stress experienced in 2022.

## 2.2 Parameter recalibration, use of discretion, anti-procyclicality considerations and eligible collateral

### *Frequency of margin model parameter recalibration*

Survey responses show that, under normal market conditions, there is some diversity in the frequency of margin model parameter recalibration (Table 1); frequencies can be as high as daily or as low as once a year. As market volatility rose rapidly during early 2022, these frequencies increased across all surveyed CCPs, with recalibrations at least weekly for half of the surveyed CCPs, of which three recalibrated daily. In addition to these regular reviews, CCPs noted that they would also review model parameters on an ad hoc basis if changing market conditions clearly called for additional scrutiny. It should be noted that these data relate primarily to the more frequently updated model parameters (such as market volatility measures); CCPs tend to update other parameters (such as correlations) less frequently.

### Frequency of margin model parameter recalibration by surveyed CCPs

Count of surveyed CCPs

Table 1

	Under normal market conditions	During stress events in 2022
Frequency		
Daily	2	3
Weekly	2	3
Every two weeks	1	0
Monthly	4	1
Quarterly	0	1
Every three to six months	1	0
Annually	1	0
Other <sup>1</sup>	1	4 <sup>2</sup>

<sup>1</sup> CCPs categorised as "Other" did not specify how often margin model parameters were updated.

<sup>2</sup> These four CCPs indicated that margin model parameter reviews (as opposed to recalibrations) took place daily under stressed conditions.

Source: CCP survey.

### *Discretionary changes to model parameters*

CCPs reported using a variety of margin models to set IM requirements, with some CCPs running several models in parallel as a robustness check on outputs. Although these models set a base level for potential margin requirements, six surveyed CCPs reported the use of manual model overrides; and all but one of these six have this discretionary provision in their risk manuals and all but two disclosed this use of discretion to clearing members in real time.

The most cited causes for the use of discretion were: (i) ensuring adequate risk coverage; (ii) enhancing the stability of margin requirements with the aim of limiting the size or speed of IM increases; (iii) improving the match between margin and market liquidity conditions; (iv) anticipating risks that had not yet resulted in a market response; and (v) incorporating feedback from users. Examples of model parameters that were adjusted through this discretionary process include the scan range, volatility floor, margin period of risk (MPOR) and the confidence interval. The duration and the frequency of overrides varied, driven largely by prevailing market conditions.

As part of CCPs' ongoing model performance assessment, the evaluation of backtesting results and the monitoring of the impacts of parameter changes were key in ensuring appropriate margin responses to changing market conditions.

### *CCPs' internal APC monitoring*

Approximately a third of the surveyed CCPs noted that they make use of internal targets which act as hard or soft caps on IM increases, with targets usually measured by the size or speed of the change. Depending on the CCP, targets may implicitly or explicitly account for market volatility. At the start of 2022, pre-defined anti-procyclicality (APC) thresholds were in place at many CCPs, albeit with notable differences across the surveyed group: in one case these thresholds were set at both product and portfolio levels; in three cases only at the product level; and in one case at the portfolio level only. In addition to these targets, specific tools to control the procyclicality of margin ("APC tools") were often already in place.

There were some notable differences in how these APC targets worked in practice in 2022. One surveyed CCP that compares margin changes with soft thresholds reported that the upper band of the threshold range was reached for a selected group of contracts during the 2022 period of stress. Another CCP reported that it closely monitored the rate of IM change by product, and indicated that one product registered a peak 28% rise in IM, which exceeded its targeted daily limit, while all other benchmark products remained under the target limit. This increase was driven by the unprecedented price surges in the relevant commodity. However, a product-level APC cap was not implemented – the CCP explained that this decision was based on the recognition that the incremental changes in the aggregate IM across the CCP's product suite were moderate, with the average and maximum measured to be +1.0% and +2.5% respectively (summing the margin requirements over all accounts daily). Another surveyed CCP disclosed an instance during which the internal target for margin increases was breached. In line with its existing APC policy, a separate surveyed CCP held margin rates constant as a percentage of contract value for a small set of products that were deemed to have entered into a stressed period. Finally, one other surveyed CCP indicated that, although it does take targets into consideration, this is reserved only for falling markets. Other CCPs that did not have pre-established targets elected to take ad hoc measures, such as more closely monitoring the rates of IM increase for both products and portfolios.

About half of the surveyed CCPs increased their focus on procyclicality effects during H1 2022 after observing large increases in margin requirements. Overall, the surveyed CCPs reported that their APC expectations were largely met.

### *Eligible collateral*

While some CCPs limited changes in IM requirements through the use of APC tools and/or manually adjusting margin model parameters, a few CCPs also, or instead, expanded the types of collateral they accepted to meet margin requirements. Four surveyed CCPs reported that they had implemented at least one expansion to their set of eligible collateral during the period between March 2020 and November 2022. These were implemented mainly on the basis of clearing members' requests, aiming to reduce end users' liquidity challenges by allowing them to post collateral types that they may naturally hold. Because non-financial counterparties are a prominent subset of commodities derivatives market end users, there can often be challenges in sourcing cash and other highly liquid collateral.

These challenges drove some of the changes to collateral eligibility, with one CCP expanding accepted collateral to European Union Allowances (EUA) when offsetting short EUA futures positions, while another CCP chose to accept collateralised bank guarantees (although, at the time of survey response submission, no such guarantees had been posted). One CCP reported that it began accepting gold warrants and short-term US Treasury exchange-traded funds (ETFs). For one CCP, expansions on the set of eligible collateral were implemented following the March 2020 Covid-19 turmoil, when it started to accept as collateral securities denominated in a wider range of currencies (but with a similar risk profile).

In the European Union, the CCP regulatory framework was amended to allow for a broader set of collateral types.<sup>8</sup> Specifically, the regulatory technical standards laid down in Delegated Regulation (EU) No 153/2013 were amended to temporarily include uncollateralised bank guarantees as collateral that could be posted by non-financial clearing members, as well as guarantees issued or backed by public entities for all clearing members.

### 3. CCPs' approaches to concentration risk management

#### 3.1 Background

Reflecting the risks which concentrated positions can pose to CCPs in the event of a clearing member default event, the CPMI-IOSCO guidance states that a CCP's margin model should incorporate estimates of market liquidation costs, including the potentially elevated costs associated with the liquidation of highly concentrated positions.<sup>9</sup>

Commodities markets are many and varied, but can broadly be characterised by high levels of opacity and concentration, with some dominated by a few active participants. Although they may be relatively small compared with other asset classes in terms of notional outstanding, commodities derivatives markets represent an outsized share of the risk faced by the CCPs, relative to this notional, due to their higher volatility relative to some other assets. In the euro area, for example, commodities derivatives represent only 1% of the total gross notional outstanding across all derivatives but around 15–20% of IM collected.<sup>10</sup>

CCPs and intermediaries operating in commodities markets can find it difficult to fully assess the risk market counterparties pose to them; for example, it can be challenging for an individual CCP or clearing member to assess the aggregate exposures of their counterparties or the build-up of concentrated positions, especially when these are broken up across a number of markets or entities. Similarly, it can often be difficult for a single authority to get a complete picture of the OTC market due to, among other things, national boundaries.<sup>11</sup> Because of this, there have been recent efforts to gain a more holistic understanding of aggregate exposures to individual commodities and the commodities market ecosystem as a whole.<sup>12</sup>

#### 3.2 CCPs' reported methodology

As part of their concentration risk management methodology, 10 surveyed CCPs use average daily trading volumes when quantifying the size of concentration add-ons. To complement this measure, several CCPs also include volumes of highly correlated markets not directly associated with their core clearing activity. Less commonly, open interest for the relevant commodities is used in parallel with average daily volumes.

<sup>8</sup> The European Commission asked ESMA to "urgently consider temporary amendments [...] that would facilitate the provision of collateral by non-financial counterparties active on gas and electricity regulated markets cleared in EU-based CCPs by: 1) expanding the list of eligible collateral [...] and 2) reviewing the framework applicable to commercial bank and central bank guarantees to allow for an easier and greater issuance and usage of this type of collateral."

<sup>9</sup> See CPMI-IOSCO (2017).

<sup>10</sup> FSB (2023), p 9.

<sup>11</sup> The size and scope of concentration risk in commodities markets has also been evidenced in supervisory stress test exercises such as the Third and Fourth European Securities and Markets Authority (ESMA) Stress Tests and the Bank of England (BoE) 2021–22 CCP Supervisory Stress Test.

<sup>12</sup> See eg FSB (2023); BoE (2022); Board of Governors of the Federal Reserve System (2022b).

For instance, one CCP considers a portfolio's share of overall market open interest when calculating the liquidity margin requirement. Here, market open interest includes both its own cleared market as well as that of the same or very similar products at other CCPs. Another CCP estimates portfolio concentration risks by applying pre-defined percentage shocks relative to outright IM levels. These pre-defined levels are calibrated by asset class and depend on both an absolute stress loss threshold as well as the adjusted net capital ("ANC") ratio of the associated member. Five surveyed CCPs reported that they use dealer surveys to calibrate margin add-on parameters; for many of these CCPs, surveys are used to support, and at times update, the calibration of the parameter configurations. Two of these CCPs clarified that they engage with their clearing members to understand and calibrate liquidation costs for large trades. Further work would be required to understand if and how other CCPs validate the outputs of their concentration add-on models.

### 3.3 Effects of 2022 market stress and lessons learned for concentration risk management

As price volatility rose in early 2022, some measures indicated a liquidity decline in commodities markets. After the start of the Russia-Ukraine conflict, open interest in exchange-traded oil futures fell significantly, in particular for WTI futures, where it shrank by almost 30% (Graph 4, panel A). Bid-ask spreads for commodities futures also widened significantly following Russia's invasion of Ukraine, to levels substantially higher than observed during the pandemic. But they subsequently narrowed and have remained relatively stable since then.<sup>13</sup> By contrast, the trading volume in commodities markets did not appear heavily affected by the start of the war and volumes stayed rather flat, with the notable exception of wheat volumes, which halved during early 2022 but subsequently recovered through the rest of the year (Graph 4, panel B).

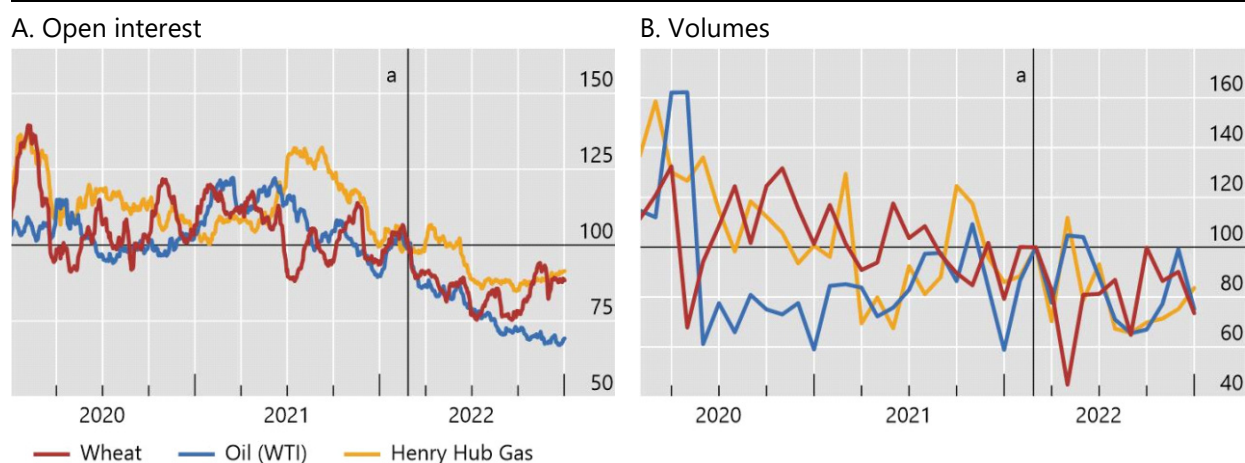
<sup>13</sup> See Board of Governors of the Federal Reserve System (2022a), Box 1.1.

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## Open interest and volumes on selected cleared futures<sup>1</sup>

24 February 2022 = 100

Graph 4



<sup>a</sup> Start of the war in Ukraine on 24 February 2022.

<sup>1</sup> On-the-run front month contracts. Wheat (Chicago SRW) is traded on CBOT and cleared through CME. West Texas Intermediate oil (WTI) and Henry Hub Gas are traded on NYMEX and cleared through CME.

Sources: Bloomberg; BIS calculations.

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Surveyed CCPs stated that concentration add-ons were not significantly revised during the period as they are generally based on average historical volumes, which did not materially change during 2022. Usually concentration add-ons do not include any additional assumptions about how or whether volumes would diverge from historical averages during periods of stress. Some CCPs stated that the parameters are already calibrated to be appropriate during stress periods, or that they exclude the largest trading days to prevent large trades from skewing the average.

One CCP is considering a potential review of its current assumption of an upward movement in trading volume during periods of stress, which, if adjusted, would lead to increased concentration add-ons. Another CCP is considering a change in policy to cap the concentration add-ons as a share of IM for each clearing member. For most CCPs, the market stress events of 2022 did not lead to a fundamental review of their concentration risk modelling.

## 4. CCPs' approaches to stress testing

### 4.1 Background

Stress testing is a risk management tool employed by CCPs to test whether they are sufficiently resilient to market shocks. A stress test estimates the credit and liquidity exposures that would result from the realisation of participant defaults during extreme price changes.<sup>14</sup> The severity of the market conditions

<sup>14</sup> According to the PFMI (CPMI-IOSCO (2012)), stress test scenarios should include, but not be limited to, the default of the participant and its affiliates (or in certain cases the two participants and their affiliates) that would generate the largest aggregate credit exposure or payment obligation to the CCP in extreme but plausible market conditions (see Key Consideration 4 of Principle 4 and Key Consideration 4 of Principle 7).



should, according to the PFMI, be extreme but plausible. The results of the stress test are used to inform the CCP's calibration of the size of its prefunded resources and/or its liquidity resources.

Central to a stress-testing methodology is the development and monitoring of a wide range of stress scenarios, which should include relevant peak historic price volatilities, shifts in other market factors such as price determinants and yield curves, multiple defaults over various time horizons, simultaneous pressures in funding and asset markets, and a spectrum of forward-looking stress scenarios in a variety of extreme but plausible market conditions. These scenarios can be derived in a variety of ways, including the use of historical market movements within a given lookback period and calibrating forward-looking hypothetical market movements.<sup>15</sup>

This section explores, at a high level, CCPs' stress-testing methodology, with a focus on stress scenario design and potential changes in the light of the market events of 2022.

## 4.2 CCPs' reported methodology

CCP survey responses indicated that there was significant variation in CCPs' approaches to designing their stress scenarios, for both historical and hypothetical/forward-looking scenarios. For historical scenarios, surveyed CCPs varied in their choice of certain key parameters, such as the length of the lookback period (with responses ranging from 10 to 30 years). To derive hypothetical scenarios, some CCPs reported that they combine qualitative and quantitative approaches, while others referred only to using quantitative techniques (including the breakdown of historically observed statistical correlations).

Both historical and hypothetical scenarios attempt to capture extreme but plausible events that may occur within the relevant markets. To identify these extreme but plausible events, CCPs typically reported that they look at the historical distribution of relevant risk factors and try to adequately measure the extreme tail of this distribution. Most CCPs begin this process by examining the historical returns or the price and volatility changes of either a subset of risk factors or a set of benchmarks relevant to the cleared products during a chosen lookback period. They then use a price move period ranging between one and five days to identify the extreme market movements. Some CCPs defined extreme but plausible events as those that fall within a 99.9% probability of occurrence (where such an approach is relevant, such as in the case of statistically derived hypothetical scenarios). This extends prefunded resource coverage far beyond that generated by a CCP's IM model, which is often subject to the regulatory minimum of covering 99% of expected market moves.

Surveyed CCPs were split on whether they expressly accounted for commodities-specific factors, such as physical delivery-related issues, in the design of their stress scenarios. Four surveyed CCPs indicated that they did consider physical delivery (and potentially other commodities-specific factors) in their stress scenario design, although the more common approach was not to do so explicitly. However, several CCPs pointed out that the market price effects of physical delivery constraints are captured in historical data, and thus would have indirectly fed into their stress scenarios. Most of those surveyed CCPs that also clear other, non-commodities asset classes said that their stress scenario design framework is essentially the same or similar for all the asset classes they cleared.

The maximum relative price shocks (ie relative to the prevailing contract price) for cleared benchmark contracts used in their stress scenario suite were reported by 10 surveyed CCPs.<sup>16</sup> These shocks,

<sup>15</sup> For more details on stress testing methodology, see CPMI-IOSCO (2017), Chapter 3.

<sup>16</sup> Note that there are some notable limitations to the data provided: as CCPs were asked to provide information for up to three benchmark contracts, not all primary markets cleared by the CCPs may be covered in their responses. In addition, not all CCPs provided data for both historical and hypothetical shocks; and CCPs reported different time durations for the shocks (ranging from one to five days, partly due to product differences). To enable comparisons across CCPs, the reported shocks have been normalised to a one-day duration.



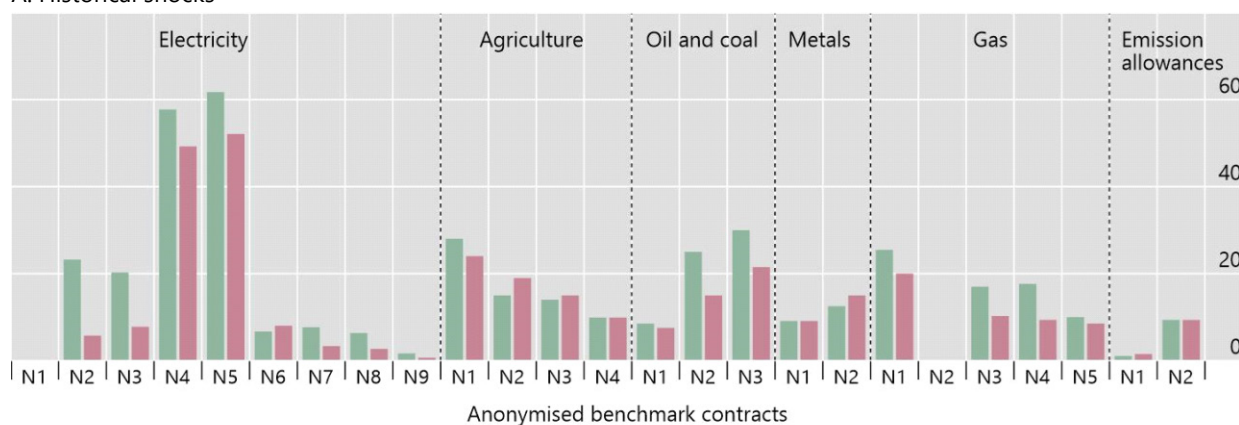
normalised to a one-day duration, are illustrated in Graph 5. Relative price shocks seem to be most severe in some electricity markets, for both historical and hypothetical scenarios, with generally smaller stress scenario shocks for the other product classes. Shocks within a product class are generally comparable across benchmarks, although there are some notable differences, with particularly pronounced variance seen across electricity contracts.

### Maximum relative shocks by benchmark contract, normalised to one-day duration

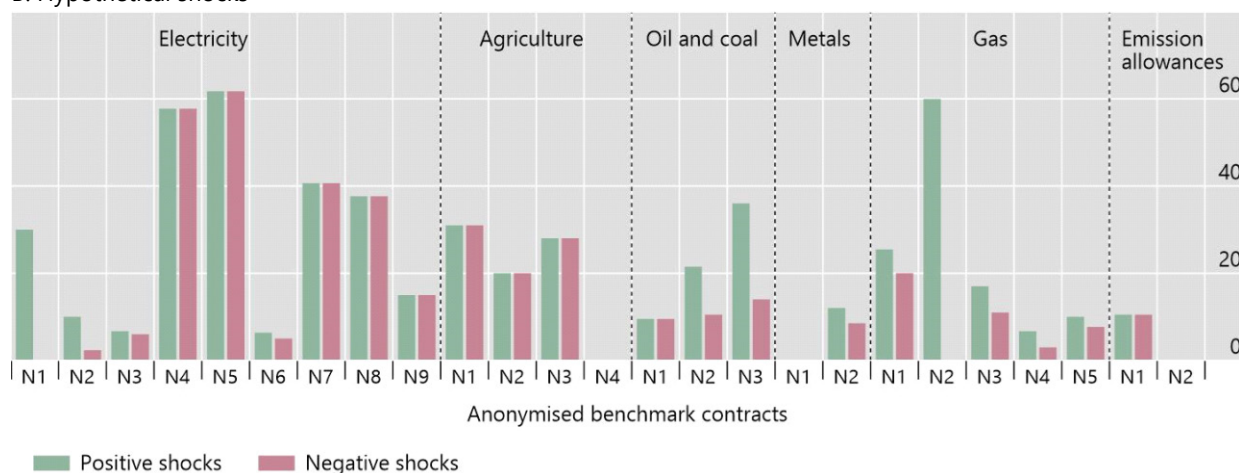
In per cent

Graph 5

#### A. Historical shocks<sup>1</sup>



#### B. Hypothetical shocks<sup>2</sup>



<sup>1</sup> No historical shock data were provided for the Electricity N1 and Gas N2 benchmarks.

<sup>2</sup> No hypothetical shock data were provided for the Agriculture N4, Metals N1 and Emission allowances N2 benchmarks. Only positive shock data were provided for Electricity N1 and Gas N2.

Source: CCP survey.

For a given benchmark, in most cases the maximum hypothetical shocks exceed the maximum historically derived shocks. However, the responses indicate that for some benchmarks the maximum historical shocks are larger than the maximum hypothetical shocks (for example, the contracts labelled N2 and N3 in electricity and N4 in gas). One CCP provided an explanation for this observation. It stated that its hypothetical scenarios are designed to complement directional price movements captured by the historical scenarios. In the hypothetical scenarios, price shocks may not be limited to a given risk factor

but, for example, they may propagate to other maturities across the futures curve and/or be accompanied by movements in other contracts (eg a change in cross-contract correlations). In other words, at a general level, a hypothetical scenario, considered holistically, could be as conservative as a historical scenario, or more so, even in cases where the historical scenario captures larger price moves for an individual risk factor.

### 4.3 Effects of 2022 market stress and lessons learned for stress-testing methodology

Seven surveyed CCPs saw market movements in 2022 that exceeded the maximum shocks in their stress scenarios. Market events during 2022 exceeded stress shocks mainly for energy markets (including electricity, oil and natural gas) and those for metals. One CCP described the market fluctuations in 2022 as “the most adverse fluctuations registered in the historical scenarios” it had in place. Most surveyed CCPs did not specify whether the observed exceedances were related to both the historical and the hypothetical scenarios (if relevant), or just one of them. Some surveyed CCPs reported that they had responded to the recent market volatility by adjusting their approaches, while others reported having largely kept to the status quo.

Seven surveyed CCPs, including two CCPs that did not experience exceedances of their maximum stress shocks, took steps to adjust either their stress scenario assumptions and/or their stress test methodology. Four of these CCPs indicated that market shocks in 2022 led them to revise their understanding of the boundary for the “plausibility” of extreme market events. These four CCPs reported having subsequently engaged in a review of their hypothetical scenario methodology. As a consequence, they have made changes (or are in the process of making them), including updates to shock definitions (eg shifting between absolute and relative price shocks and focusing on scenarios that more directly consider geopolitical risks). Three CCPs either adjusted their stress scenarios in the light of events or initiated reviews of their methodology for hypothetical scenarios. One of these CCPs stated that, although its stress scenarios had covered recent market volatility in the relevant market, it had updated its stress scenario shocks in the light of the extraordinary levels of volatility experienced.

The other five surveyed CCPs reported no change to either their stress scenario assumptions or their stress-testing methodology, although two of these CCPs experienced exceedances of the maximum stress shocks in their stress scenarios during 2022. However, it should be noted that some CCPs indicated that the process of routinely reviewing stress scenarios and adding new historical scenarios to their stress scenario suites is an inherent aspect of their stress-testing methodology. Thus, they did not consider their responses to large market events in 2022 to require specific adjustments to their prior approaches, with the data related to those events incorporated in due course as a matter of routine.

## 5. The transparency and predictability of increased margin requirements for end users in 2022

### 5.1 Background

CCPs call IM and VM from their clearing members, both for the clearing members' own (proprietary) portfolios and for the portfolios of clearing members' clients. Clearing members, in turn, call margin from their clients and may choose to apply a margin "multiplier" on the IM portion of the overall margin requirement (as described in Section 1.2).

As detailed in Sections 2–4, CCPs consider a range of factors in developing their IM models, and the experience of the 2022 commodities market volatility led to some CCPs re-calibrating some aspects of their IM models. How CCPs communicate such changes in approach, and ultimately call margin from clearing members (and indirectly from clients of clearing members) is important in facilitating market participants' understanding of, and preparedness for, increased margin requirements.

To understand the impact of surveyed CCPs' margin practices, the working group, in conjunction with the FSB, conducted a workshop discussion with non-financial commodities firms that participate in commodities derivatives markets ("end users"; see Annex 2 for details of the workshop). This section of the report focuses on workshop participants' views on the transparency and predictability of CCPs' and clearing members' margin requirements. The FSB's report on *The Financial Stability Aspects of Commodities Markets* incorporates workshop participants' views on their ability to access the requisite liquidity to meet their margin requirements and any associated changes in hedging and/or trading behaviour.

Workshop participants reported that challenges posed by the predictability of both IM and VM were an issue in 2022. They highlighted that issues of margin transparency relate principally to IM, including add-ons, where requirements can vary from CCP to CCP (even for the same products), depending on the CCP's margin model. As VM reflects the mark-to-market moves of a participant's positions, which can be observed in the market in real time, it does not lead to the same challenges around transparency, although the timing of VM calls (eg intraday calls) can be difficult to predict.

How an end user accesses cleared markets can have implications for the transparency of their margin demands: many end users access cleared markets via clearing members, although a few larger end users participate directly as clearing members.

End users reported that they commonly use information and tools provided by CCPs and their clearing members to prepare for potential margin demands. These tools can often be of use when anticipating the drivers behind base IM levels, or understanding them in real time. However, prediction is more difficult in areas such as the more complex components of IM requirements, any offsets that may be applicable for diversified portfolios, and the frequency and timing of VM calls (eg intraday).

Workshop participants stated that, for the early 2022 period, they understood that increased IM calls were driven largely by changes in price volatility and the prices themselves. Most believed that geopolitical events were prominent in driving these factors, describing the cause as a shortage of physical supply in key energy commodities markets, especially in Europe. However, it was not clear to them how far increased IM requirements were driven solely by changes in volatility and/or price levels as compared with the specifics of CCPs' and clearing members' margin models.

### 5.2 Transparency and predictability of CCPs' initial margin requirements

To ensure that the collateral they hold effectively mitigates counterparty credit risk, CCPs' margin models need to respond to changes in market conditions. Workshop participants generally agreed that how these

model outputs are communicated is important for end users' preparedness. Workshop participants explicitly highlighted that the way CCPs communicate margin changes can differ significantly from entity to entity, with some giving little or no forewarning of major shifts in margin levels. Setting expectations for notice periods on IM model changes was highlighted as a measure that could facilitate end users' preparedness.

One speaker stated that intraday cleared IM calls were the most unpredictable, and that the thresholds for intraday calls could often differ across CCPs and clearing members. It was reported that these calls were often hard to understand, as intraday calls are commonly based on the aggregate call across all accounts at a clearing member (which a single end-user client would not know) and not simply calls on individual accounts.

Workshop participants reported that tools such as margin model calculators and simulators provided by CCPs could help them anticipate calls, but that some of the tools did not have a level of accuracy which permitted them to confidently predict potential margin calls during periods of market stress. A few noted that their use of these tools was often inversely related to the level of market stress; while tools were often accurate enough during normal market periods, they were significantly less useful during periods of stress, given the lack of a clear relationship between the tools' outputs and the actual margin calls that were received. Workshop participants made a distinction between the availability of margin simulators, which were provided by CCPs, and (margin) stress-testing tools, which were not consistently provided by CCPs. While the former help end users estimate margin requirements, given specific hypothetical changes to the composition of the portfolio held, the second would provide an estimation of margin shifts for a static portfolio assuming large changes in market conditions (ie "what if?" functionality).

### 5.3 Transparency and predictability of clearing member initial margin requirements

Workshop participants noted that a particular challenge in understanding IM requirements called by clearing members arises from the discretionary application of IM multipliers by their clearing members. These can leave an end user's margin levels higher (sometimes much higher) than the CCPs' own margin requirements. Participants noted that multipliers were sometimes introduced or changed by clearing members without explanation and with very little notice. Margin multipliers could also, at times, appear arbitrary, covering risks that are not well understood or explained to end users – examples provided include "special delivery margin" or "contingent intra-month margin", the drivers of which were unclear, as were the thresholds at which they would be charged.

Clearing members may have good reason for applying IM multipliers, for example mitigating counterparty credit risks or concerns with client liquidity that often arise in volatile markets. Even so, workshop participants indicated that there was clear scope for improving client understanding of margin multiplier dynamics, including additional transparency related to their use and the factors used to assign them. Indeed, participants noted that these multipliers were often as unpredictable in size relative to CCP margin levels, if not more so, and it was often challenging, when a margin call came, to understand the primary factors driving that call.

One workshop participant was of the view that, in some cases, the IM multipliers from clearing members stemmed from a lack of understanding of the nature of the end user's business. Another participant gave an example of where it had successfully challenged an assigned multiplier after further explaining its business model and structure, highlighting the (here ex post) value of transparency between clearing member and end user.

Workshop participants also noted that clearing members generally provide inadequate support in the form of margin forecasting tools, and thus third-party vendors are commonly used as an alternative.

## 6. Conclusions and policy implications

A CCP's margin model produces its baseline expectation for IM requirements, and will generally respond to heightened volatility in the market. However, CCPs retain a significant amount of decision-making discretion during stress events, which can affect the size and speed of model-derived margin changes. Survey results show that most of the surveyed CCPs increased the frequency with which they reviewed their model parameters in early 2022. Further, the margin model outputs themselves can be manually overridden by the CCP. Such discretionary overrides are used for a variety of reasons, often to mitigate rapid shifts in margin levels, and the survey responses show that the market stresses of 2022 led a number of the CCPs to make use of them. In addition, a number of the CCPs reported monitoring the size or speed of IM increases in relation to an internal target or cap. Several such targets were breached in 2022, usually in relation to specific contracts, as a consequence of the extreme market conditions.

Another way in which CCPs can vary their margining framework (for example to help mitigate liquidity strains in the market) is in relation to the collateral that clearing members can post to meet margin requirements. In 2022, largely in response to clearing members' requests, a number of surveyed CCPs expanded the range of eligible collateral types. These changes partly reflect particular liquidity challenges faced by the significant proportion of non-financial clearing member and client counterparties in the commodities space. In response, CCPs expanded the set of eligible collateral types to include some of those assets more easily accessed by these counterparty types.

Although margin requirements are highly dependent on underlying market conditions such as price or volatility levels, IM models often take into consideration other sources of risk. Concentration risk "add-ons" are a firm-specific form of margin that help CCPs manage the additional liquidation risk posed by large positions. Concentration "add-ons" tend to be calculated with respect to historical average market conditions and/or dealer estimates of liquidation costs that are periodically updated; consequently, surveyed CCPs did not generally adjust their approaches to concentration risk in the light of the events of 2022.

Another important element of a CCP's risk management framework is its stress testing, which helps it size its total prefunded resources, including margin and other liquid resources such as its default fund. Survey results found a wide range of methodological approaches employed by surveyed CCPs for designing their stress-test scenarios, which are calibrated to represent extreme but plausible events. Around half of the surveyed CCPs reported that the market events of 2022 exceeded a few of the biggest shocks in their stress scenario suite (relating mainly to energy and metals markets). Several CCPs are adjusting their stress scenarios, or their approaches to stress testing more generally, in the light of this experience.

Commodities markets end users participating in the workshop said that the communication they receive from CCPs about margin changes is of variable quality and timeliness, and issues were cited in relation to the usefulness and accuracy of CCPs' "margin forecasting tools", such as margin simulators, especially during market stress. End users also spoke of a lack of transparency and understanding around margin "multipliers", which clearing members can add to CCP margin requirements. These multipliers were sometimes implemented or adjusted with little notice during periods of stress, adding to existing liquidity pressures.

Overall, these findings complement a number of analytical themes presented in the *Review of margining practices* report, and which have been scoped into further policy development work. In particular:

- The findings in relation to the CCPs' approaches to taking account of procyclicality effects of IM, and the specific responses to the 2022 stress events, will feed into the ongoing workstream on evaluating the responsiveness of IM models.

- The findings in relation to end users' perspectives on the transparency and predictability of margin calls, including aspects relating to clearing member margin multipliers, will feed into the ongoing workstream on enhancing the transparency of margin requirements in centrally cleared markets.

More generally, the findings may be of contextual value to national regulatory and supervisory authorities for their oversight of commodities (and other) CCPs as the experiences of 2022 are likely to inform CCPs' ongoing risk management practices in the future. This includes the observations made in relation to CCPs' calibration of their stress testing scenarios in the light of 2022 market events.

## References

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## Abbreviations

APC	anti-procyclicality
BCBS	Basel Committee on Banking Supervision
CCP	central counterparty
CPMI	Committee on Payments and Market Infrastructures
ETDs	exchange-traded derivatives
FSB	Financial Stability Board
IM	initial margin
IOSCO	International Organization of Securities Commissions
ISDA	International Swaps and Derivatives Association
MPOR	margin period of risk
OTC	over-the-counter
PFMI	Principles for financial market infrastructures
VM	variation margin



## Annex A – Survey of CCPs

The CCP survey focused on entities that clear commodities contracts which fall within the primarily affected product classes: agriculture, electricity, emission allowances, metals, natural gas and oil and petroleum (see Table A1 for breakdown). Twelve CCPs<sup>17</sup> responded to the survey, with some variation in both the style and length of responses across questions.

Count of CCPs clearing selected product classes

Table A1

	Count of CCPs
Product classes cleared	
Electricity	9
Natural gas	8
Agriculture	6
Emission allowances	5
Metals (base and precious)	4
Oil, coal and petroleum distillates	4

Source: CCP survey.

The contracts cleared within a given market can vary considerably across CCPs, even within a given product class. For example, electricity market derivatives often are generally specific to a geographical region (given local differences in the generation of electricity and the challenges associated with distributing electricity across long distances); geographically specific benchmarks are also common in natural gas markets, with derivatives contracts including Dutch TTF (continental Europe), Henry Hub (United States) as well as the Spanish-based PVB. Other categories covered did not necessarily have as distinct a geographical focus (eg metals), but all groups included a wide variety of individual contracts, with the agricultural group including wheat, corn, soybeans, rice etc. Table A2 summarises the number of unique benchmark contracts cleared by the surveyed CCPs; moreover, it shows that most CCPs participating in the survey clear more than 5% of the benchmark contracts in the markets they serve.

<sup>17</sup> The surveyed CCPs were the Australian Securities Exchange CCPs; BME Clearing; Chicago Mercantile Exchange Inc.; European Commodity Clearing AG; ICE Clear Europe; JSE Clear; LCH SA; LME Clear; NASDAQ Clearing AB; Nodal Clear, LLC; OMI Clear C.C. S.A. and Singapore Exchange Derivatives Clearing.

Benchmark contracts cleared by surveyed CCPs

Table A2

	Unique benchmark contracts cleared by surveyed CCPs <sup>1</sup>	Instances with market share greater than 5%
Product classes		
Electricity	15	12
Agriculture	12	8
Natural gas	9	7
Oil, coal and petroleum distillates	6	3
Metals (base and precious)	3	1
Emission allowances	4	4

<sup>1</sup> Some CCPs clear more than one benchmark contract in a given product class.

Source: CCP survey.

The survey questions put to the CCPs are reported in Box A1.

Box A1

**A. Commodities markets served by the CCP**

**Q1.** Within the below table please:

- Indicate the primary derivatives commodities markets served by the CCP. *NOTE: The CCP's survey response does not have to be all-encompassing across all commodity products offered by the CCP. The survey is focused on the CCP's key commodity products, and the CCP may focus its response on these primary product lines.*
- The key benchmark contracts cleared by the CCP – some examples are provided, but please add relevant benchmark contracts for the CCP.
- To the extent of the CCP's awareness, whether the CCP has over approximately 5% cleared market share in each of the benchmarks.

Key markets	Market served (Yes/No)	Benchmark contract(s) cleared (eg Brent for crude oil)	Market share >5% (Yes/No)
Electricity		eg German baseload	
Natural gas		eg Henry Hub	
Oil, coal, petroleum distillates		eg Brent	
Metals (Base and Precious)			
Emission allowances			
Agriculture			

## **B. Margin response to stress events**

**Q2.** How did actual increases in modelled margin requirements compare with any relevant internal target for maximum speed or size of increases, if any (eg max x% increase over y time period)?

**Q3.** Did the CCP use manual margin model overrides such that the margin requirements deviated from the modelled margin rates?

If Yes:

**Q3.a** What were the key considerations in making the decision? If possible, please answer in order of importance?

**Q3.b** What was changed (eg model parameters)?

**Q3.c** Was the decision communicated to market participants?

If Yes, at what point?

**Q3.d** With what frequency, and to what extent, were modelled margin requirements overridden (eg x% over a y month period)?

**Q3.e** Is the use of manual margin model overrides an option in normal market conditions?

**Q4.** How frequently have the margin parameters for commodities products been updated during stress events?

**Q4.a** How frequently have the margin parameters been updated under normal market conditions?

**Q5.** Do you now accept additional types of eligible collateral relative to March 2020?

If Yes:

**Q5.a** What types of collateral?

**Q5.b** Were they added for variation margin and/or initial margin requirements?

**Q5.c** What were the key factors that drove each eligible collateral change?

## **C. Concentration risk and transparency**

**Q6.** Does the CCP monitor activity in the OTC market? If Yes:

**Q6.a** Please explain what metrics/data do you use to monitor the activity in the OTC market.

**Q6.b** Please explain how changes in the data/metrics you monitor impact your assessment of concentration or liquidation risk

**Q7.** Does the CCP engage in dealer surveys to calibrate the parameters of margin add-ons? If Yes:

**Q7.a** How the surveys are considered? For which add-ons are they used?

**Q8.** What market variables does the CCP use when quantifying the size of concentration add-ons (eg average daily volumes)? When doing so, does the CCP consider all markets or only the ones associated with the CCP?

**Q9.** What assumptions does the CCP make for how these variables (eg volume increases, open interest decreases) may react to periods of market stress?

**Q10.** Have any market stress events caused the CCP to review its approach to concentration risk?

If Yes, how?

## **D. Stress testing**

### **Scenario design and selection**

**Q11.** Does the CCP have stress scenarios that apply to commodity derivatives? If Yes:

*[Note: Please answer with reference to specific commodity markets and (where relevant) benchmark contracts, as detailed in Section A. You may limit to the top two or three markets cleared.]*

**Q11.a** Describe how the CCP designs and selects historical and hypothetical commodity market stress scenarios, calibrated for extreme but plausible events. What factors are considered when determining whether a market scenario satisfies the extreme but plausible condition?

**Q11.b** Do the CCP's stress scenarios and/or rulebook account for potential disruptions in the ability to physically deliver the underlying commodities due to war, strike, riot, natural disasters, etc.?

If Yes, explain.

**Q11.c** Does the CCP's stress scenario design account for the potential use of market stabilization mechanisms by trading venues in periods of volatility (eg price controls, position limits, circuit breakers)? If Yes, explain how.

**Q12** With reference to two or three products/benchmark contracts (eg crude oil, gold, Henry Hub) cleared by the CCP, by market share, please detail the maximum shock applied in hypothetical stress scenarios as compared to historical scenarios – for example, report the upwards and downwards shock amounts (in percentage or outright terms) with applicable unit of measure, and the time period of the price change.

**Q13** Explain any fundamental differences between the CCP's commodity market stress scenario design approach compared to other cleared markets, such as rates, credit, equities, or foreign exchange. *[Please answer with reference to specific commodity markets.]*

### **Scenario review and observed stress events**

**Q14** Did movements during 2022 exceed those of the stress scenarios?

If Yes, in which markets?

**Q15** Have specific market shocks (in 2022 or earlier) resulted in changes to your interpretation of the boundary of "plausibility" of extreme events?

If Yes, please explain.

**Q16** Did specific market shocks (in 2022 or earlier) trigger a review of your hypothetical scenario methodology?

If Yes, what was the outcome?

## Annex B – BCBS-CPMI-FSB-IOSCO workshop on commodities markets

On 3 November 2022, the Basel Committee on Banking Supervision (BCBS), the BIS Committee on Payments and Market Infrastructures (CPMI), the Financial Stability Board (FSB) and the International Organization of Securities Commissions (IOSCO) held a joint workshop with representatives from 10 active participants in commodities cash and derivative markets. The workshop consisted of two sessions on: (i) the relationship between margin calls and liquidity supply and demand; and (ii) the extent to which there has been a migration of activity from ETD to OTC markets and a change in hedging activity. The workshop was held under the Chatham House Rule. The main takeaways from market participants' feedback are reported below.

### Liquidity preparedness and stress

The objective of this session was to discuss the links between margin calls, liquidity demand and liquidity supply.

#### *Liquidity demand*

Commodities market participants noted that initial margin (IM) for cleared commodities derivatives had been increasing prior to the invasion of Ukraine. Nevertheless, they observed that recent increases in cleared margin have been very significant, even on an intraday basis, and were very eurocentric. The driver of these increases was supply side shocks in the physical markets, resulting in extreme changes in commodities prices. One speaker noted that, in some cases, action by smaller players with less liquidity resources exacerbated price swings as they unwound positions instead of meeting higher IM requirements.

Anecdotally, one firm faced a 10-fold increase in IM, while another indicated a 16-fold increase as a result of rapid increases in German power futures contracts. Firms also noted rises in variation margin calls, between five- and 10-fold increases for some of the firms that participated in the workshop for some commodities and over various time periods. Participants suggested that the maximum one-day margin calls (including intraday margin calls) were, at times, equivalent to billions of euros. Some noted that trading volumes and open interest on exchanges continue to be affected, with low market liquidity especially noticeable for longer maturities. One speaker noted that reduced hedge availability affected their activity in the physical market in terms of hedging long-term forward supply contracts.

Participants in commodities markets generally agreed that the predictability of both IM and VM was an issue in early 2022, although it was well understood that the drivers of variation margin requirements were the price moves. Generally intraday margin calls were the most challenging to predict. Observations by participants were made at the CCP and broker level. Taking each in turn:

- Participants noted that because CCPs calculate margin requirements in different ways (CCPs develop their own models to reflect the markets they clear), this can make it challenging to understand why initial margin requirements might be increasing on one exchange while remaining relatively stable on another. A particular challenge noted by participants is inconsistency in how CCPs communicate updates to risk factors within their margin models. Some CCPs may give minimal warning, or none, of a change in model risk factors, which can lead to unanticipated increases in initial margin requirements. The associated explanations of model updates also vary considerably across CCPs and would benefit from harmonisation.
- At the clearing member/broker level, participants noted that discretionary add-ons/multipliers from clearing members were hard to understand and predict. One participant stated that the add-ons/multipliers from clearing members were sometimes introduced without explanation and with very little notice; this could be a particular issue during stress periods, which could

exacerbate the predictability issue. One participant argued that the layers of different types of margin (across the clearing member and CCP levels) suggest that overall the market is over-collateralised. Another participant was of the view that, in some cases, the add-ons/multipliers from clearing members stemmed from an incomplete understanding of the nature of their business model; some intermediary credit review teams focus only on exposures in derivatives markets (which could be one-directional) rather than the overall net exposure to commodities across derivatives and physical commodities.

Participants in commodities markets use a mix of margin tools provided by CCPs, clearing members and third parties to help them understand and anticipate future margin requirements. The adequacy and availability of tools varies considerably, with participants generally noting that brokers provide limited or no analytic resources. Several participants observed that CCP tools are useful for backward-looking analysis but often not for prediction/forecasts, and there is significant room for improvement. One participant stated that they relied on third-party tools to understand and manage their margin requirements in respect of both cleared and OTC positions. Another participant said the CCP tools needed to be combined with internal analysis to cover “worst case” scenarios. Participants noted that “what-if” tools (for example where market prices/volatility could be changed) are not generally available, or if they are available, they do not always accurately reflect what happens in actual elevated volatility market conditions.

Estimates of the accuracy of these tools varied. One participant stated that the day-to-day prediction error of the margin tools was in the range of 5–10%. Another stated that their backtesting of margin forecasts suggests that forecasts were appreciably more accurate in relation to CCPs that were transparent compared with those that were less so. Referring back to the discussion on CCPs updating risk factors in margin models, one participant noted that margin simulator tools would inevitably be only of limited use when risk factors are updated at short notice, as the margin simulations would be based on old risk factors.

Commodities market participants observed that CCPs have taken steps to improve transparency; however, some said that further improvements are necessary. One participant pointed out that a particular area lacking transparency was around intraday and ad hoc margin calls.

### *Liquidity supply*

Participants noted that liquidity sources during the stress period remained the same as during normal times. They generally required cash to meet many cleared margin calls due to eligible collateral restrictions, and predominantly relied on bank credit lines to meet those liquidity needs. For OTC derivatives, cash is also commonly required. One speaker shared its experience that brokers were not often willing to accept physical assets and convert them into cash for use as margin; consequently, this speaker noted that, in times of stress, they would raise emergency liquidity lines, or look to reduce liquidity needs by deferring payments or reducing business activities. Another speaker suggested that it should be possible to use bank guarantees that are not fully collateralised for IM, a practice available, to a limited extent, at some CCPs.

Some commodities market participants noted the need to have much more cash (several times more, anecdotally) available than what was necessary to retain exposures similar to those a year prior. The lack of cash availability to meet margin calls may drive some participants to reduce positions, negatively affecting trading liquidity.

Firms source liquidity mainly from their parents, if a distinct entity, or from bank credit lines. As the year went on, banks were reluctant to extend additional credit to commodities market trading participants, and so there was limited scope to access the necessary liquidity to support this market. Some participants observed that banks had cut back their credit lines in the commodities markets and suggested this could hurt funding liquidity for smaller commodity firms without well-established bank relationships.

The retrenchment in bank credit lines has also resulted in some reliance by commodity firms on structured finance in lieu of bank lines for funding or, instead or in parallel, a significant reduction of market positions. In addition, the maturity of bank financing and short-term commercial paper issuance has become shorter.

Participants in commodities markets emphasised that they are usually real-economy firms that deliver goods to real people. Because of this, the need to allocate more capital to trading and hedging will reduce these firms' capacity to invest in the physical commodities markets and this could disrupt the availability of physical commodities. This should be considered by regulators in discussions like those in Europe to regulate participants in commodities markets as investment firms. In their opinion, the workshop participants believe the latter would result in poor liquidity and would adversely affect the overall commodities derivatives market.

To conclude the discussion on liquidity supply, participants were asked to share perspectives on whether there had been any permanent changes in market functioning. One participant highlighted the value of implementing circuit breakers on exchanges to mitigate the impacts of extremely volatile prices. Several participants noted that the need for cash/liquid resources was now far more significant than in previous years, and may persist through at least the medium term. One speaker noted that hedging is becoming an exclusive club, given the costs, which is bad for competitiveness and the market more generally.

Discussion at this stage moved onto the second session of roundtable, focusing on how these challenges in hedging were potentially leading to a migration of activity to OTC and/or a reduction in hedging activity overall.

## Commodity trading activity and hedging

The session's key objective was to discuss whether there has been a migration of activity to OTC derivative markets and if there has been any material change in the amount of hedging activity in commodities derivatives markets.

Participants suggested that commodities derivatives activity has migrated in some segments of the market from centrally cleared ETD markets to largely uncleared, bilateral OTC markets. Several participants stressed that this was not due to a preference for OTC as they prefer ETD markets in normal times because of their typically better market liquidity, but was in response to the spike in cleared margin requirements (discussed above).

This migration was not the result of an independent decision to shift a certain percentage of business from ETD to OTC, but the result of attempting to balance funding and liquidity risk (eg the need to have funds or access to funds to pay the larger margin calls), counterparty credit risk (eg from OTC trades that are not centrally cleared), and market risk (eg from reducing the amount of hedging of commodities prices or having lower-quality hedges in place).

This has led to the migration of some activity by highly rated commodities traders that were able to take advantage of the beneficial collateral terms in OTC markets. However, there has not been a wholesale migration of activity as there are limits to the amount of OTC trading that can take place due to counterparty credit limits at banks.<sup>18</sup> Smaller players, especially those with less favourable credit ratings, have found it particularly difficult to move some of their business to OTC markets, given these counterparty credit risk concerns.

A number of the speakers stressed that counterparty credit risks were constantly monitored in the market. They suggested that, while the failure of a major commodities market participant would lead

<sup>18</sup> Banks tend to be the largest dealers of non-cleared OTC derivative transactions.

to significant volatility in commodities markets and abnormal trading patterns, this should not have systemic consequences. They asserted that this is because the risk would be spread across the market and so could be absorbed, giving the example of the failure of a mid-sized commodities trader in Asia that left creditors with \$3.5 billion in unpaid debts, but which did not create significant problems. One participant, however, noted that over time commodities markets could become more concentrated around larger players. These big firms would need to have better risk management and corporate governance to prevent disruption to their business as any problems could spill over to others in the market.

Participants also noted that the balance of risks (as described above) had led to a net curtailment of hedging activity, leaving some commodities firms more exposed to market risk. Some speakers again stressed that this was not a choice based on a change in risk appetite, but was due to elevated hedging costs. This cutback in hedging is particularly prevalent in longer-dated derivatives contracts (eg with an initial maturity of more than 18 months) and in non-benchmark contracts where liquidity has fallen considerably. This is a significant change to the situation before the outbreak of the war in Ukraine, where some market participants said they were able to hedge positions out for two to three years.

One speaker also noted that its firm now reserves more cash for its hedging and trading business. These cash allocations amount to a material part of the overall group's liquidity, an unprecedented occurrence. This has translated into less hedging and fewer long-term positions in underlying commodities markets. Market participants also reported that the quality of hedges has fallen as so-called dirty hedges – in which relatively more liquid short-tenor benchmark derivatives contracts are used to hedge non-benchmark physical commodities – have been increasingly used, leading to greater basis risk.

Several speakers also noted the economic impact of higher hedging costs. A rise in the cost of hedging has fed into the price of the final commodity (eg energy prices). As there is a clear chain from market conditions through to the physical delivery of a commodity, more expensive hedging costs will lead to higher commodity prices in the economy.



## Annex C – Members of the senior and working groups on margin

### Senior group co-chairs

Bank of England	Jon Cunliffe
US Commodity Futures Trading Commission	Rostin Behnam

### Senior and working group members

Reserve Bank of Australia (RBA)	Ellis Connolly Benn Robertson*
Bank of Canada	Alper Odabasioglu*
European Central Bank (ECB)	Daniela Russo Francesco Vacirca* Christian Weistroffer*
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Bank of France (BdF)	Frederic Hervo* Katia Pascarella* Théau Conte*
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Deutsche Bundesbank	Oliver Hutengs*
Hong Kong Monetary Authority	Arthur Yuen Eva Tung*
Hong Kong Securities and Futures Commission	Ryan Ko Thomas Wong*
Reserve Bank of India	P Vasudevan Visvanathan Srinivasan* Rohit Das*
Bank of Italy (BoI)	Claudio Impenna Cristina Di Luigi* Riccardo Rocco*
Commissione Nazionale per le Società e la Borsa (CONSOB)	Salvatore Lo Giudice*
Japan Financial Services Agency	Yuji Yamashita Oi Hidetoshi*(until January 2023) Yuya Oshima* Yuya Murasugi* (from January 2023)
Bank of Mexico (CBM)	Orlando Luisillo*

Comisión Nacional Bancaria y de Valores	Rodrigo Hernandez Clemente Samanthat Góngora Rojo Joanna*
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Monetary Authority of Singapore (MAS)	Ian Chung* Yolanda Constantine*
Swiss Financial Market Supervisory Authority (FINMA)	Michael Piller*
Bank of England (BoE)	Sasha Mills# Barry King* Stephen Longden*
UK Financial Conduct Authority	Carmel Deenmamode*
Board of Governors of the Federal Reserve System (FRB)	Travis Nesmith Anna Amirdjanova*
Federal Reserve Bank of New York (FRBNY)	Sishush Maru*
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FSB Analytical Group on Vulnerabilities Chair	Denis Beau
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The Senior group on margin would like to extend its thanks to the:

- *Working group co-chairs:* Sasha Mills (BoE) and Richard Haynes (CFTC)
- *Workstream co-leads:* Barry King (BoE) and Richard Haynes (CFTC)
- *Members of the Commodities Workstream:* Dana Brown (CFTC), Ian Chung (MAS), Théau Conte (BdF), Rehim Kilic (FRB), Stephen Longden (BoE), Yuya Murasugi (JFSA), Benjamin Stricker (Bafin), Francesco Vacirca (ECB) and Franck Viollet (ESMA).

In addition, the Senior group on margin thanks Melissa Cavers (CFTC), Jeffrey Hasterok (CFTC), Nancy Doyle (CFTC), Edward Kent (BoE), Francis Jackson (BoE), Oana Furtuna (ECB), Hong Sherwin (CFTC) and Xiaobin Zhou (CFTC) for their assistance in analysing the CCP survey responses and in the drafting of the report.