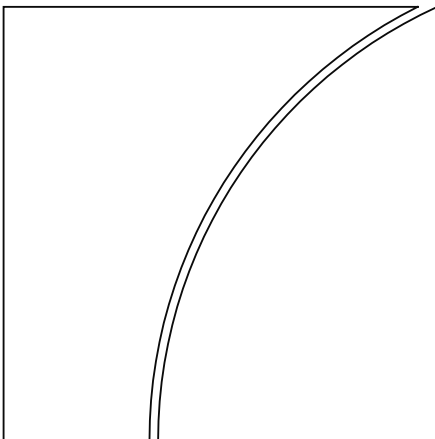


Basel Committee on
Banking Supervision
Committee on
Payments and Market
Infrastructures
Board of the International
Organization of Securities
Commissions



Review of margining practices

September 2022



BANK FOR INTERNATIONAL SETTLEMENTS

This publication is available on the BIS website (www.bis.org) and the IOSCO website (www.iosco.org).

© *Bank for International Settlements and International Organization of Securities Commissions 2022.
All rights reserved. Brief excerpts may be reproduced or translated provided the source is stated.*

ISBN 978-92-9259-595-1 (online)

Review of margining practices

Contents

Review of margining practices	i
Executive summary	1
1 Context	5
1.1 March 2020 market turmoil	5
1.2 Margining practices	5
1.2.1 Initial margin	5
1.2.2 Variation margin	6
1.2.3 Centrally cleared markets.....	6
1.2.4 Non-centrally cleared markets.....	7
1.3 Review of margining practices.....	8
2 Size and composition of margin calls	8
2.1 Variation margin.....	9
2.2 Initial margin.....	11
2.3 Excess collateral at CCPs	17
3 Drivers of IM calls.....	18
3.1 Trading activity.....	20
3.2 CCP models	21
3.2.1 Model types and choices by CCPs.....	21
3.2.2 APC tools	22
3.2.3 Assessing the responsiveness of IM models	23
3.2.4 Margin exceedances.....	24
3.3 SIMM model.....	25
4 Transparency of margining practices	26
4.1 CCPs' perspective.....	26
4.2 Intermediaries' perspective.....	26
4.3 Clients' perspective	28
5 Preparedness of market participants.....	29
5.1 Intermediaries preparedness.....	29
5.2 Clients' preparedness	32
6 Impact on the system	33

7	Key findings and next steps	36
7.1	Increasing transparency in centrally cleared markets	36
7.2	Enhancing liquidity preparedness of market participants as well as liquidity disclosures	36
7.3	Identifying data gaps in regulatory reporting	37
7.4	Streamlining VM processes in centrally and non-centrally cleared markets	38
7.5	Evaluating the responsiveness of centrally cleared IM models to market stresses with a focus on impacts and implications for CCP resources and the wider financial system	38
7.6	Evaluating the responsiveness of non-centrally cleared IM models to market stresses	39
	References	40
	Abbreviations	41
	Annex A: Illustrative timeline of events in Q1 2020	42
	Annex B: Overview of the surveys	43
	Annex C: Additional figures	46
	Annex D: Additional interconnectedness maps	52
	Annex E: Members of the senior and working groups on margin	54

Executive summary

Regulatory and market context

The Covid-19 market turmoil of March 2020 was the most significant test of the resilience of financial markets since the Great Financial Crisis (GFC) of 2007–09. Financial markets generally proved resilient, with no widespread concerns about counterparty credit risk.

In part, this reflects global financial regulatory reforms following the GFC. Reforms were put in place expressly to increase the role of central counterparties (CCPs) by mandating and incentivising centrally cleared derivatives activity, simplifying counterparty credit exposures and increasing transparency to regulatory authorities. Reflecting the resulting increase in the systemic importance of CCPs, in 2012 the Committee on Payments and Market Infrastructures (CPMI)¹ and the International Organization of Securities Commissions (IOSCO) published the *Principles for financial market infrastructures* (PFMI) – developed further with additional guidance published in 2016 and 2017 – to help enhance the robustness of CCPs and ensure strong risk management standards.

In non-centrally cleared markets, the Basel Committee on Banking Supervision (BCBS) and IOSCO developed a framework that established minimum standards for margin requirements for non-centrally cleared derivatives (although not non-centrally cleared securities). These reforms were designed to reduce systemic risk in non-centrally cleared derivatives markets and to help promote central clearing.

During the period of high market volatility in March 2020, large increases in aggregate margin requirements were seen in both the centrally and non-centrally cleared markets. The Covid-19 pandemic and its market impact thus presented a real-world test of derivatives and securities markets' operations in the context of this episode's broader liquidity pressures.

This report presents analysis undertaken by an ad hoc group established by the BCBS, CPMI and IOSCO – as part of the Financial Stability Board's (FSB's) work programme on non-bank financial intermediation (NBFIs) – examining whether and, if so, to what extent, margin calls were unexpectedly large in centrally and non-centrally cleared derivatives and securities markets. This report considers both initial margin (IM) and variation margin (VM), as well as centrally and non-centrally cleared markets (including clearing member-client dynamics), margin practices transparency, predictability and volatility. It also considers the liquidity management preparedness of market participants to meet margin calls and the availability of each jurisdiction's regulatory data.

This work follows the publication in November 2020 of the FSB's *Holistic review of the March market turmoil*, which – among other things – called for further work to examine “whether market participants were fully prepared for the margin calls they experienced, their ability to liquidate assets to meet margin calls under stressed conditions, and the role of margining practices both in centrally cleared and bilateral markets in amplifying funding strains”.²

To support this work, four detailed surveys were conducted at (i) CCPs; (ii) clearing members and broker-dealers (“intermediaries”); (iii) other market participants active in global centrally and non-centrally cleared derivatives and securities markets (“clients”); and (iv) regulatory authorities. The surveys collected quantitative and qualitative data across the major entity types most affected by centrally and non-centrally cleared margin dynamics, and were supplemented by public information where possible. Information gathered through the CCP survey covers the vast majority of CCPs and is therefore a reasonable indication

¹ The Committee on Payment and Settlement Systems (CPSS) changed its name to the Committee on Payments and Market Infrastructures (CPMI) in September 2014. References to reports published before that date use the Committee's old name.

² The terms non-centrally cleared, bilaterally cleared, and uncleared are often used interchangeably to refer to products not cleared through a CCP. This report uses the term “non-centrally cleared” for such products and “centrally cleared” for products cleared at CCPs.

of the overall market, while the coverage of responses to the other surveys is more limited and represents only a sample of market participants or jurisdictions.

In October 2021 the BCBS, CPMI and IOSCO published the consultative report *Review of margining practices*. Written feedback was received from 33 entities or groups: 10 were from CCPs or industry associations representing CCPs; seven were from clearing members or groups representing clearing members; 10 were from clients or industry associations representing clients; the remaining six were from a variety of entities, including academic institutions, consultancies, authorities and individuals.³ In addition to the written feedback, BCBS, CPMI and IOSCO held a series of virtual stakeholder outreach sessions in November 2021.

Overall, the consultation respondents viewed the consultative report as accurate, and as providing a clear view of market events and margin dynamics during the Covid-19 turmoil. Respondents agreed that the relevant post-GFC reforms enabled market participants to continue to transact in risk transfer markets during the Covid-19 turmoil. In particular, the greater use of CCPs and the implementation of non-centrally cleared margin rules mitigated counterparty credit risk. Most respondents noted that the report properly identified the main drivers for the increase in margin requirements and accurately assessed the preparedness of market participants to manage their liquidity requirements. In general, the responses also suggested that the report appropriately described the level of transparency, responsiveness and performance of CCP margin models as well as non-centrally cleared margin models and practices. However, some concerns were raised on data availability and specific parts of the analysis, and some additional topics were proposed for further work. A more detailed summary of the feedback has been published alongside this report.⁴

Size, composition and drivers of margin calls

Given the rapid increases in market volatility experienced in March 2020, there was a broad-based and rapid increase in margin calls across the financial system. The aggregate changes in stocks and flows of margin differed in size across markets and CCPs.

Daily CCP VM calls were large, and significantly higher than the average flows observed between January and February 2020, increasing from around \$25 billion to a peak of \$140 billion, as based upon our survey results. These flows were a direct result of significant shifts in market volatility during the period (VM flows are directly determined by the realised mark-to-market changes in portfolios). Furthermore, while centrally cleared VM calls were predominantly made on an end-of-day (EoD) basis, there were significant intraday VM calls during the most stressful period in March. Most of these were made on pre-defined schedules, with some notable ad hoc calls on peak days.

The total IM requirement across CCPs increased by roughly \$300 billion over March 2020, with a further increase in excess collateral of \$115 billion, resulting in an overall increase in collateral pre-positioned at CCPs of \$415 billion (a roughly 40% increase relative to the average in February 2020). Slightly less than half of this collateral was held in cash. Market volatility and model reactions to volatility were responsible for the majority of the peak increase in IM requirements, with changes in volumes and risk positions playing a smaller role – particularly for over-the-counter (OTC) interest rate swaps and exchange-traded derivatives (ETD), which account for the largest proportion of overall IM.

There was significant dispersion in the size of IM increases across, and within, asset classes. Price volatility and the reaction of CCP margin models to this volatility appear to have driven much of this dispersion, with the largest IM changes in markets that saw the largest volatility spikes. Any remaining

³ Where respondents did not expressly request otherwise the comments are available on the BIS (www.bis.org/bcbs/publ/comments/d526/overview.htm) and IOSCO (www.iosco.org/publications/?subsection=public_comment_letters) websites.

⁴ Available on the BIS (https://www.bis.org/bcbs/publ/d537_feedback.pdf) and IOSCO (<https://www.iosco.org/library/pubdocs/pdf/IOSCOPD714-feedback-statement.pdf>) websites.

differences may have been due to differing CCP model implementation, product features or portfolio composition. In particular, there is a diversity of model choices across CCPs and asset classes, with individual CCPs' choices leading to differing responses to underlying market volatility.

In contrast, IM requirements on non-centrally cleared products remained relatively stable during the stress period, as calculated for a given portfolio under the Standard IM Model (SIMM) approach. This is likely to be an intended consequence of the SIMM's conservative design, although it suggests IM requirements for non-centrally cleared transactions may be less responsive to increases in market volatility and provides perhaps a useful counterfactual to the experience in centrally cleared markets given the similar levels of volatility faced in key underlying markets.

Transparency of margin practices

The evidence collected suggests that transparency around IM models differs across CCPs and jurisdictions. CCPs generally note that they provide a variety of tools and information to aid with the prediction of stressed margin calls, although the capabilities of these tools differ across CCPs. Most CCPs provide tools that let clearing members and clients calculate margin requirements for existing portfolios as well as changes to portfolios that participants expect to make, while some CCPs provide additional functionality, allowing participants to calculate margin requirements under "what if" scenarios. While these tools were considered useful during the March period, some clearing members and clients suggested a range of potential improvements related to the tools' transparency, disclosure and functionality that would help them overcome the challenges of anticipating margin changes.

Preparedness of market participants

In general, intermediaries indicated they were relatively unaffected by changes in margin, and made few, if any, changes to counterparty margin call policies and procedures. Some indicated that they did make material changes to the credit limits applied to counterparty positions or the credit limits imposed on those positions. The majority of intermediaries reported that they did not experience or observe material issues when converting high-quality liquid assets into cash during the Covid-19 period, although a number made material changes to their liquidity resources and/or cash management/liquid asset investment strategies. Cash in the form of central bank reserves and sovereign debt were the main liquidity sources used by intermediaries to cover margin outflows, and coinciding with central bank interventions, central bank reserves became a more important source of liquidity both in absolute and relative terms.

More than half of the surveyed clients reported no significant increases in liquidity demand from margins for both cleared and non-centrally cleared derivatives, although some faced liquidity needs materially greater than anticipated. Clients also varied in their level of preparedness for margin calls. Fire selling of assets by clients was generally avoided, partly due to central bank intervention to support funding markets. Cash was key in funding the increased liquidity demand for the majority of clients surveyed; cash collateral posted to CCPs increased on both a relative and absolute basis during March. However, clients also made increasing use of repo and asset sales to meet direct margin payments during the same period. While most clients stated that their intermediaries fulfilled their contractual obligations, some noted that margin unpredictability did increase during periods of peak market stress.

Data gaps have been highlighted by attempts to map the interconnectedness between how sources of liquidity demand and supply for firms interact with key nodes in the financial system. These gaps would need to be filled in order for authorities to gather a fuller picture of NBFIs' sector liquidity preparedness and intermediaries' provision of liquidity to clients.

Next steps

The BCBS, CPMI and IOSCO have considered the responses to the consultation and believe that further work is necessary in six areas, as set out below. This further work, which may inform policy considerations, is discussed in more detail in Section 7 of this report. The BCBS, CPMI and IOSCO will work together and with the FSB, as part of its work programme on NBFI, to take forward this work.

1. **Increasing transparency in centrally cleared markets.** Further international work is proposed to explore consistent metrics and disclosures concerning procyclicality, responsiveness to volatility and model performance. This work should also consider good practices with respect to the provision of tools and simulators. Additional international work could also consider the role that disclosure of modelling choices by individual CCPs could have in enhancing understanding of, and comparisons between, CCP model behaviours. This further work should include exploration of improvements to existing expectations for disclosures both to clearing members and the public.
2. **Enhancing the liquidity preparedness of market participants as well as liquidity disclosures.** Additional international work could identify ways to further enhance liquidity preparedness, including appropriate liquidity measures in the NBFI sector, and elucidate ways that clearing members can encourage and facilitate greater liquidity preparedness on the part of clients. Work could include analysis related to NBFI sector liquidity arrangements and intermediaries' provision of liquidity to clients to facilitate the fulfilment of margin obligations, and the effectiveness of those arrangements during periods of extreme stress/volatility.
3. **Identifying data gaps in regulatory reporting.** Further international work is proposed to identify gaps in current regulatory data at the jurisdictional level, which could provide a more comprehensive picture of the preparedness of market participants for margin requirements. This work could consider what additional regulatory disclosures or data points could provide authorities with a fuller picture of NBFI sector preparedness and intermediaries' provision of liquidity to clients.
4. **Streamlining VM processes in centrally and non-centrally cleared markets.** Further international work is proposed to consider ways to foster market participants' preparedness for the large VM calls that can occur during market stress through efficient collection and distribution of VM and other means. Additional work is also proposed to identify good practices for VM collection and distribution by CCPs.
5. **Evaluating the responsiveness of centrally cleared IM models to market stresses with a focus on impacts and implications for CCP resources and the wider financial system.** Further international work is proposed to understand the degree and nature of CCP margin models' responsiveness to volatility and other market stresses and to explore appropriate ways to analyse, compare and set baseline expectations as to procyclicality in various settings. Additional work could also review IM levels in non-stress times in the light of this responsiveness, including a review of the effectiveness of tools that reduce the procyclicality of margin models and of the consistency of their use, as well as the role of clearing members' practices when passing on CCP margin calls to clients in dampening or amplifying the procyclicality of margins.
6. **Evaluating the responsiveness of non-centrally cleared IM models to market stresses.** Further international work could look into the timeliness of mechanisms for taking into account stress periods in the calibration of internal models, as well as the timely remediation of IM shortfalls and the level of disclosure on the performance of non-centrally cleared IM models.

1 Context

1.1 March 2020 market turmoil

The Covid-19 market turmoil of March 2020 was the most significant test of the resilience of derivatives and securities markets since the Great Financial Crisis (GFC). Business activity worldwide dropped abruptly and financial asset prices slumped.⁵ Equity markets in many countries recorded the greatest single-week decline since the GFC during the week ending 28 February 2020.⁶ The ensuing volatility and market stresses, including liquidity stresses, had substantial effects on the global financial markets – resulting, in some cases, in the so-called “dash for cash”.⁷

In March 2020, financial markets proved resilient. Sharp price declines in equities and other assets, and high volatility, did not result in widespread concerns about counterparty credit risk. However, during this episode, there were dramatic increases in margin requirements in both the centrally and non-centrally cleared markets. The Covid-19 pandemic and its market impact thus presented a real-world test of the derivatives and securities markets’ operation in the context of the broader liquidity pressures of March 2020.

In the light of the market turmoil and the economic contraction resulting from the onset of Covid-19, central banks and regulatory authorities worldwide infused their economies with cash and support in various forms. Central banks and other public authorities undertook monetary support measures,⁸ fiscal support measures⁹ and other measures.¹⁰ As a result of these unprecedented policy actions the period of stress was relatively short-lived.

1.2 Margining practices

Margin is cash and non-cash collateral that are collected to protect against future or current risk exposures resulting from market price changes or in the event of a counterparty default. Two main categories of margin, initial and variation margin, are used in both centrally and non-centrally cleared markets to cover different aspects of risk exposure.

1.2.1 Initial margin

Initial margin (IM) is collected to cover potential changes in the value of each participant’s position – the potential future exposure (PFE) – over an appropriate closeout period, in the event that a participant holding the position defaults. IM typically comprises a “core” IM component, which is associated with market risk and “add-ons”, which refers to margin designed to cover other risks (eg liquidity or concentration risk). Typically, it is possible to cover IM with both cash and non-cash collateral (often highly liquid assets such as sovereign bonds).

⁵ Annex A summarises some of the key events in March 2020.

⁶ At one point in March, the major US, European and UK equity indices had fallen over 30% below their recent peaks.

⁷ While this report focuses on the liquidity effects of margin calls during the March 2020 market turmoil, it must be acknowledged that margins were not the sole or predominant cause of the overall dash-for-cash. Other work by the FSB, IOSCO, central banks and others – both concluded and ongoing – examine liquidity pressures and potential liquidity reforms associated with other aspects of the global financial markets that experienced financial stress in March 2020.

⁸ Examples include central bank quantitative easing, reducing the interest rates paid by the central bank on its own liabilities, and buying more government bonds. Actions were taken by all central banks of the five largest economies: the Board of Governors of the Federal Reserve System, the ECB, the People’s Bank of China, the Bank of Japan and the Bank of England.

⁹ Examples include central banks and other authorities establishing loan programmes and even cash payments to households.

¹⁰ Such as easing of regulatory requirements to extend credit to firms adversely affected by the crisis or supporting the debt security markets.

1.2.2 Variation margin

Variation margin (VM) represents funds that are collected to extinguish current exposures resulting from changes in market prices. In derivatives markets VM is typically collected and paid out in cash.¹¹ VM is calculated and called regularly by marking open positions to market. This process involves establishing a fair market price for a given position, calculating whether each position has made a loss (or a profit) and paying (or receiving – for derivatives positions) VM sums to (or from) the central counterparty (CCP) or bilateral counterparty. VM payments are typically made at least once daily but can be made more frequently intraday (ITD).

1.2.3 Centrally cleared markets

For centrally cleared transactions, a CCP interposes itself between counterparties to a trade, becoming the buyer to every seller and the seller to every buyer, thereby ensuring the performance of open contracts. CCPs have a broad set of tools to manage risk, process default events and assure their continued operation during times of market stress.

The post-GFC reforms explicitly sought to increase the role of CCPs by mandating and incentivising central clearing of OTC derivatives activity, and – by design – the reforms have greatly increased the systemic importance of CCPs.¹² The reform process therefore included work on enhancing the robustness of CCPs, most notably through the publication in 2012 by the Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO) of the *Principles for financial market infrastructures* (PFMI).¹³ The PFMI were developed further with the publication in 2017 of additional guidance on the principles and key considerations in the PFMI regarding financial risk management for CCPs (PFMI further guidance).¹⁴

CCPs typically collect margin at least once a day based on end-of-day positions (EoD margin). However, CCPs can call for collateral outside the traditional EoD schedule. These ITD calls are typically scheduled according to timetables known by a CCP's membership, but can include ad hoc ITD calls at other times.

Although the tendency of IM (and other risk-sensitive protections) to increase as volatility increases is expected and typical, the PFMI include guidance on how CCPs should manage the procyclicality of their margin arrangements.¹⁵ Both the PFMI and the 2017 PFMI further guidance consider the practices which CCPs should follow when changing their margin requirements during a time of market stress to avoid crystallisation of this risk. The latter states that CCPs "should develop appropriate methods

¹¹ Given the short settlement cycle, securities CCPs often collect VM but do not pay it out, as final settlement is at the trade execution price rather than the current market value. Instead, any VM collected is returned as part of the settlement process.

¹² BCBS-CPMI-FSB-IOSCO (2018).

¹³ CPSS-IOSCO (2012).

¹⁴ CPMI-IOSCO (2017).

¹⁵ CPSS-IOSCO (2012), paragraph 3.6.10, p 53 states that CCPs "[...]should appropriately address procyclicality in its margin arrangements. In this context, procyclicality typically refers to changes in risk management practices that are positively correlated with market, business, or credit cycle fluctuations and that may cause or exacerbate financial instability".

or tools for mitigating the potential for destabilising, procyclical changes arising from its margin system".^{16, 17, 18}

In response, CCPs have developed various approaches to mitigating the risk of procyclicality in their margin models. Some CCPs use explicit anti-procyclicality (APC) controls and frameworks and some jurisdictions mandate use of APC measures. Other CCPs do not do so in explicit frameworks but, in other ways, have built measures or controls on procyclicality into their models.

1.2.4 Non-centrally cleared markets

For non-centrally cleared transactions, each party must manage its exposure to its counterparties bilaterally. In the wake of the GFC, the BCBS and IOSCO developed a framework that establishes minimum standards for margin requirements for non-centrally cleared derivatives.¹⁹ The purpose of these minimum standards is both to reduce systemic risks and promote central clearing.²⁰ In the phased approach to implementing the standards, as of March 2020, all financial firms and systemically important non-financial entities were to (i) exchange VM on contracts entered into after 1 March 2017; and (ii) exchange IM if both counterparties belong to groups whose aggregate month-end average notional amount of non-centrally cleared derivatives exceeds €0.75 trillion.^{21, 22} There is no equivalent regulatory margin requirement for non-centrally cleared securities. Margin required to be paid under the BCBS-IOSCO framework is known as regulatory VM and IM.²³

The BCBS and IOSCO identified two main benefits associated with the introduction of margin requirements for non-centrally cleared derivatives:

- *Reduction of systemic risk:* margin requirements for non-centrally cleared derivatives would be expected to reduce contagion and spillover effects by ensuring that collateral is available to offset losses caused by the default of a derivatives counterparty.
- *Promotion of central clearing:* by reflecting the potentially higher risk associated with non-centrally cleared derivatives, margin requirements for these products are generally at a higher level than for centrally cleared products.

¹⁶ CPMI-IOSCO (2017) at paragraph 5.2.43, p 36 and in the cover note respectively state "...in a period of rising price volatility or credit risk of participants, a CCP may require additional IM for a given portfolio beyond the amount required by the current margin model" and "[t]o the extent practicable and prudent, a CCP should adopt forward looking and relatively stable and conservative margin changes as changes in risk management requirements or practices that are positively correlated with the market, business or credit cycle fluctuations and may cause or exacerbate financial instability."

¹⁷ CPSS-IOSCO (2012), p 54. See also CPMI-IOSCO (2017), pp 7–8 (further guidance on procyclical changes, including requirement to conduct periodic assessment of any destabilising procyclical changes). The PFMI also state that an FMI (such as a CCP) should define stable and conservative collateral haircuts, calibrated to include periods of stressed market conditions. The PFMI provide that CCPs' margin system components be designed to ensure that margin levels are "commensurate with the risks and particular attributes of each product, portfolio, and market" that the CCP serves. CPMI-IOSCO (2017), paragraph 5.1.2, p 27.

¹⁸ CPMI-IOSCO (2017), paragraph 5.2.43, p 36.

¹⁹ BCBS-IOSCO (2020). This supersedes the July 2019 version.

²⁰ See BCBS-IOSCO (2020), pp 2–4 for a discussion of these goals and the liquidity impact that would result from derivatives counterparties' need to provide liquid high-quality collateral to meet IM requirements.

²¹ See BCBS-IOSCO (2019) for the standards for margin requirements as of March 2020.

²² In April 2020, the BCBS and IOSCO extended by one year the final two implementation phases in order to provide firms with additional operational capacity to respond to the immediate impact of Covid-19 and at the same time, facilitate covered entities to act diligently to comply with the standards for margin requirements by the revised deadline. With this extension, the final implementation phase will take place on 1 September 2022, at which point covered entities with an aggregate average notional amount (AANA) of non-centrally cleared derivatives greater than €8 billion will be subject to the requirements. As an intermediate step, from 1 September 2021 covered entities with an AANA of non-centrally cleared derivatives greater than €50 billion will be subject to the requirements. For further details see BCBS-IOSCO (2020).

²³ Counterparties can choose to adopt similar risk management arrangements for other transactions; under these circumstances the equivalent of IM is referred to as discretionary IM or independent amounts.

For non-centrally cleared derivatives, the Standard IM Model (SIMM) is a common methodology used to calculate IM. Developed by the International Swaps and Derivatives Association (ISDA),²⁴ the SIMM model is used by most banks implementing the BCBS-IOSCO rules and generally responds less rapidly than CCP models to changes in market conditions such as price volatility by design.²⁵

1.3 Review of margining practices

In November 2020, the FSB published a report titled *Holistic review of the March market turmoil*. One of the areas for further work identified in that report was “whether market participants were fully prepared for the margin calls they experienced, and their ability to liquidate assets to meet margin calls under stressed conditions, and the role of margining practices both in centrally cleared and bilateral markets in amplifying strains”.²⁶

To carry out this work the BCBS, CPMI and IOSCO established an ad hoc group. This group was tasked with examining, based on relevant data and information, the margin calls during March and April 2020 and their impacts on market participants in derivatives and securities (cash) markets. The scope includes both IM and VM and covers:

- margin in centrally and non-centrally cleared markets during the March market turmoil, including clearing member-client dynamics;
- margin practice transparency, predictability and volatility during the March market turmoil across various markets, jurisdictions and margining models; and
- liquidity management preparedness of market participants (especially non-banks) to meet margin calls (including the ability of firms to use or transform high quality liquid assets in meeting margin calls).

This report presents the analysis undertaken by the group. To support this work, four detailed surveys were conducted: (i) a survey of central counterparties (CCP survey); (ii) a survey of clearing members/broker-dealers (intermediaries survey); (iii) a survey of other market participants active in global cleared and non-centrally cleared derivative and securities markets (client survey); and (iv) a survey of/data collection from regulatory authorities (authorities survey). As part of the information collection, the ad hoc group held three industry roundtables with representatives from client sectors. While the coverage of responses to the CCP survey give a reasonable indication of the overall market, responses to the intermediaries, client and authorities surveys represent only a sample of market participants or jurisdictions (for further details see Annex B).

This final report also incorporates feedback received during the public consultation and a series of virtual stakeholder outreach sessions.

2 Size and composition of margin calls

Given the rapid increases in market volatility experienced in March 2020, there was a broad-based and rapid increase in margin across the financial system. The size of the aggregate changes in the levels and flows of margin and experiences across markets and CCPs varied. This section draws on the survey results and other available information to describe the size and composition of margin calls across centrally and non-centrally cleared markets, across asset classes and across types of market participant.

²⁴ ISDA (2013).

²⁵ See Glasserman and Wu (2018).

²⁶ FSB (2020), p 42.

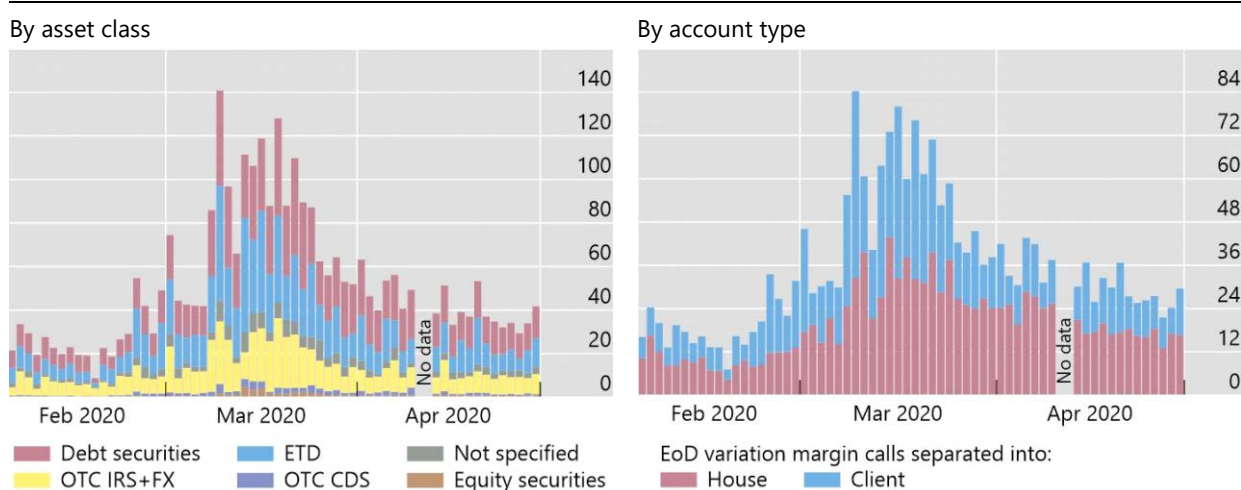
2.1 Variation margin

CCPs reported that daily CCP VM calls increased from around \$25 billion in February 2020 to a peak of \$140 billion on 9 March 2020 – an increase of approximately 460%. This increase affected all asset classes²⁷ and both house and client accounts (Figure 1). As the Covid-19 pandemic affected jurisdictions and markets, CCP VM calls exhibited a succession of peaks, each exceeding \$100 billion.²⁸ In absolute terms, VM calls at ETD and equity securities CCPs were responsible for more than two thirds of the global VM peak in the centrally cleared market.^{29, 30} VM calls on equity securities jumped the most: by 2,000% compared with their February average. However, the calls were much smaller on an absolute basis compared with those in other asset classes. While VM calls from CCPs increased for both house and client accounts, the aggregate increase in centrally cleared VM was proportionately larger for client accounts. This may be due to house positions being, on average, relatively less exposed to directional movements than client positions, and thus less sensitive to changes in volatility levels, as seen in March 2020.

CCP variation margin paid

In billions of US dollars

Figure 1



EoD = end-of-day; ETD = exchange-traded derivatives; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

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

Although centrally cleared VM calls were made predominantly on an EoD basis during the period, there were significant peaks in ITD VM calls during the most stressful periods in March. CCPs reported making very limited use of ad hoc margin calls (Figure 2, left-hand panel). CCPs have different practices when calculating and passing through intraday margin calls – some commonly hold ITD margin collateral through the day, passing the VM component back to members only during the next EoD cycle, while

²⁷ For the purposes of this report, the asset classes for centrally cleared products are divided up into equity securities (eg equity stocks, exchange-traded funds, index funds, mutual funds), debt securities (eg government bonds, corporate bonds, agency bonds, mortgage-backed securities, repo, securities lending), ETD (eg options, futures, listed commodity derivatives), OTC credit default swaps (CDS), OTC interest rate swaps (IRS) and foreign exchange (FX).

²⁸ See Annex A. The peak CCP VM calls in March 2020 occurred on the 9th (\$140 billion), 12th (\$111 billion), 13th (\$106 billion), 16th (\$119 billion), 18th (\$128 billion) and 20th (\$110 billion).

²⁹ The amount of potential hedging by participants across product cleared within a particular CCP is often highly dependent on the set of products cleared by the CCP.

³⁰ Definitions of VM for debt and equity securities CCPs may be different from those of derivatives CCPs. In some cases these CCPs have included settlement margin, which represents simply the amount paid when contracts are settled rather than representing changes in profit and loss as for derivatives CCPs, as part of reported VM. This affects the comparability of VM trends between derivatives and securities CCPs.

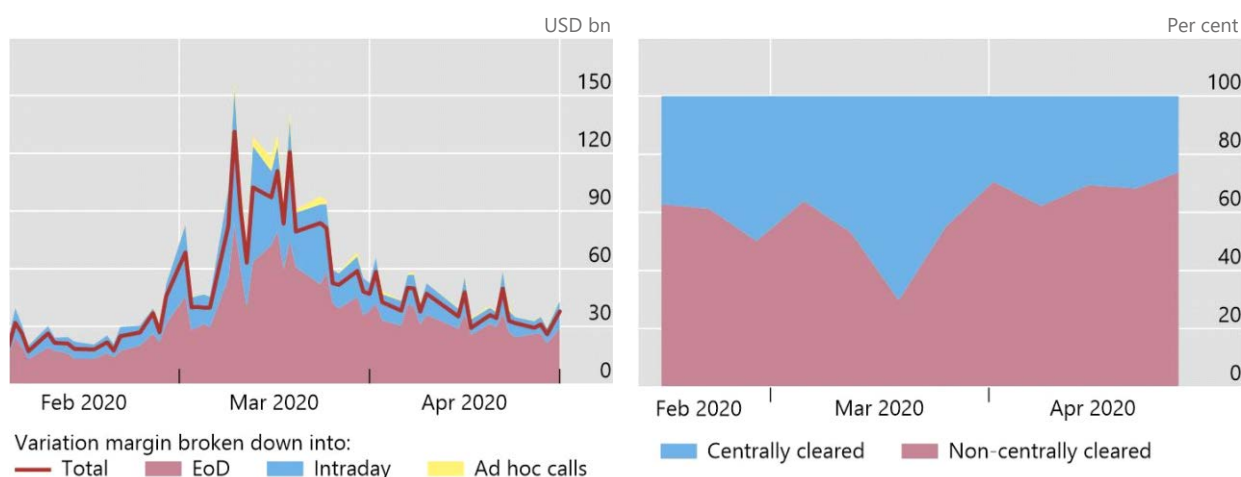
others “pass through” some or all ITD VM payments from VM payers to VM receivers within the ITD cycle. Moreover, some CCPs have scheduled ITD cycles while others collect ITD on an ad hoc basis. The peak ITD VM call of \$70 billion was made on 9 March 2020 and coincided with the peak EoD VM call of \$84 billion. Maximum ad hoc VM calls were around \$5 billion, far lower than the peaks of EoD and ITD VM calls.

Breakdown of variation margin paid

Figure 2

CCP variation margin calls¹

Breakdown of variation margin calls paid by intermediaries



¹ Differences between the total VM shown and the sum of the EoD, intra-day and ad-hoc VM calls may be due to total VM levels netting payments across individual calls. This chart only includes CCPs where there was adequate information for an accurate EoD call breakdown.

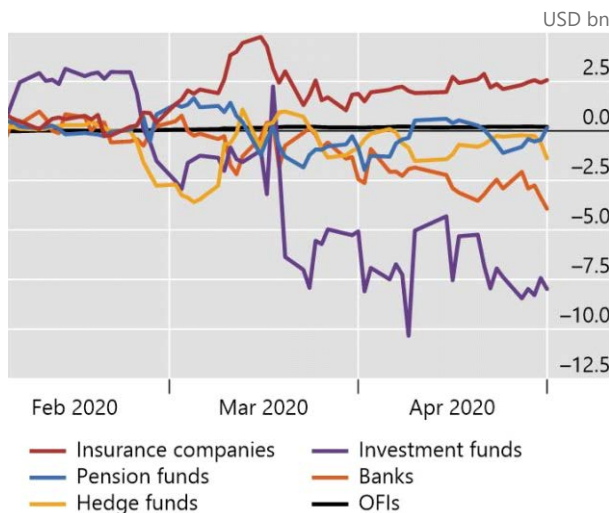
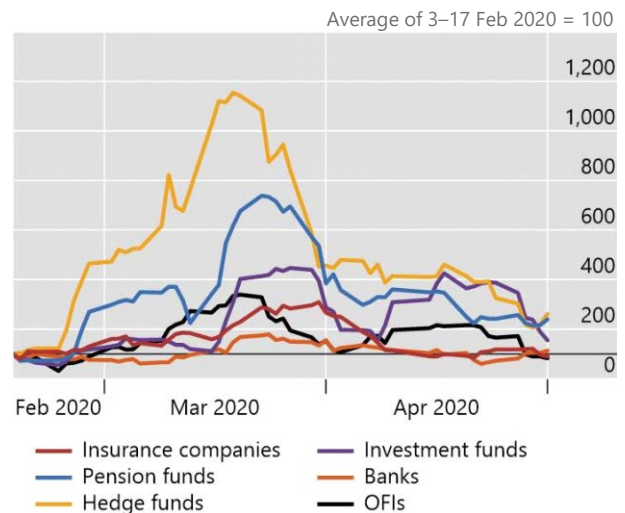
Sources: IOSCO Financial Stability Engagement Group’s Data Working Group survey of CCPs; survey of clearing members/broker-dealers.

Based on the available data, the increases in both centrally cleared and non-centrally cleared VM were substantial.³¹ While the intermediaries survey covers only a sample of intermediaries, the survey results suggest that, although VM for non-centrally cleared positions seems to generally exceed that for centrally cleared positions, in mid-March VM for centrally cleared positions exceeded that for non-centrally cleared positions (Figure 2, right-hand panel). Although based on the limited margin data available from authorities (covering mainly US and euro area clients), most “client” sectors³² suffered valuation losses on their centrally cleared derivative portfolios, resulting in more centrally cleared VM paid than received for client portfolios on an aggregate basis. This was the case especially for the investment fund and the “bank-clients”³³ sectors (Figure 3). While, in aggregate, insurance companies ended up being cumulative net receivers of VM over the period, their VM payments did show significant volatility: they received VM calls until around mid-March 2020 but had to pay most of this VM back after mid-March, when markets (especially interest rates) reversed direction. Similar VM dynamics were observed for pension funds, while the VM of hedge funds typically moved in the opposite direction to those of insurance companies and pension funds.

³¹ The increases in centrally cleared VM were substantial for most client groups, although they differed in magnitude across client sectors. However, most authorities were unable or unwilling to provide sectoral non-centrally cleared VM data for NBFI clients, indicating a potential data gap.

³² Insurance, pension funds, hedge funds, investments, banks and other financial institutions (OFIs).

³³ These are defined as any banks that clear as a client and not as a clearing member.

Cumulative flows²Absolute value of flows, normalised³

OFIs = other financial institutions.

¹ South African Reserve Bank provided data only for insurance corporations and banks. ² Increases indicate variation margin (VM) received, while decreases indicate VM paid. Aggregation at a sector level nets out VM paid and received within the sector. ³ Absolute value of flows by sectors, 10-day moving average normalised with respect to the 3–17 February 2020 average.

Source: Survey of/data collection from regulatory authorities (submissions from ECB; Commodity Futures Trading Commission; South African Reserve Bank).

Data on the gross values of centrally cleared VM flows show that the increase in VM volatility was substantial and differed across sectors. The right-hand panel of Figure 3 shows the combined absolute value of centrally cleared VM payment and receipt flows for each sector, normalised using the early February average. The largest relative increase in centrally cleared VM was faced by hedge funds, whose *gross* VM payments and receipts increased more than tenfold. On the other hand, *gross* centrally cleared VM only doubled for the “bank-clients” sector.

2.2 Initial margin

When volatility increases, IM levels normally adjust upwards. This is because IM is designed to cover potential future exposures in the event of a participant default, and when volatility increases so does the likelihood of large potential future exposures. Total IM required, reported by CCPs, increased by approximately \$300 billion (40%) between end-February and mid-March 2020. Both house and client accounts saw similar percentage increases in centrally cleared IM, although the size of the increase differed by asset class (Figure 4). The increase of required IM for CCPs clearing ETDs – which account for 46% of total required IM – was 62%. This accounted for roughly two thirds of the total increase of required IM for all asset classes. IM collected by CCPs clearing cash equities increased by the most in relative terms (>300%). CCPs clearing over-the-counter interest rate swaps (OTC IRS) and FX products saw the smallest relative increase, roughly around 20%.

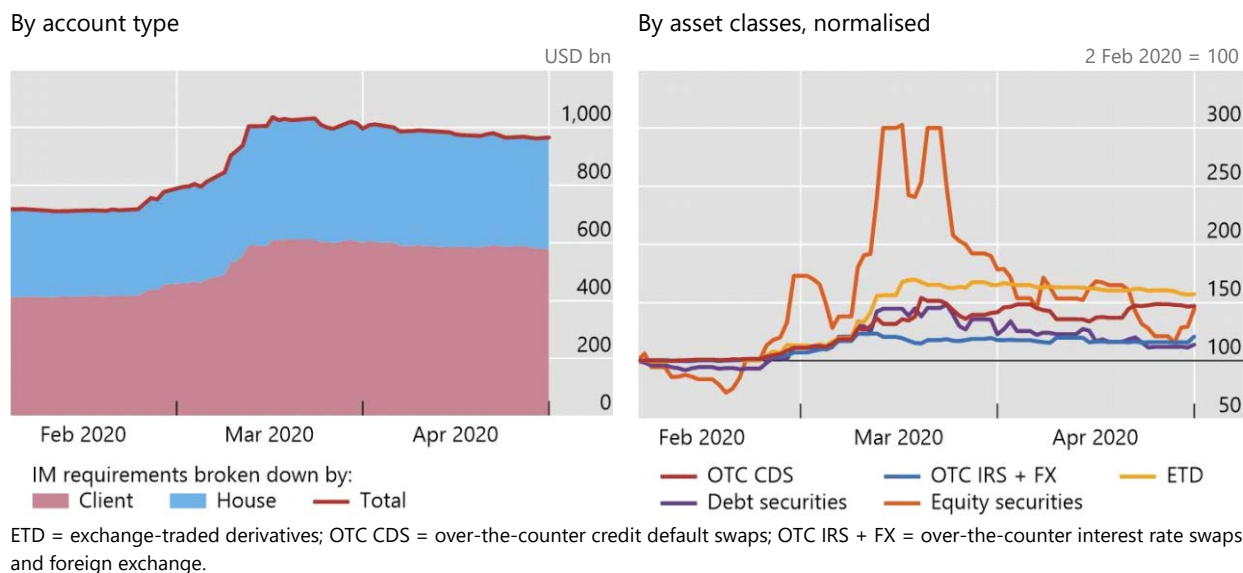
These differences across asset classes may be partially explained by differences in the size of shock experienced in each asset class. Some ETD products, such as equity contracts saw unprecedented shocks to market prices and increases in volatility (eg VIX – a forward-looking measure of equity market volatility – increased by 400% from February to mid-March). Other ETD products – such as metals and agriculture – saw relatively mild shocks by historical standards. Although the volatility of IRS rates in March was not large by such standards, the percentage increase in volatility in March 2020 was the largest in history.³⁴ Other factors beyond volatility can also have an effect on changes in IM paid, including the risk

³⁴ For example, as measured by SRVIX.

characteristics of portfolios held at CCP (eg directional vs non-directional portfolios), changes in portfolio size and composition over time, and characteristics of individual margin models. A few of these factors are considered in more detail in Section 3.

Central counterparty initial margin required

Figure 4



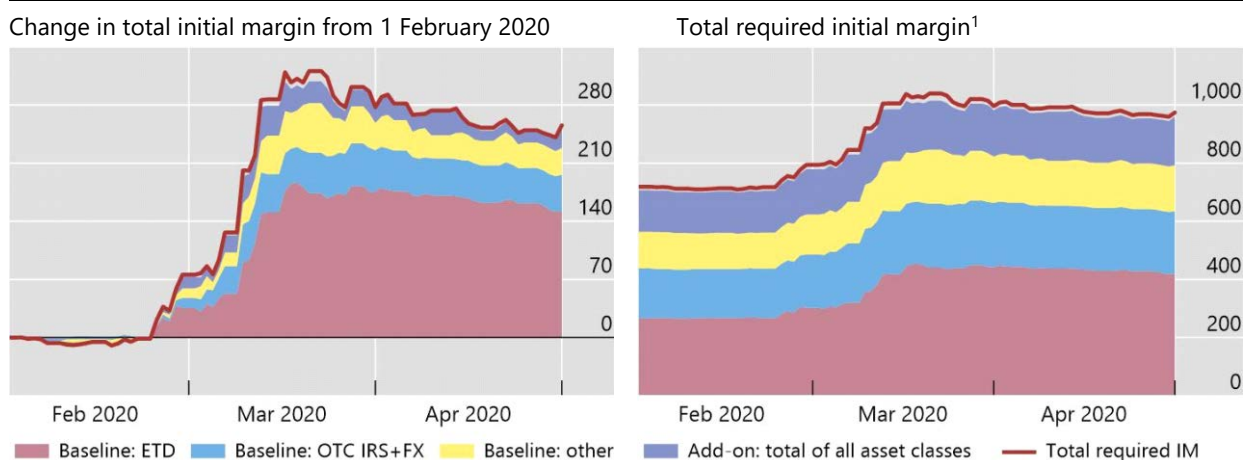
Source: IOSCO Financial Stability Engagement Group's Data Working Group survey of CCPs.

The majority of the increase in centrally cleared IM requirements was driven by the core component of IM models, rather than margin add-ons (Figure 5). Decomposing changes in total centrally cleared IM requirements into a "core" model component – which captures changes in portfolios' market risk – and the contribution from margin add-ons (which are designed to cover other risks, such as liquidity and concentration risk) show that only around 10% was driven by margin add-ons (possibly due to increases in CCP estimates of liquidity or concentration risk). The rest was driven by the core component, and the majority of that increase was driven by ETD core IM requirements, with some of the benchmark ETD products often seeing some of the largest volatility increases during the period.

Total required CCP initial margin

In billions of US dollars

Figure 5



¹ While the contribution from core models is shown separately for some asset classes, add-ons are shown as a total across all asset classes.

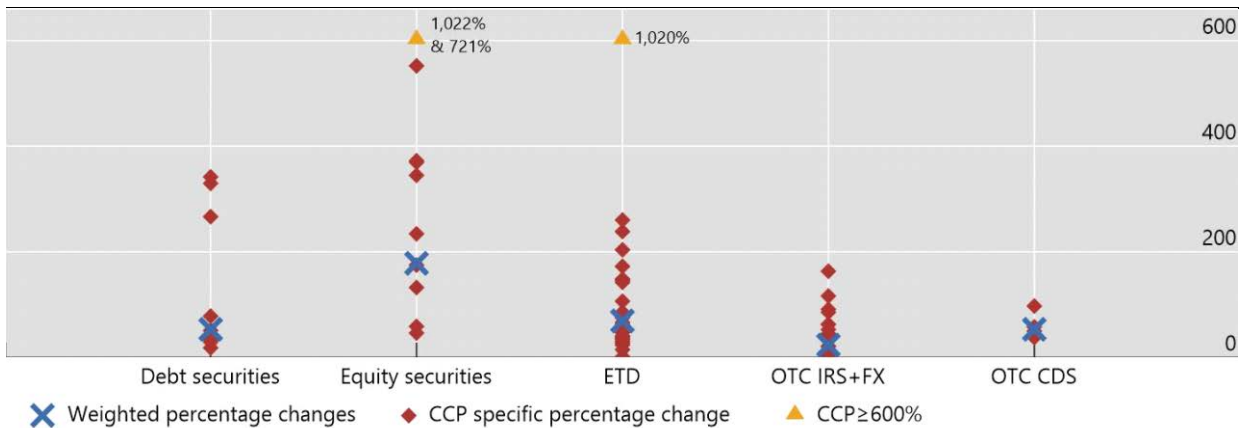
Source: IOSCO Financial Stability Engagement Group's Data Working Group survey of CCPs.

Due to the variety of factors affecting the level of required margin at a CCP, the size and speed of IM increases differed not just across asset classes, but also within asset classes (Figure 6). The dispersion of relative IM changes within CCPs clearing equity and debt securities was widest, while dispersion between CCPs clearing OTC products was less pronounced. For derivatives CCPs, dispersion for CCPs clearing ETD products was the largest, with some CCPs seeing no change in IM held and others seeing IM more than double. CCPs showing the largest increases in IM tended to be relatively small (as measured by total IM).

Base-to-peak total initial margin increase per CCP clearing service¹

In per cent

Figure 6



ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

¹ The peak percentage change in total centrally cleared IM requirements relative to their February 2020 (pre-stress) average, per CCP clearing service, per asset class.

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

The speed of the increases in IM was fairly uniform across asset classes, at least in terms of weighted averages. The average largest five-day increase in IM requirements was fairly uniform across asset classes – with average peak five-day increases being around one third. Similarly, average one-day increases clustered around 10% (Figure 7). However, there were some differences. The increases in the OTC segment were slower relative to the other asset classes. Furthermore, some CCPs – albeit those that are relatively small – deviated significantly from the mean, increasing their IM requirements by more than 150% over five days. Some of the largest CCPs also saw significant changes in margin requirements even over relatively short periods of time – by more than 50% over a five-day period. Section 3 of this report considers possible factors and reasons for some of these differences.

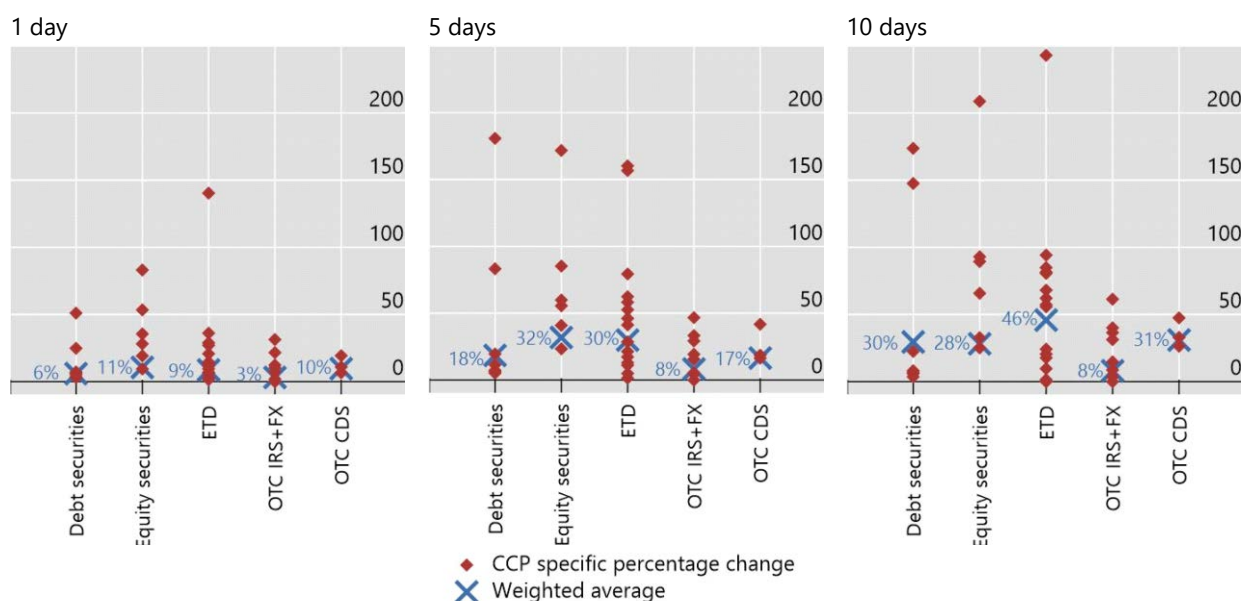
Peaks in centrally cleared IM calls were more than 20 times larger than the pre-stress average and were more frequent (Figure 8). Although the peak amount of IM calls was half the comparable peak VM calls, the difference between normal and stressed periods was more pronounced. This difference is partly because IM typically does not change substantially during normal times, while VM calls can be sizeable even during non-stress times. Furthermore, the liquidity impact of IM can be pronounced because it reflects a transfer of collateral from participants to CCPs, while CCPs pass on VM received from one set of participants to other participants.

According to data collected from the intermediaries survey, the relative shares of centrally and non-centrally cleared IM increases indicate a growing proportional contribution of the non-centrally cleared segment (Figure 9) during the latter stages of the crisis, with a sharp peak around the beginning of April 2020. Moreover, the relatively higher contribution of non-centrally cleared IM continued in April.

Average largest N-day increases in initial margin requirements for all reporting counterparty clearing services¹

In per cent

Figure 7



ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

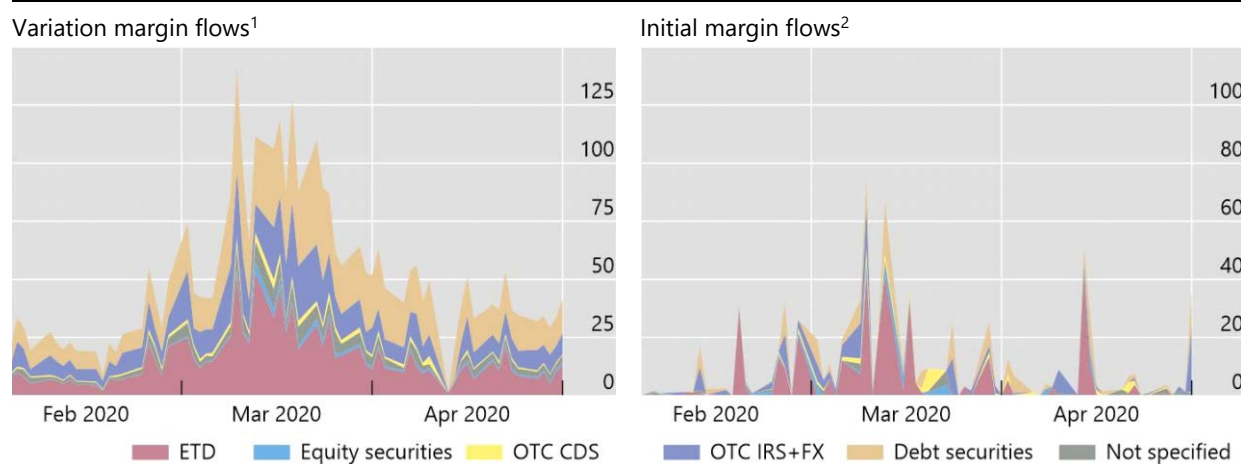
¹ The maximum one-, five- and 10-day increase in margin requirements on static portfolios between 2 March and 15 April 2020, per CCP clearing service, per asset class. The peak increase may be across different dates for the reporting CCPs.

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

Daily CCP margin calls

By asset class; in billions of US dollars

Figure 8

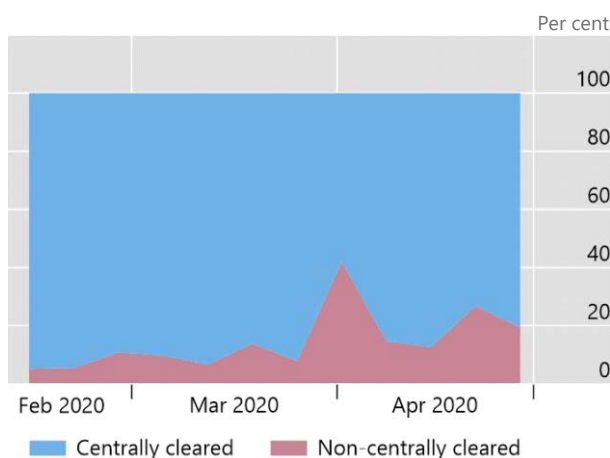
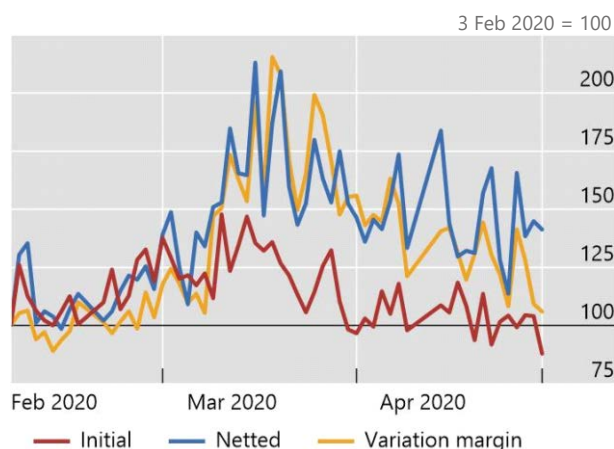


ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

¹ Variation margin flows represent total variation margin paid made on a given date. ² Initial margin flows is the difference of daily initial margin levels.

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

Initial margin calls

Non-centrally cleared margin requirements, normalised¹

¹ The Acadia data set defines variation margin to be the total posted collateral balance in relation to the approximate cumulative fair value (ie mark-to-market) of the underlying portfolios. This “stock” value is different to how variation margin is defined throughout the rest of this report, where variation margin is a daily “flow” measure of payments made to meet margin requirements related to changes in fair value of the underlying portfolios.

Sources: Survey of clearing members/broker-dealers; Acadia.

Data provided by Acadia³⁵ indicate that collateral posted to meet non-centrally cleared margin calls peaked in mid-March (Figure 9, right-hand panel). VM calls and netted non-centrally cleared discretionary³⁶ margin calls far exceeded collateral posted to meet regulatory³⁷ non-centrally cleared IM calls during March 2020. Average daily posted gross collateral balances related to regulatory non-centrally cleared IM calls remained relatively steady between \$43 and \$51 billion during the period February–April 2020 (Table 1). However, average daily gross collateral balances related to netted non-centrally cleared discretionary margin calls rose from \$233 billion to \$320 billion from February to March, an \$87 billion (37%) increase month over month. Similarly, average daily gross collateral balances related to non-centrally cleared VM calls rose from \$248 billion to \$384 billion, a \$136 billion (55%) increase.

Average daily collateral balances¹ related to non-centrally cleared margin requirements

February–April 2020, USD billions

Table 1

Month	IM	Netted margin ²	VM
February	47.5	232.9	247.8
March	50.7	320.0	383.6
April	43.2	291.6	319.1
February–April	47.3	284.3	321.4

IM = initial margin; VM = variation margin.

¹ Values are daily collateral balances, and do not represent daily flows between counterparties. ² Netted margin calls are related to combined margin calls netted across discretionary “independent amounts” (economically similar to IM) and VM applicable to discretionary margin on the same day in the same currency.

Source: Acadia

³⁵ Acadia is a third-party financial market infrastructure provider utilised by many participants in non-centrally cleared derivatives markets to help process margin calls and related collateral exchanges.

³⁶ Discretionary margin calls are determined bilaterally per commercial relationships and are not subject to non-centrally cleared margin rules.

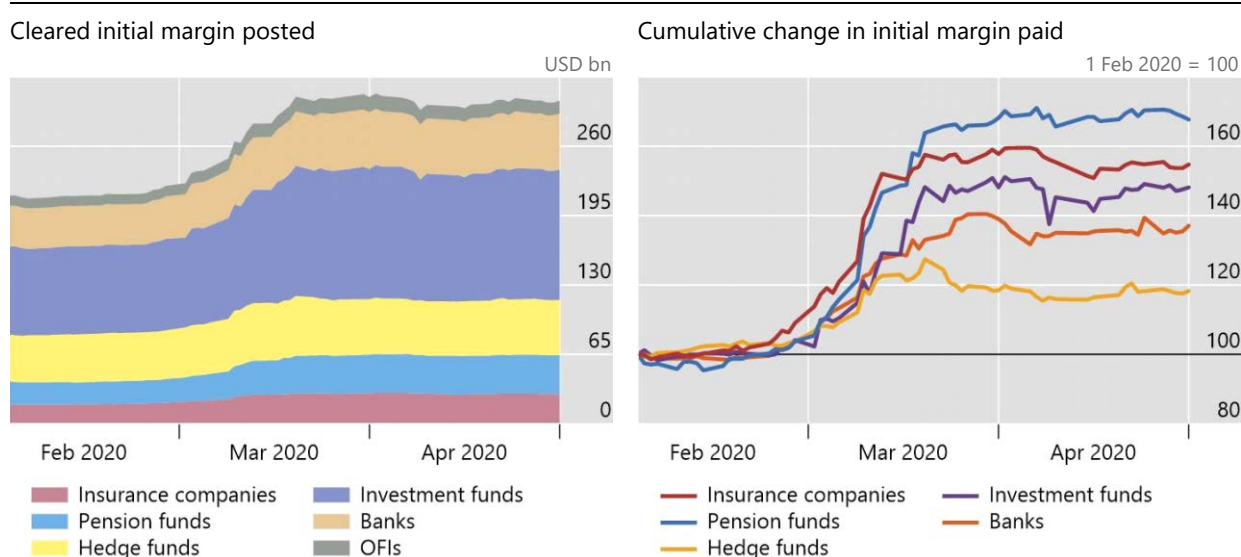
³⁷ Regulatory margin calls are those calls required under jurisdictions’ implementation of the minimum standards for non-centrally cleared margin requirements.

Acadia data also indicate that the overall total, counts and average daily non-centrally cleared margin call volumes all spiked during March 2020. By all measures, non-centrally cleared margin calls increased significantly during March 2020 compared with February, especially for non-centrally cleared netted and VM calls, per Acadia data (Table 1). Notably, the total cumulative value of non-centrally cleared margin rose from \$1.6 trillion equivalent in February 2020 to \$5.7 trillion in March, a \$4.1 trillion or 249% increase. In both absolute and relative terms, VM calls rose the most, rising from \$0.9 trillion in February to \$3.7 trillion in March, up \$2.8 trillion or 310% in total. Additionally, the monthly total count of non-centrally cleared margin calls rose 68% from February to March 2020, while the average daily margin call amount rose 108%.

Data from the authorities survey show that the volumes of centrally cleared IM posted by the client sectors increased substantially during the initial market turmoil related to the Covid-19 pandemic. Centrally cleared IM data on the client sectors show that client IM increased during March and then stabilised roughly at the end-of-March levels through April (right-hand panel of Figure 10). Overall, the increase was around 45%, which is in line with the increase observed from the CCP data. The percentage increase for all the sectors except hedge funds exceeded 40%; hedge funds recorded a much lower increase of around 20% (Figure 10, left-hand panel). Both quantitative and qualitative data indicate that IM increases were very dependent on CCP and product. These differences may in some cases be due to differences in product characteristics and volatility across different asset classes.

Centrally cleared initial margin paid by client sectors in selected jurisdictions (stocks)

Figure 10



Source: Survey of/data collection from regulatory authorities (ECB; Comisión Nacional Bancaria y de Valores; Commodity Futures Trading Commission; South African Reserve Bank submissions).

Client survey respondents were asked to provide the date in each of February, March and April when they faced their highest margin flows (the sum of VM and IM), the relevant amounts on those peak dates and the percentage attributed to centrally and non-centrally cleared margin requirements. Responses showed a dispersion across different dates each month. Of those peak days, the amounts were higher in March than in April and February, and for the firms that faced peak margin around 19 March these amounts were significantly higher. The majority of margin calls (VM and IM) on those days was from non-centrally cleared contracts.

2.3 Excess collateral at CCPs

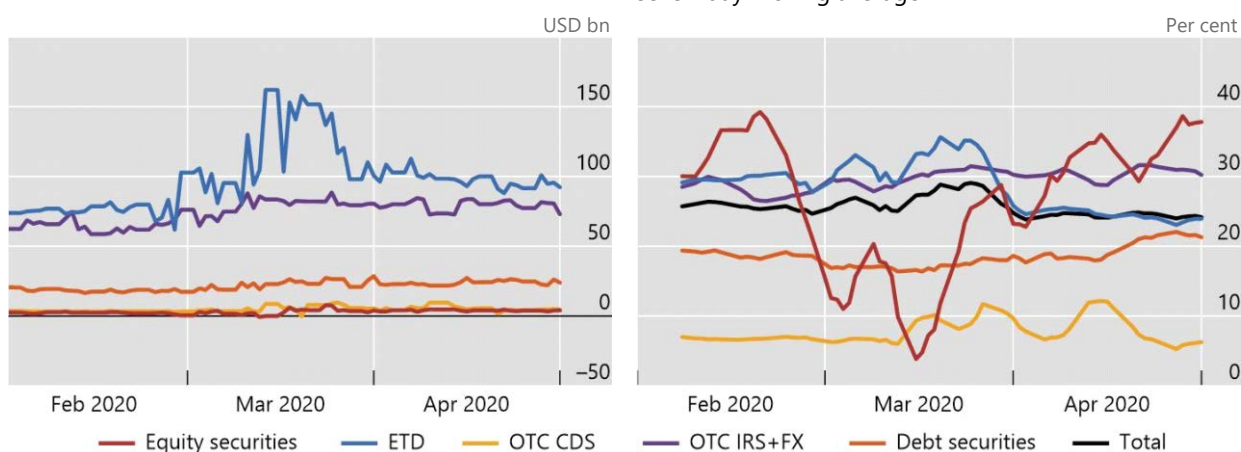
Excess collateral³⁸ posted at CCPs as a percentage of total required IM increased across most asset classes during March, then retreated in April (Figure 11). The seven-day moving average of total excess collateral increased from around 26% to a March peak of 29% of required centrally cleared IM, representing a roughly \$115 billion increase relative to the start of February. The increase in excess collateral occurred even as participants were required to post more IM. Added to the increase in IM requirements of \$300 billion, the overall increase in IM collateral held by CCPs was \$415 billion at the peak. The majority – around \$90 billion – of the increase in excess collateral is accounted for by the ETD asset class. This concentration partly reflects that most excess collateral is posted in the ETD and OTC IRS and FX asset classes. Some of the increase in collateral may be due to members and clients choosing to maintain a roughly static amount of excess collateral as a percentage of requirements for the operational reasons noted in footnote [38], rather than using excess collateral to meet new collateral demands.

CCP initial margin collateral

Figure 11

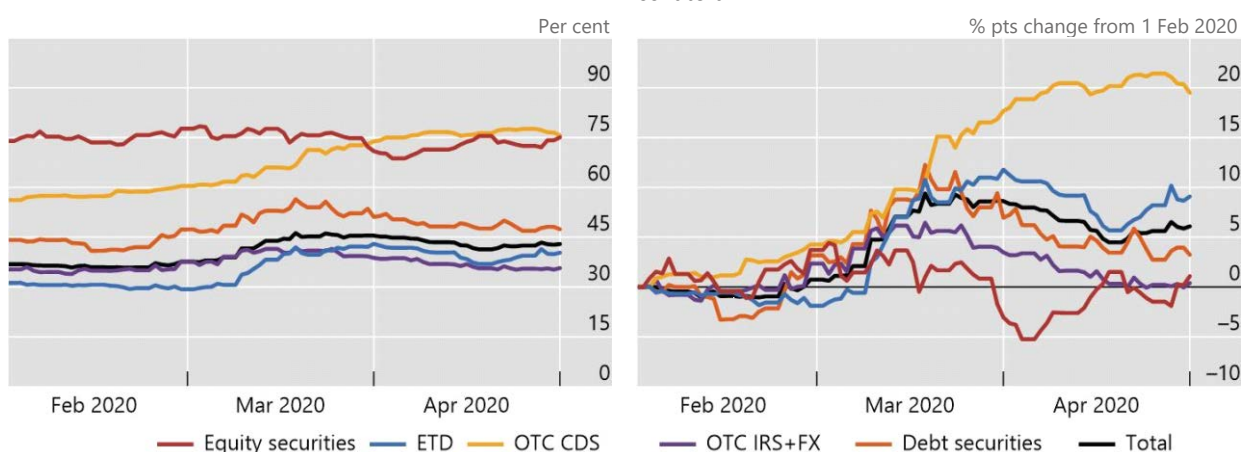
Excess collateral¹

Excess collateral¹, share of required initial margin – seven-day moving average



Cash as a percentage of total initial margin collateral²

Change in cash collateral as a percentage of total collateral³



ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

¹ The amount of cash and non-cash collateral posted less requirements. ² Weighted average cash collateral as a percentage of total initial margin collateral posted to CCPs. ³ Cash collateral as a percentage of total initial margin collateral posted to CCPs, as a weighted average per asset class.

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

³⁸ A common practice of members and clients is to post collateral at the CCP that exceeds the portfolio requirement. This additional collateral is often identified as "excess collateral" and used as buffer for ITD margin calls, reducing the amount of additional collateral the member needs to pass to the CCP and easing the intraday operational burden.

Even though CCPs typically do not require IM (or at least all of IM) to be posted in cash, the proportion of collateral held as cash increased across all asset classes, translating to an aggregate increase from about 37% to about 43% during March–April 2020 (Figure 11, bottom left-hand panel). IM requirements can be met with a mix of cash and highly liquid non-cash collateral depending on CCP rulebooks.

Overcollateralisation in the form of excess margin and the amount of collateral posted as cash are potentially one indicator for the ability of market participants to source liquidity, although perhaps at a higher cost depending on availability. The left-hand panel of Figure 12 depicts the excess margin for client and house accounts, both of which saw increases over the course of March–April 2020. The dynamics of centrally cleared IM and excess margin are qualitatively similar for both client and house accounts.

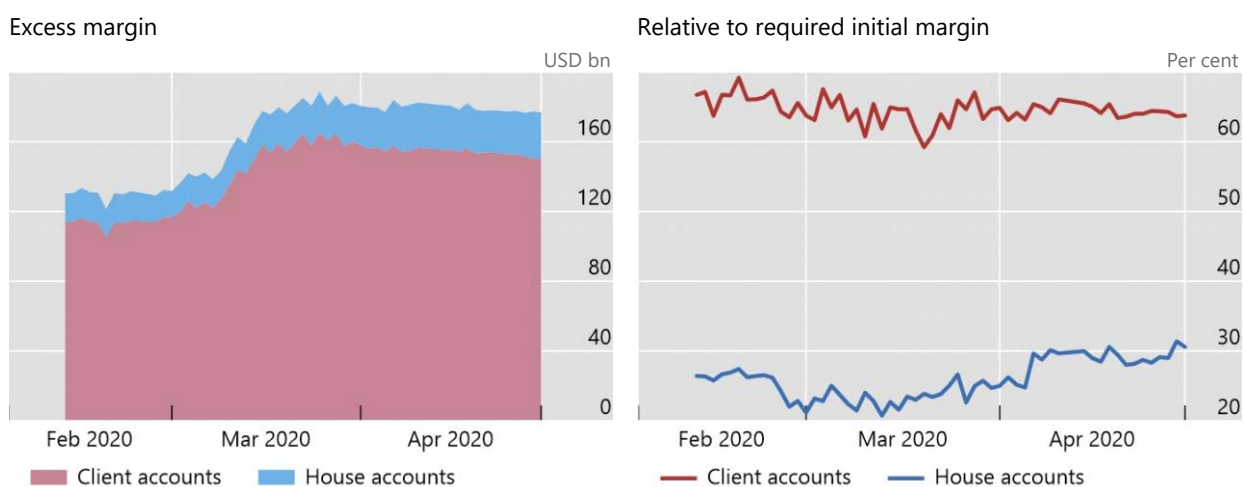
The right-hand panel of Figure 12 depicts the degree of overcollateralisation, as measured by aggregate excess margin relative to required IM. The degree of overcollateralisation temporarily dropped in the most turbulent weeks of March 2020 for client accounts, but remained relatively flat for house positions. By mid-April 2020, the degree of overcollateralisation returned to end-February 2020 levels for client accounts, and even to above pre-crisis levels for house accounts. Throughout the period, the degree of overcollateralisation was considerably higher for client than for house accounts.

Increases in excess margin across the stress period, and the higher proportion of collateral posted in cash, as a whole might suggest an absence of extreme liquidity pressures, although this should also be considered in the context of timely central bank action in the form of targeted extraordinary monetary measures to mitigate the early market turmoil. Further analysis is likely to be necessary.

Excess CCP margin

Breakdown across house and client accounts

Figure 12



Source: Survey of clearing members/broker-dealers.

3 Drivers of IM calls

An increase in IM requirements following an unprecedented shock is expected and, in many cases, represents prudent risk management. The experience in centrally cleared markets notably contrasts with non-centrally cleared markets, where IM requirements stayed broadly flat, due in large part to model construction.

As this section details, the overall increase in IM requirements was driven by a number of factors, including trading activity, changes in volatility (market risk), and models reacting to market stress.

Differences in margin responses across asset classes can be explained largely by differences in volatility in the underlying products cleared in those asset classes, although other factors had some effect. In particular, it is important to understand the degree to which prudent pre-crisis margin levels driven by CCPs' anti-procyclicality measures or other tools or actions taken by CCPs helped to dampen the response of IM to extreme volatility. The scale of the response to volatility also depends on model design choices and how conservative margin requirements are in less volatile times. While both centrally and non-centrally cleared markets saw comparable increases in volatility, the corresponding adjustment in IM requirements for non-centrally cleared derivatives was much smaller, due primarily to the low responsiveness of SIMM to volatility changes.

Intermediaries reported that, out of the listed factors potentially affecting margin calls that they paid, market volatility was the most important factor across both centrally and non-centrally cleared transactions (Table 2).³⁹ Position sizes, the directionality of risk positions and the change in value of posted collateral were reported to be the next most important factors. Product/asset class traded was also seen as important for both centrally and non-centrally cleared derivatives. As expected, given their lower responsiveness, changes in model parameters were seen as a less significant factor for non-centrally cleared derivatives than for centrally cleared derivatives and securities.

Factors that affected the size of margin calls paid by intermediaries

Average ranking by total submissions for each factor, most important (13) to least important (1)

Table 2

	Centrally cleared securities	Centrally cleared derivatives	Non-centrally cleared derivatives
Market volatility	11.4	11.6	11.8
Position size/materiality	9.2	10.5	10.8
Transaction volume	9.0	8.5	8.5
Directionality of risk positions	8.9	9.0	10.0
Change in posted collateral value	8.1	8.7	8.9
Products/asset classes traded	7.4	8.7	9.2
Trading strategy	7.2	6.9	7.1
Change in model parameters	7.1	6.9	4.3
Change in haircut applied to posted collateral	5.0	4.3	3.5
Anti-procyclicality tools	4.8	4.7	3.8
Creditworthiness	4.7	4.5	6.0
Entity type/classification	3.9	4.4	4.9
Failure to pay or delay in payment of margin call	2.9	4.0	6.0

Source: Survey of clearing members/broker-dealers.

Intermediaries were also asked to rank the factors they believe affected the size of margin calls they received from their own counterparties, ie excluding CCPs (Table 3). Comparing the responses to the two survey questions, the four most important factors are generally consistent across margin paid and received, with market volatility as the most important factor for both. Trading strategy appears to have been a more significant factor for margin received on centrally cleared securities than margin paid by intermediaries on centrally cleared securities. This is consistent with intermediaries generally holding positions that are, on average, relatively less exposed to directional movements than are client positions.

³⁹ The survey asked intermediaries to rank factors from most important to least. For the purposes of this report, these rankings have been inverted so that the highest numbers represent the most important factors. For example, if a respondent ranked a factor as 1 in the survey (most important), the rank of 1 was converted to the highest-ranking number (eg 13).

Factors that affected the size of margin received by intermediaries

Average ranking by total submissions for each factor, most important (13) to least important (1)

Table 3

	Centrally cleared securities	Centrally cleared derivatives	Non-centrally cleared derivatives
Market volatility	11.1	11.6	11.7
Position size/materiality	9.4	10.3	10.7
Directionality of risk positions	8.9	9.2	10.2
Transaction volume	8.9	8.6	8.6
Trading strategy	8.0	7.5	7.3
Change in posted collateral value	7.8	8.7	9.1
Products/asset classes traded	7.5	9.0	9.1
Change in model parameters	6.4	6.4	4.3
Anti-procyclicality tools	5.1	5.3	3.8
Creditworthiness	4.7	4.7	5.7
Change in haircut applied to posted collateral	4.3	4.0	4.3
Entity type/classification	4.2	4.3	4.6
Failure to pay or delay in payment of margin call	2.8	4.5	5.8

Source: Survey of clearing members/broker-dealers.

Client survey respondents and industry roundtable participants stated that, while centrally cleared IM requirements generally rose quickly in March, non-centrally cleared IM calls showed more dispersion in terms of responsiveness. Qualitative evidence from the client survey indicates that there was significant variability in the rate of IM increases across CCPs.

3.1 Trading activity

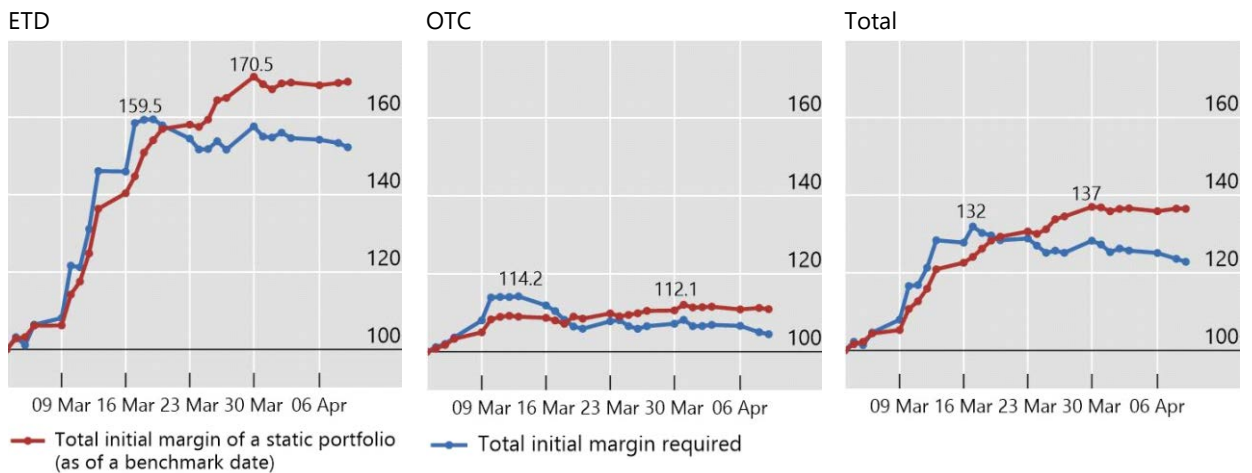
To decompose the impact of trading activity and changes in IM models CCPs were asked to provide the output of a “static portfolio” analysis. This analysis uses open positions as of the beginning of March 2020 and calculates the margin requirement over time based on a hypothetical assumption that this portfolio was held each day. Comparing the evolution of IM requirements on these static portfolios with actual IM changes provides a sense of the relative importance of the two factors. Some caveats should be borne in mind. These comparisons are done at the aggregate level and therefore, even with similar trends between actual and static portfolios, it is possible that a subset of portfolios were reducing risk over time but were balanced off against a separate set of portfolios which were increasing risk.

This analysis suggests that the underlying volatility and models’ response thereto, rather than portfolio changes, were responsible for most of the peak increase in centrally cleared IM requirements (Figure 13). Changes in the IM for the static portfolios show similar increases to those actually seen in March, indicating that, on an aggregate basis, portfolio changes did not seem to have a major effect on aggregate IM changes during this initial period, except in early March, when volumes did contribute to the overall IM increase. The static portfolio analysis also suggests that there may have been a reduction in risk positions after mid-March, as might be expected, with the hypothetical margin requirement on the static portfolio being larger than the actual IM required for some asset classes.

Evolution of CCP initial margin requirements on static portfolios¹

Index, 2 March 2020 = 100

Figure 13



ETD = exchange-traded derivatives; OTC = over-the-counter.

¹ All reporting CCPs across all asset classes are included in the right-hand panel. Data have been interpolated. Data from three CCPs have been excluded due to incompleteness or insufficient quality.

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

3.2 CCP models

3.2.1 Model types and choices by CCPs

CCPs report a wide range of model types and calibration choices for key IM model parameters. These choices can reflect differences in regulation and market standards across asset classes and jurisdictions, as well as the markets and products cleared. There were differences in modelling choices made across key model parameters by CCPs clearing products in the same asset class. These differences are observed across a number of components, including the confidence level of the model, whether the model is based on value-at-risk or expected shortfall calculations (Figure 14), the lookback period, the margin period of risk (MPOR),⁴⁰ and any implemented anti-procyclicality measures.

Model choices can lead to differences in how IM requirements respond to changes in volatility. This will be visible in the size and speed of changes to IM during stress. However, model parameters cannot be considered in isolation but should rather be viewed in terms of how they interact on a collective basis. For example, a lack of conservatism in one model parameter could be offset by a more conservative approach elsewhere.

Beginning with the MPOR, CCPs reported a number of choices, particularly for services clearing ETD and cash equities. In particular, MPOR for ETD varied from one to five days, while MPOR for cash equities varied from two to 10 days. Respondents also reported differences in MPOR for all other classes, although across a smaller range. Differences in choice of MPOR may in some cases be driven by the dispersion in liquidity of underlying products, including within an asset class. In other cases the differences may be due to local regulatory margin requirements, differences in risk appetite across CCPs or whether the positions represent house or client activity.

The confidence level employed by CCPs varies across and within asset classes, with some CCPs in each asset class choosing to target confidence intervals beyond the minimum prescribed by regulation. Both ETD and cash equities asset classes employed confidence levels of 99–99.87%, although for ETD the

⁴⁰ The MPOR traditionally represents a CCP's estimate for the length of time required to liquidate, auction or hedge the position of a defaulted member, with less liquid products associated with a longer MPOR.

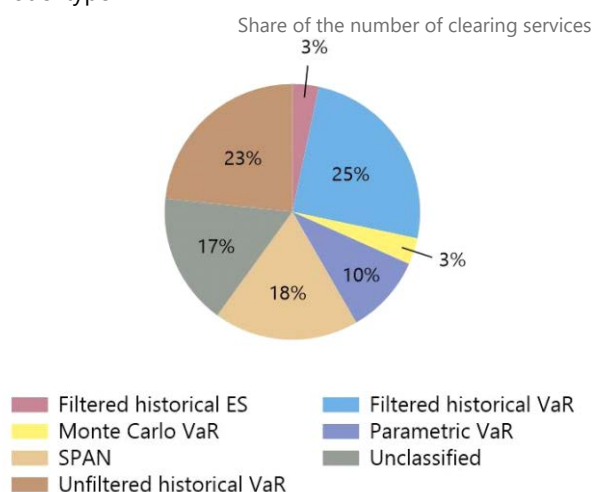
vast majority of CCPs used the 99% standard. Narrower ranges were generally seen in other asset classes, but none were uniform, even in cases where the number of CCPs in an asset class was small. As with other parameters, confidence levels need to be looked at in combination with other parameters in margin models to assess the aggregate level of conservativeness.

Features of CCP margin models

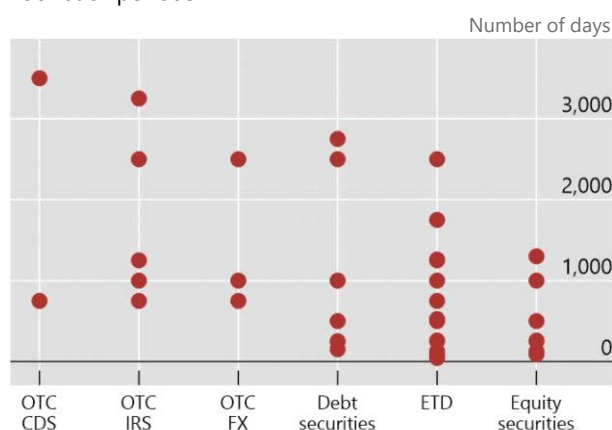
Number of clearing services

Figure 14

Model type



Lookback periods¹



ES = expected shortfall; ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS = over-the-counter interest rate swaps; OTC FX = over-the-counter foreign exchange; VaR = value-at-risk.

¹ Stress periods are not incorporated in the lookback period ranges indicated above as these were not consistently provided by survey respondents.

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

Lookback periods varied widely within and across asset classes (Figure 14, right-hand panel). The lowest maximum and minimum lookback period were reported in the cash equities asset class. The highest maximum and minimum lookback period were reported for OTC CDS, which also reported the widest range.

A majority of clearing services in the survey (79%) stated that they had not contemplated, or implemented, any changes to margin methodologies or ITD call processes since the Covid-19 market events. Of the remainder who had implemented, or planned to implement, changes, the nature of the changes was diverse. Some areas under consideration included incorporating the stressed market component into the IM model; daily (instead of monthly) volatility parameter updates; the addition of ITD volatility margin collection; and the expansion of eligible collateral for margin calls.

3.2.2 APC tools

While approximately half of the CCPs reported that they have no formal APC frameworks, many of those same CCPs state that they do use measures they consider to be APC tools (such as 10-year lookback periods, volatility floors or use of discretion). This includes the tools used by CCPs, as well as the actions CCPs would take in the event that models were not performing as intended.

While not always a regulatory requirement, around 40% of CCPs in our sample reported their "risk appetite for APC". This was typically expressed as an upper bound for increases in IM over a time period measured in days. Any measures used to mitigate further increases in cases where thresholds were breached were not disclosed and are likely to differ across CCPs. Where risk thresholds were reported there was some commonality, but also some differences in the tolerances observed. CCPs reported tolerances from a 25% increase in IM over five days, to up to 80% over the same time period. These

differences could be due to the different products being cleared at different CCPs, or to different portfolio compositions.

The majority of CCPs reported using at least one APC tool in their margin models, thus sometimes exceeding regulatory requirements in some jurisdictions. Where APC regulatory requirements exist, such as the European Market Infrastructure Regulation in the EU, several APC options are often available to a CCP. Given this flexibility, the choices of individual CCPs often differ. Some CCPs in jurisdictions without prescriptive APC requirements also reported employing APC tools in their margin models. The widest variety of tools was seen in the ETD and cash equities asset classes (Table 4). ETD clearing services saw the widest variety of multiple-tool approaches, in part due to the higher number of ETD CCPs relative to other groups. A higher proportion of clearing services for cash securities than for other asset classes reported they did not utilise APC tools.

CCP's anti-procyclicality tools by asset class

Proportion of clearing services reporting details of anti-procyclicality tools within each asset class

Table 4

APC tools	Debt securities	Equity securities	ETD	OTC IRS + FX	OTC CDS
Buffer	11	-	20	-	-
Floor	-	50	45	80	33
Stressed period	-	-	10	10	33
Other	33	30	-	-	-
Multiple tools (buffer, floor, stressed period, other)	22	20	20	10	33
None	33	-	5	-	-

APC = anti-procyclicality; ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+ FX = over-the-counter interest rate swaps and foreign exchange.

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

3.2.3 Assessing the responsiveness of IM models

To better understand how CCP margin models responded to market volatility, volatility in the largest single risk factor (or a group of highly correlated risk factors) as identified by the relevant CCPs was compared against changes in CCPs' margin rates and changes in IM levels in Q1 2020.⁴¹ Because CCP IM models depend on a variety of factors, increases in CCP IM requirements can often be lower than the changes in the price volatility of their key risk factors. Nevertheless, comparing IM increases with changes in the underlying market volatility may help to identify unexpectedly high procyclicality. Generally, margin rate and IM increases were lower than the corresponding increases in the price volatility of key risk factors for CCPs, as shown by Figure 15 (referenced by the 45-degree dashed line, which delineates volatility and margin increasing in tandem – eg 100% IM or margin rate change accompanying a 100% volatility change).

Major increases in volatility were observed for many of the analysed risk factors (in a few cases greater than 300%). The data show a range of volatility changes across key CCP risk factors, with particular dispersion in more diverse asset classes such as ETD (Figure 15).⁴² Differences in responsiveness to volatility

⁴¹ The volatility of the largest risk factor represents the volatility at the contract level, which provides a relatively clearer view of how a margin model reacts to volatility. However, at the portfolio level, other risk factors (other than the largest risk factor), and correlation among all risk factors in a portfolio, composition of a portfolio (eg long, short, or balanced) also play a role in determining a portfolio IM, and thus the responsiveness of a margin model at the portfolio level. Therefore, even though the two graphs show similar pattern, certain differences remain and may be attributed to these factors.

⁴² This is also evidenced by the similar result when percentage increases for proxy volatility (eg VIX, SRVIX etc) are compared with CCPs' IM percentage increases (see Section 2.2).

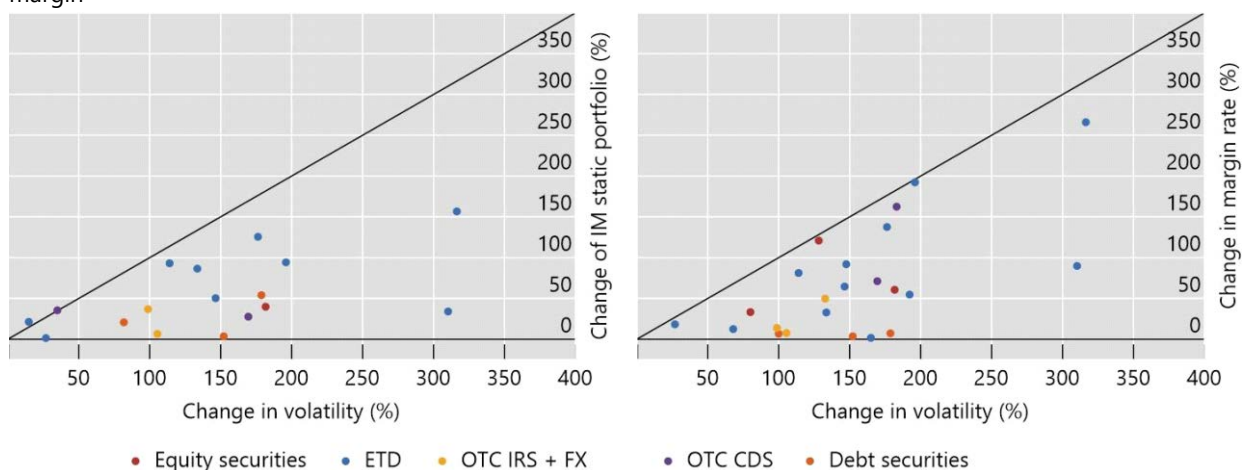
exist between IM at the portfolio level and the margin rate at the individual contract level, with the first often lower than the second. This may be explained by the relative composition of the portfolios (eg directional vs balanced).

Asset price volatility

Figure 15

Compared with changes in CCP static portfolio initial margin

Compared with changes in CCP margin rates



ETD = exchange-traded derivatives; IM = initial margin; OTC CDS = over-the-counter credit default swaps; OTC IRS+ FX = over-the-counter interest rate swaps and foreign exchange.

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

As noted, the analysis shows that risk factor IM changes were lower in all cases, on a relative basis, than volatility increases. The size of this difference did differ by product and by CCP, although it was generally true that risk factors with larger volatility increases experienced larger margin rate or portfolio IM increases. ETD and cash securities had a wide dispersion of volatility increases, reflecting diverse product types within their respective asset classes; other asset classes such as equities are somewhat more clustered.

3.2.4 Margin exceedances

Many CCPs experienced margin exceedances⁴³ in February and March 2020, although in general their size was not deemed excessively large relative to CCP financial resources. In particular, exceedances, when they occurred, generally represented less than 15% of default funds – except for debt securities CCPs, where a peak of 30% was observed. This suggests that overall CCPs were well protected, even during the periods of highest volatility.

Exceedances were not necessarily correlated with changes in IM levels (Figure 16). Comparing margin exceedances with changes in IM on a static portfolio basis (which isolates model effects) shows no clear relationship between the two overall. This is the case for all asset classes, and especially for the most material services, as shown by the dispersion of outcomes.

Although generally exceedances were low, there are some exceptions, with a few clearing services reporting both large margin exceedances and large normalised changes in IM requirements. As shown in the right-hand panel of Figure 16, numerous ETD CCPs saw no or small exceedances but several ETD CCPs

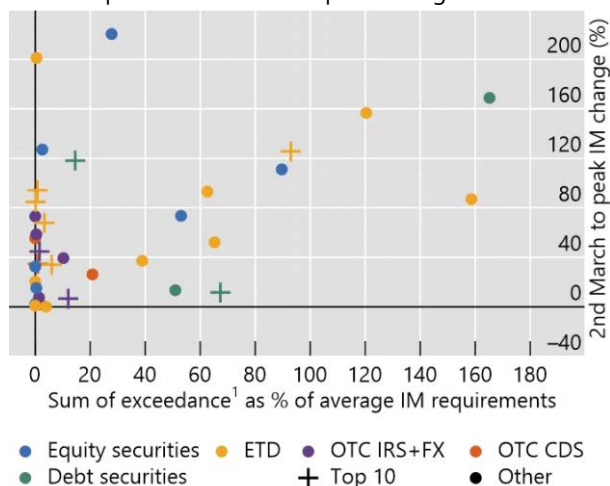
⁴³ CCPs assess margin coverage by performing ex post comparisons of observed outcomes with expected outcomes derived from the use of margin models ("backtesting"). Exceedances occur when observed outcomes would have led to losses – in the event of a given clearing member default – that were greater than the IM requirement modelled and set by the CCP for that given clearing member. However, the presence of exceedances does not necessarily indicate a deficiency in a CCP's margin model; for example, a margin model calibrated with a 99% level of confidence would be expected to experience a small number of exceedances per year.

in particular saw large exceedances relative to their margin levels, as well as increases in IM levels exceeding 100%. Improving our understanding of this pattern, including CCPs' modelling choices and their approach to IM features (including anti-procyclicality), warrants further study. Additional analysis on the relationship between exceedances and procyclicality may also be helpful.⁴⁴

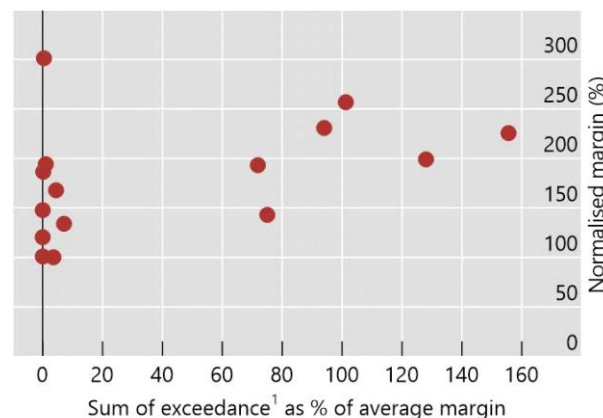
CCP initial margin exceedances

Figure 16

As a percentage of average initial margin requirements vs. static portfolio 2 March to peak change



ETD normalised margin² vs exceedances ratio



ETD = exchange-traded derivatives; IM = initial margin; OTC CDS = over-the-counter credit default swaps; OTC IRS+ FX = over-the-counter interest rate swaps and foreign exchange.

¹ Sum of exceedances is the sum of all margin exceedance amounts during March 2020. All margin exceedance is the profit or loss exceeding the total IM amount for all clearing members for a CCP on a particular day. ² Normalised margin in this figure is the maximum margin during the time period divided by margin on 2 March 2020 (ie start-to-peak).

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

3.3 SIMM model

Information from the intermediaries survey indicates that intermediaries had substantially more backtesting exceedances on non-centrally cleared transactions margined using SIMM in March 2020 (with an exceedance rate of over 5% and an average exceedance level of over \$100 million) than in February 2020 (with less than a 1% exceedance rate and an average amount of each exceedance of less than \$5 million).⁴⁵ The average exceedance rate moderated in April 2020 to under 2%, as did the amount of the average exceedance to under \$20 million.

According to ISDA, some of the exceedances required the assessment of bilateral SIMM shortfall remediation, where intermediaries looked to increase non-centrally cleared IM amounts above those calculated by SIMM.⁴⁶ Some of these SIMM shortfalls were remediated by the firms involved by increasing the amount of IM in order to reduce the exceedance rate. None of these portfolios required bilateral remediation by the next monitoring at the end of September 2020. The SIMM shortfalls that were subject to remediation assessment were related to equity bucket risk weights, equity correlations between buckets

⁴⁴ See Gurrola-Perez (2020).

⁴⁵ Intermediaries that responded to the Intermediaries survey reported the number of exceedances where one-day profit exceeded one-day IM collected, the total number of portfolios and the total amount of profit that exceeded the IM collection amounts of regulatory IM based on ISDA SIMM.

⁴⁶ The ISDA Governance Forum reported to the regulators and licensed users of SIMM the backtesting exceedances in the first half of 2020 related to the Covid-19 market stress in two separate reports.

and credit non-qualifying CMBX credit indexes⁴⁷ and totalled over \$400 million. The total SIMM IM amount across all portfolios was reported to ISDA to be over \$130 billion at the end of June 2020.

4 Transparency of margining practices

A number of reviews of the early 2020 period have emphasised the importance of intermediary and client preparedness for potential IM and VM calls. This preparedness is aided by CCPs sharing analytical tools and data that allow clearing members to estimate potential margin needs. This section considers the transparency and understanding of CCPs' margin practices and the availability of tools and data to help market participants estimate and anticipate margin calls from CCPs.

In particular this section draws on qualitative information provided through three surveys of (i) CCP clearing services on the transparency of their margin models and the availability of margin calculators/simulators; (ii) intermediaries on their understanding of CCP's policies and procedures and their ability to estimate margin calls from CCPs; and (iii) clients on their ability to anticipate margin changes and perform risk management using information provided by CCPs.

4.1 CCPs' perspective

A large percentage of CCP survey respondents (85%) indicated that information on margin models and methodologies are publicly available on their websites, while 76% indicated that they make margin calculators or simulators available to their clearing members and, in many cases, to clients.⁴⁸ The information made available varies, but usually includes information on how margin is calculated and called, margin calculators, margin rates, collateral haircuts, risk model details and modelling techniques used, and risk or operational manuals covering clearing, margin calculation and additional margin processing.

Approximately one fifth of CCPs reported that they provide tools that would allow users to undertake "what-if" analysis of how IM requirements might evolve under various simulated volatility conditions. Because these provide scenario analysis, these tools are likely to allow market participants to better anticipate the potential changes in IM requirements during a period of stress.

Almost all CCPs (95%) suggested that their clearing members expressed no concerns to them about meeting their margin requirements during March 2020; in addition they made no changes to their processes for calling margin ITD. The remainder reported late-in-the-day calls as the main concern of members. However, a wide variety of criteria and thresholds for triggering their ITD margin call processes were described by CCPs. Out of all the criteria used, margin erosion-based metrics – ie comparing the intraday profit with loss change to IM held – was the most commonly reported method, albeit often as part of a multi-criteria process.⁴⁹

4.2 Intermediaries' perspective

Intermediaries' (bank and non-bank clearing members) overall level of understanding of policies and procedures of CCPs was highest for those that govern EoD margin call timing and calculation methodologies (Figure 17). This is the case for both cleared derivatives and cleared securities. Intermediaries reported a comparatively lower understanding of policies and procedures governing ad

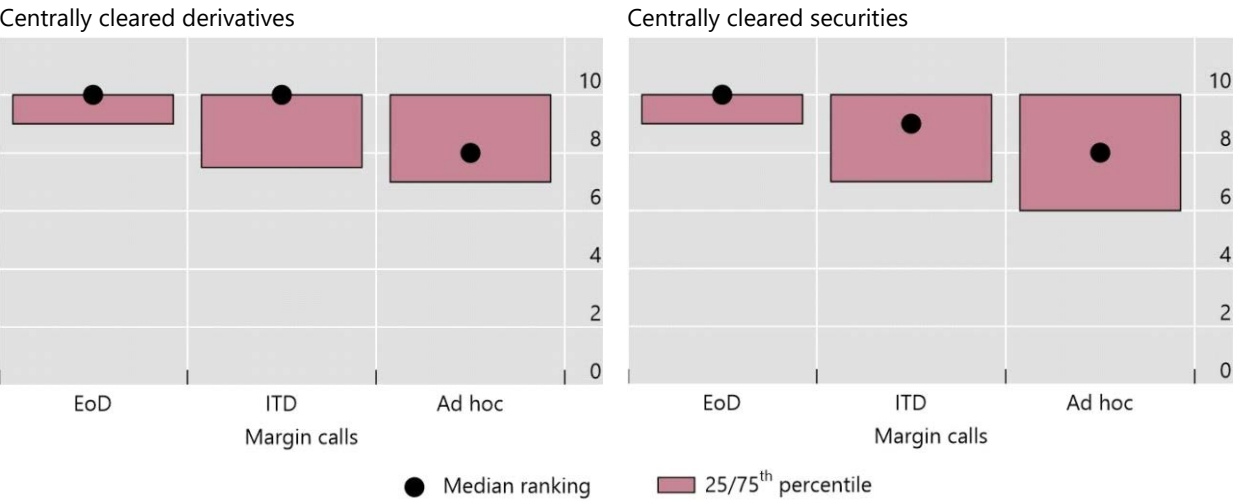
⁴⁷ Indices that track the commercial mortgage-backed securities market.

⁴⁸ Typically as web-based applications.

⁴⁹ These multi-criteria processes might also include, for example, minimum outright amount, a member credit rating threshold, or a member capital-based calculation. Each of these thresholds work to ensure that the CCP has adequate collateral coverage during a stressed market period, even in the case when a member default occurs on an ITD basis.

hoc margin calls, with greater dispersion of responses observed for cleared securities. There was also a greater dispersion in reported levels of understanding for ITD margin calls, relative to EoD margin calls.

Intermediaries understanding CCP margining policies and procedures¹ Figure 17



EoD = end-of-day; ITD = intraday.
¹ Total understanding and comprehension (10) to complete lack of understanding (1).
 Source: Survey of clearing members/broker-dealers.

Less than half of intermediaries in the survey (46%) indicated that they have the data and tools available to estimate CCP margin calls prior to the call being issued to clearing members. In general, intermediaries use tools provided by CCPs, although a few respondents mentioned middleware providers or specific third-party tools.⁵⁰ Some intermediaries stated that they can replicate CCPs’ margin models, at least for some entities within their group.

A number of intermediaries pointed to particular issues regarding material gaps in data, information and/or tools needed to perform accurate estimations of CCP margin call amounts and timing. These issues included a lack of disclosure of the specific parameters that CCPs use to calculate IM, the discretion CCPs have to change parameters, and timing mismatches between trade booking and clearing registration that were exacerbated by the magnitude and frequency of CCP margin calls. They also noted issues regarding lack of access to real-time data from CCPs, the multitude of models utilised by CCPs, and a lack of availability of information on exact cut-off times and data sources utilised by CCPs.

Several intermediaries noted additional disclosures that would help them estimate margin calls with reasonable accuracy, and recommendations on how to improve both centrally and non-centrally cleared margin calls. Intermediaries suggested additional disclosures could include what-if application programming interfaces (APIs)⁵¹ that contain all margin components (not just core market risk), disclosures about how and when parameters are recalibrated for standard portfolio analysis of risk (SPAN)-based margin methodologies,⁵² disclosures on the calibration of margin add-ons (particularly those relating to large positions) and extra disclosures on ITD margin (including timings, sensitivities/thresholds, reference points and policies). Intermediaries also called for an overall improvement in transparency of CCP margins,

⁵⁰ Such as Murex or Summit, and IMCalc.
⁵¹ An API that can be used to predict a response to a hypothetical event such as a change in margin parameters.
⁵² SPAN-based margin models involve the CCP determining a set of parameters (eg the price scan range, which is the maximum price movement reasonably likely to occur for each product) that are inputted into the SPAN methodology to calculate the IM obligation for a portfolio.

particularly with respect to ad hoc ITD calls. Suggestions included a more uniform approach to ITD margin calls across CCPs and improved anti-procyclicality measures at CCPs.

4.3 Clients' perspective

Clients highlighted challenges in replicating CCP margin models, and therefore challenges both in anticipating margin changes and performing risk management, even in cases where margin tools were provided by CCPs. Client survey responses indicate a range of views on the predictability of margin calls, including both centrally and non-centrally cleared calls, both of which some clients considered less predictable overall in March 2020. Clients in aggregate found margin demands in March to be generally less predictable than in the prior month. In particular, the share of respondents reporting margin calls as highly or very highly predictable fell from 59% to 40% between February and March, while the share of clients reporting that margin calls were not at all predictable rose from 14% to 26% over the same period (remaining at 22% in April).

Smaller clients reported a greater level of unpredictability than large clients did. The share of small or medium-sized clients reporting that peak margin calls were unpredictable in March (31%) was well above the share of large respondents reporting the same response (16%). These differences in predictive capabilities existed throughout the Covid-19 stress period and might be indicative of fundamental differences in the ability of small respondents to predict margin calls. While large clients in April largely returned to predictive ability levels seen pre-Covid, small clients continued to report lower predictability than in February.

Discussions with industry participants indicated that some clients utilise tools and support for cleared margin calculations while others do not. While clients generally reported a worsening in margin predictability, views varied as to the usefulness of the tools and support available from CCPs. The percentage of clients reporting that the support and tools available from CCPs were extremely useful increased over time – from 14% to 23%. However, the percentage of clients reporting that the support and tools were not useful also increased from 27% to 33%, showing that client views became more disparate after March. Clients also expressed – in discussions in the industry roundtables – that despite their extensive use of these tools, some tools had severe limitations and should be improved in scope and functionality.

Clients' qualitative feedback was also mixed on the utility of tools provided to estimate margin. Some reported poor usability for these tools or, in some cases, a lack of awareness of their existence. Some clients reported that CCP tools are generally more complex, or advanced, than those provided by their clearing member(s). The tools provided by CCPs vary substantially. Nevertheless, there seemed to be a broadly held view that the CCP-provided tools were generally better for determining the impact of a new trade on margin than for performing tasks related to risk managing one or more complex portfolios.

Overall, most clients reported being able to adequately estimate liquidity needs during March 2020, although some firms were not as prepared. Many clients report using sophisticated liquidity management techniques, as well as maintaining good relationships with prime brokers and access to balance sheets as aids in these estimations. However, this was not the case for all clients. There was a large concentration of client survey respondents who reported nil or low deviations in actual and estimated liquidity needs (indicating a strong ability to estimate liquidity needs or portfolios that were relatively unaffected by the volatility), but also a non-negligible portion of respondents who reported non-zero deviations (indicating that the stressed period did lead to unexpected liquidity needs for a portion of the client community).

5 Preparedness of market participants

This section discusses the liquidity pressures that resulted from increased margin calls at the height of the Covid turmoil and how market participants responded.

Intermediaries reported being relatively unaffected by the increase in margin calls in March 2020. Even for intermediaries that experienced the largest increases in margin outflows relative to liquidity resources, these remained a relatively small proportion of their liquidity resources, amidst unprecedented central bank interventions to support liquidity.

The size of margin calls which clients faced varied. So did their level of preparedness for margin calls during March 2020, with some clients facing liquidity needs materially greater than anticipated. Existing liquidity policies and risk controls helped to provide buffers that prevented some clients from experiencing liquidity issues – although this may have been due to their limited exposure to derivatives and securities transactions. Some clients that would be expected to have more directional risk exposure reported more liquidity pressure. Nevertheless, fire-selling of assets was avoided, partly with the intervention of central banks. Cash remained the key resource in funding the increased liquidity demand for a majority of the clients, while they relied on asset sales proportionally more in March than in February and April.

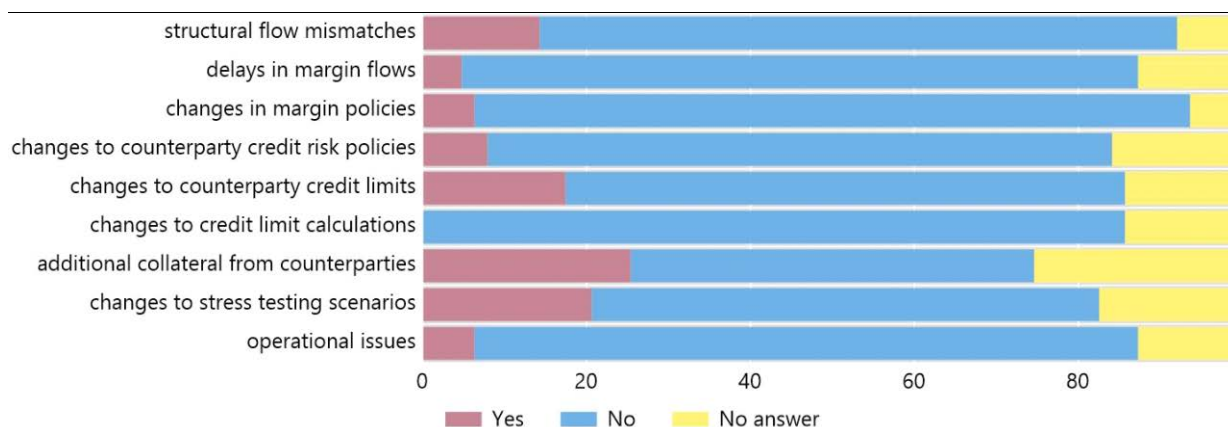
5.1 Intermediaries preparedness

In general, intermediaries indicated they were relatively unaffected by changes in margin. Only 14% of intermediaries reported experiencing material structural flow mismatches in making or receiving flows related to margin calls and only 5% experienced delays in margin flows (Figure 18).

Intermediaries' experiences during the Covid-19 period

Per cent of firms that had...

Figure 18



Source: Survey of clearing members/broker-dealers.

Consistent with this, a majority (87%) of intermediaries stated that they made no material changes to counterparty margin call policies and procedures (including but not limited to any modifications to the timing of when IM and/or VM calls were passed onto counterparties, or how the margin calls were calculated). While no respondents to the intermediaries survey stated that they made material changes to how credit limits were calculated, 17% indicated that they made material changes to the credit limits applied to counterparty positions or the type of credit limits imposed on those positions (eg applying limits to highly impacted sectors/vulnerable countries/counterparties, temporary adjustments to credit limits and increased collateral haircuts). For instance, some intermediaries mentioned that they requested excess margin buffers for some counterparties in anticipation of ITD margin calls, or introduced further

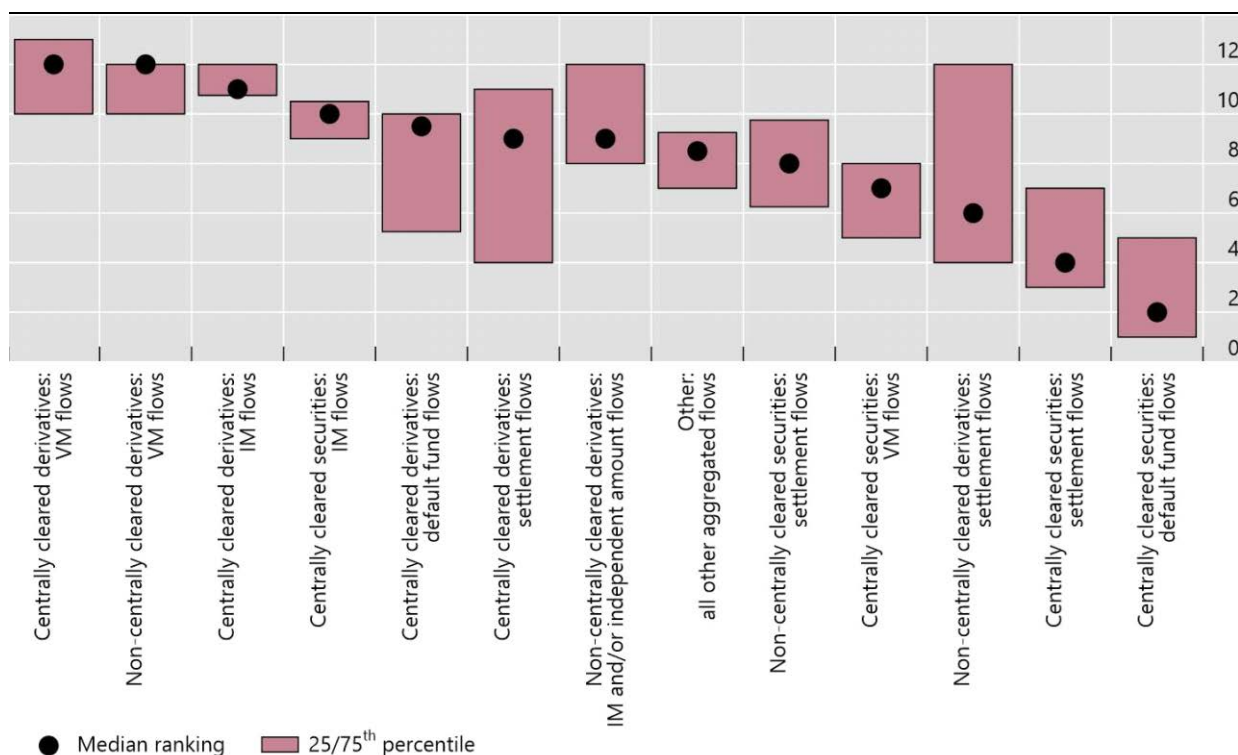
limits, caps and risk management approval requirements (ie closely tracking and escalating client issues). Furthermore, 21% of intermediaries indicated that they implemented material changes in stress testing scenarios relevant to the risk management of counterparty positions.

The intermediaries survey responses indicate that flows related to cleared derivative VM, non-centrally cleared derivative VM, centrally cleared derivative IM and centrally cleared securities IM were the most important factors driving draws on liquidity resources (Figure 19). Settlement flows for centrally and non-centrally cleared derivatives had the largest dispersion in rankings. In general EoD margin was seen as creating the largest need to draw on liquidity resources, with ITD flows the least important – particularly for non-centrally cleared markets.

Demands on intermediaries' liquidity resources from margin

Ranking of the demands that forced draws on liquidity resources by type¹

Figure 19



IM = initial margin ; VM = variation margin.

¹ Maximum demand on funding resources (13) to minimum demand (1).

Source: Survey of clearing members/broker-dealers.

In terms of liquidity resources, 75% of intermediaries did not experience or observe material issues converting high quality liquid assets into cash. Despite this, 29% of intermediaries made material changes to their liquidity resources and/or cash management/liquid asset investment strategies during the Covid-19 period. Material changes led intermediaries to allocate more liquidity to cash with, for example, higher balances at central banks. The use of central bank liquidity facilities, the creation of new liquidity assets (eg self-securitisation, credit claims) that could be used as collateral for central bank liquidity operations and the issuance of new debt were prioritised by some entities. Management practices evolved with the reduction of the volume and tenor of short-term money market placements and non-HQLA securities, or with more focussed approaches to liquidity management. Also, for intermediaries affiliated with depository institutions, the influx of corporate deposits tended to increase the intermediary's liquidity resources.

The sufficiency of liquidity can be analysed within the context of total margin outflows due to the cleared and non-centrally cleared segments. The left-hand panel of Figure 20 depicts the percentage of

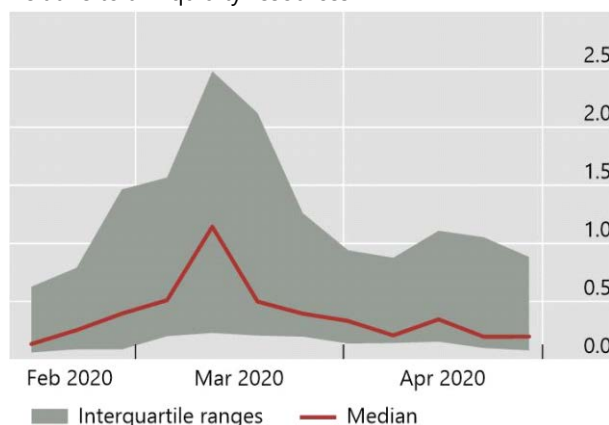
total liquidity resources relative to total margin outflows. While margin calls increased during the first half of March 2020, the total margin (VM plus IM) outflows as a percentage of total liquidity resources for even the top third quartile of respondents most affected (relative to their liquidity resources) did not exceed 2.5%.

Liquidity demands and buffers at intermediaries

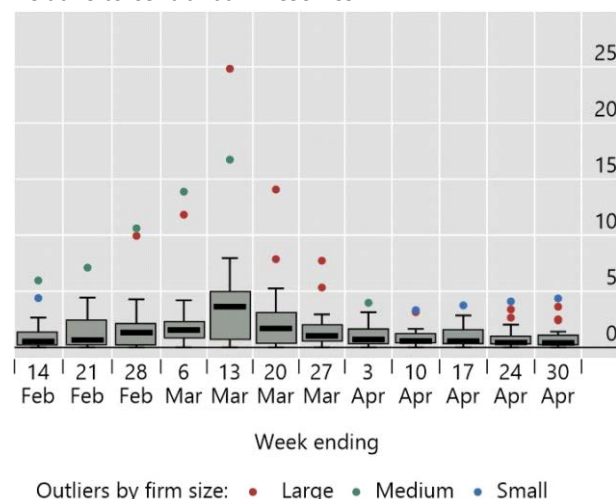
Margin outflows as percentages of liquidity sources

Figure 20

Relative to all liquidity resources



Relative to central bank reserves



Source: Survey of clearing members/broker-dealers.

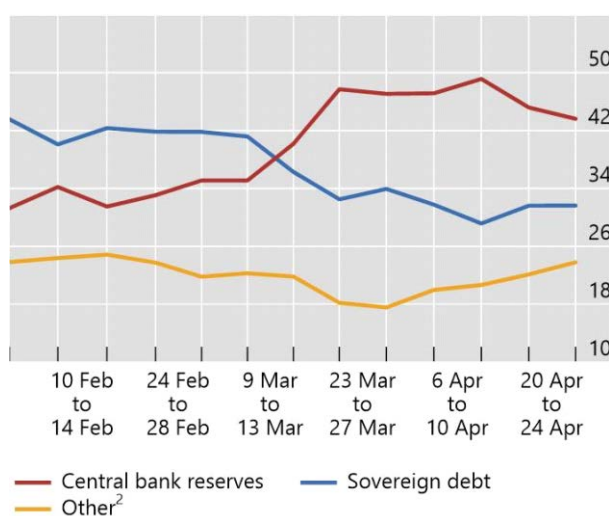
The right-hand panel of Figure 21 shows margin outflows by intermediaries as a percentage of central bank reserves held by these intermediaries. This ratio does not exceed 5% on average even at the height of the crisis and even for those institutions with the highest demands (relative to central bank reserves), it is below 25%.

Composition of intermediaries' liquidity sources

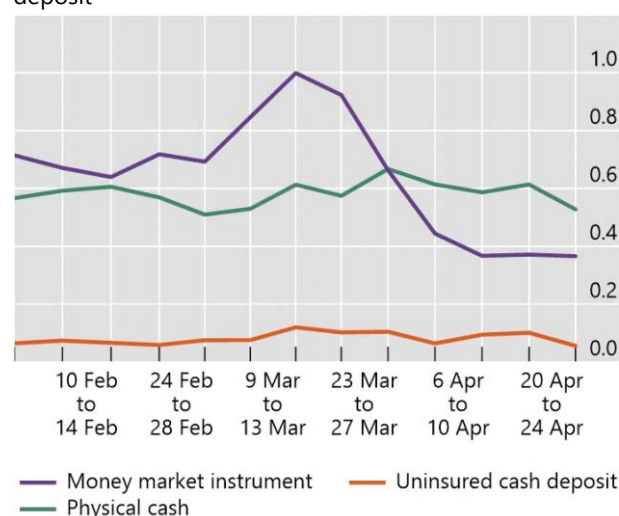
Per cent of total liquidity sources¹

Figure 21

Central bank reserves, sovereign debt and other sources²



Money market instrument, physical cash, uninsured cash deposit



¹ The percentages across the two panels add to 100%. ² Does not include money market instruments, physical cash, uninsured cash deposits, see right-hand panel for these.

Source: Survey of clearing members/broker-dealers.

Central bank reserves and sovereign debt were the main liquidity sources used to cover margin outflows. Coinciding with central bank interventions, central bank reserves became a more important source of liquidity – both in relative terms (Figure 21) and absolute terms starting in mid-March. Though representing a less significant liquidity source even at the beginning of the period, the amount of money market instruments used decreased in late March.

5.2 Clients' preparedness

Client survey results showed that there was significant heterogeneity in the margin calls faced by clients. Some non-banks, such as insurers and pension funds, faced persistent VM outflows on their hedges, as well as IM increases. Discussions with hedge funds suggested that many of them were well positioned to meet liquidity demands and did not find increases in margin unreasonable or unmanageable. Similarly, larger asset managers reported that they were able to meet liquidity needs from buffers maintained for these purposes. Other clients, especially smaller ones, indicated more strain. Several clients noted that the ability to post securities to meet non-centrally cleared margin was helpful.

The heterogeneity in experiences is supported by evidence from the intermediaries survey. Intermediaries stated that clients generally met margin calls on time, with at least 93% of margin calls across all markets met by clients on the day they were due, with no significant change across February, March and April 2020. However, 21% of intermediaries indicated that specific market segments or counterparty types experienced materially high and out of the ordinary liquidity demands.

The client survey also revealed significant heterogeneity in clients' indicated level of preparedness for margin calls during March 2020. Most clients reported no significant increases in liquidity demand from margin for both cleared and non-centrally cleared derivatives. Specifically, of the responding clients, 55% reported no increased liquidity needs for cleared derivatives, while 64% reported the same for non-centrally cleared derivatives. Yet, although there was no major shift in the aggregate liquidity demand, a number of clients indicated that their liquidity needs were materially greater than expected.

Cash remained key in funding increased liquidity demands for the majority of the clients surveyed (Figure 22, left-hand panel). Clients used available cash deposits to meet peak margin requirements most of the time over February, March and April. In fact, in both February and March, clients reported using available cash deposits to meet margin requirements nearly 75% of the time. This proportion was even higher in April. Despite the continued reliance on cash, clients increasingly used repo in March and asset sales in March and April to meet direct margin payments across most client groups.

Despite significant data gaps, authorities' data suggest that some clients had to rely on repo and sovereign debt markets to raise the cash to meet increased margin calls. In some instances, and for some specific sectors (eg non-asset managers, including "pension funds", "money market funds (MMFs)", "banks-clients"), clients may have had to rely on repo markets and sovereign debt markets to raise cash to meet margin calls, or to replenish liquid buffers following the margin calls in March 2020. However, these data have significant gaps and there are challenges to reliably identifying more detailed trends.

While most clients stated that their intermediaries fulfilled their contractual obligations, some noted that intermediaries' actions may have contributed to margin unpredictability. Some bilateral agreements led intermediaries to absorb ITD calls, while others had contractual agreements prohibiting add-ons. Some respondents suggested that intermediaries appeared to struggle with capital-related internal funding requirements, and as a result requested ITD VM from clients to address significant trade valuation changes. There were also comments that mismatches between the processes and their timing at different intermediaries could add to the need for clients to hold liquidity buffers. Such frictions might be reduced with further operational standardisation.

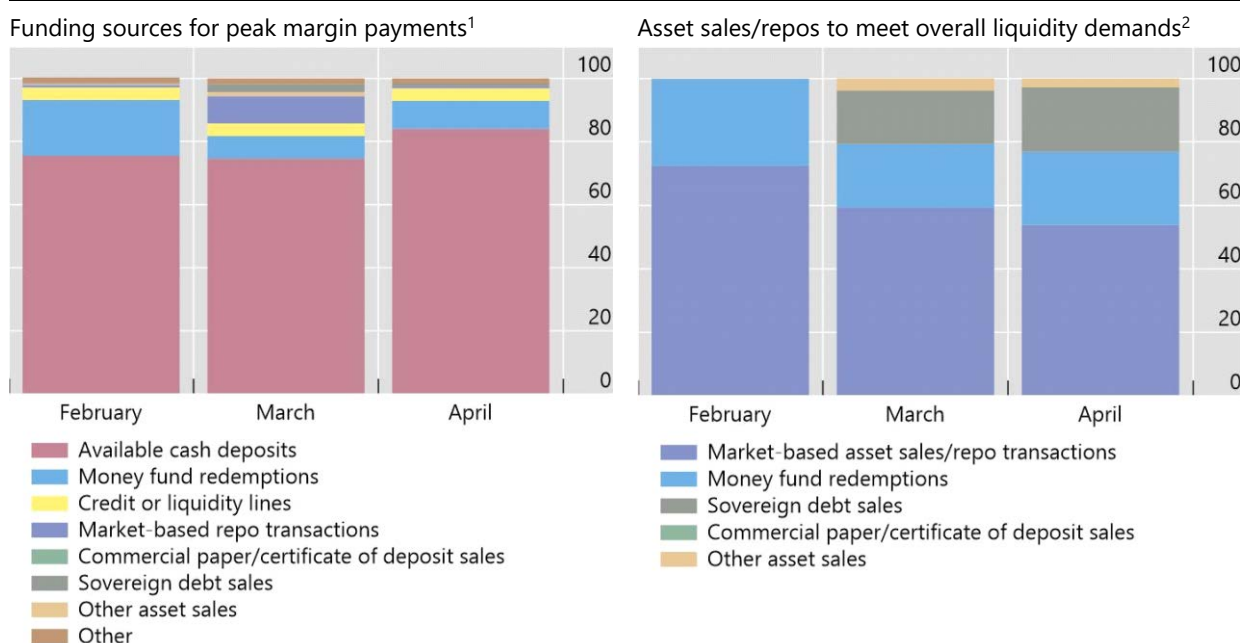
Clients' responses highlighted *overall* market liquidity as an issue and clients increasingly relied on asset sales in March and April relative to February (Figure 22, right-hand panel). Around 40% of respondents increased liquid assets and roughly 30% of them liquidated assets for cash as a response to

heightened volatility. Almost a quarter of respondents increased risk exposure, while around 40% of respondents reduced their risk exposure instead, highlighting how varied client responses can be. Despite the stress, many clients indicated little difficulty or none in sourcing liquidity (only 25% of respondents indicated they faced unexpected challenges).

Funding sources for margin and overall liquidity demands

In per cent

Figure 22



¹ Per cent of peak margin payment directly funded by the corresponding source, averaged across reporting clients. ² Per cent of overall liquidity demands met by the corresponding type of asset sale/repo, averaged across reporting clients.

Source: Client survey.

6 Impact on the system

To visualise how margin interacts with other markets and participants in the financial system, an attempt has been made to map how the sudden increases in margin were transmitted across the system (Figure 23). As total CCP margin calls spiked in March, market participants across the system had to meet increased IM and VM payments. The map shows both IM and VM flows.

To meet the increased liquidity demands, firms chiefly used available cash but increasingly relied on asset sales in March and April 2020. As noted in previous sections of the report, the proportion of cash collateral posted remained largely unchanged or increased across most asset classes. Market participants across the system therefore took action to meet those increased liquidity demands, as shown in the additional interconnectedness maps (Annex D).

Participants met margin calls principally by using available cash deposits. As noted in Section 2.3 above, excess collateral increased by approximately \$115 billion in March 2020, and the percentage of collateral posted as cash increased from approximately 38% to 48%, although IM generally does not need to be posted in cash. Nonetheless, in some cases, market participants moved to raise liquidity from various sources. Where market participants sought to raise liquidity, they relied more on repo and asset sales, in March 2020, to meet direct margin payments. This is an area where more data would be useful.

A number of liquidity-raising operations were conducted while other market participants were simultaneously experiencing liquidity demands of their own – affecting assets and sectors including MMFs,

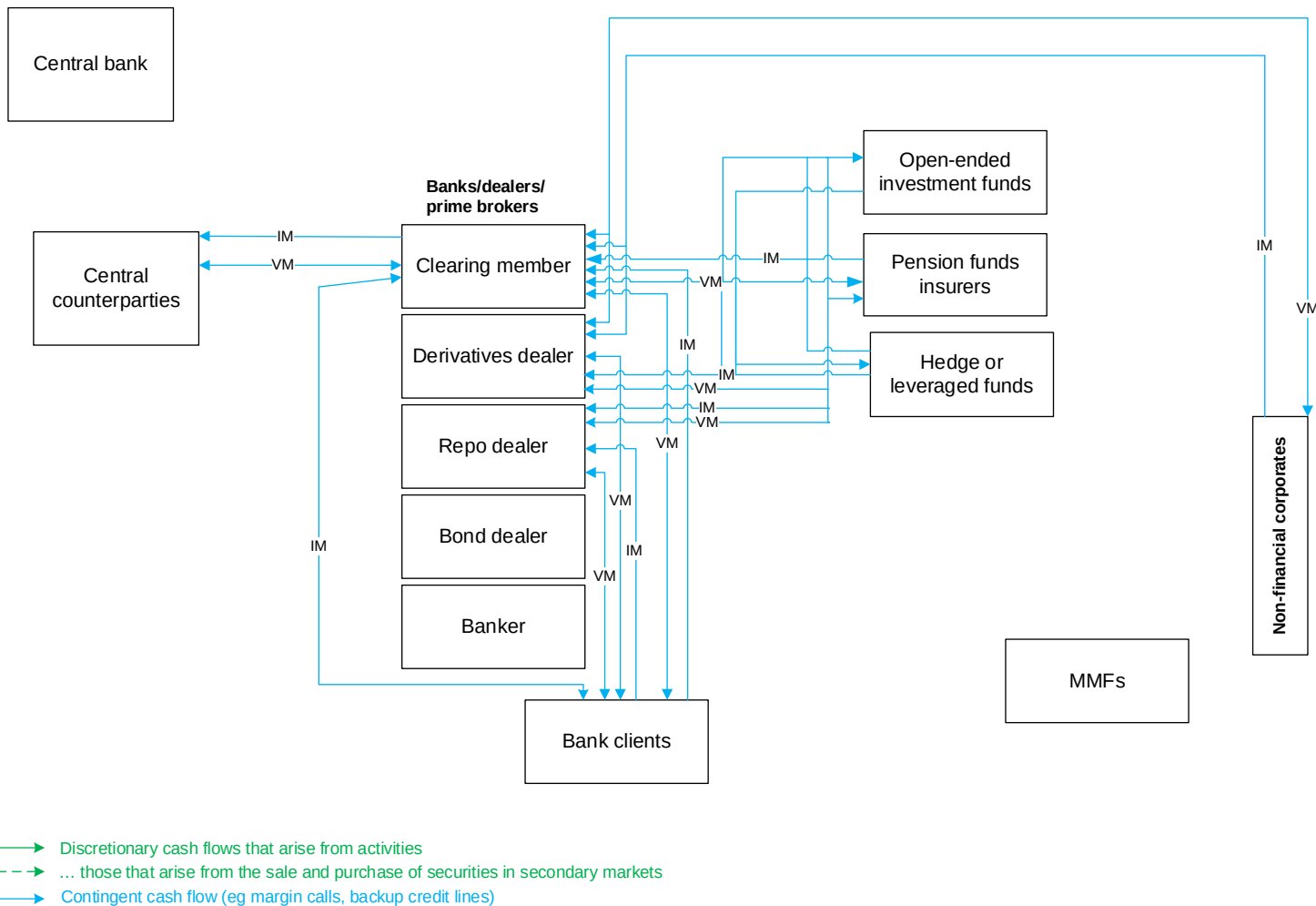
open-ended funds, leveraged funds and dealers, as illustrated on the interconnectedness map – which are all being investigated as part of other workstreams internationally. MMFs holding non-government debt experienced significant outflows. Some open-ended funds – such as those exhibiting structural maturity mismatches – also experienced large redemptions. Some leveraged investors sold substantial holdings of US Treasuries, contributing to increased price volatility in those markets. Meanwhile, dealers’ capacity to intermediate – and purchase corporate bonds – was subject to constraints, contributing to further illiquidity in the market.

Some clients perceived vulnerabilities in funding markets at the time. Qualitative responses to the client surveys provided some context on perceived market function. Respondents reported a perceived breakdown in liquidity in the following markets: FX forwards and swaps; certain types of high-quality liquid assets; corporate bond investment grade credit markets; money markets; and sovereigns, including US Treasuries and gilts, especially off-the-run issues. Liquidity in the secured repo markets was also reported as scarce. Respondents also noted pricing disruptions; bank counterparties declining to provide various forms of liquidity; reduced market capacity; increased transaction costs; and fixed income exchange-traded fund net asset value discounts of 4% to 5%.

Market participants trying to raise liquidity to meet margin calls were therefore doing this in a context of impaired market liquidity, which was alleviated by central bank intervention, as shown on the interconnectedness map. In a systemic stress event of a largely unexpected magnitude, where market participants simultaneously attempt to raise liquidity to face multifarious sources of liquidity demands in the same manner, those actions appear to have further propagated the stress across the system, raising the need for central bank intervention. Some instances of liquidity-raising by firms needing to meet margin calls may have been hampered by this stress, and may have contributed to broader stresses in normally liquid asset and funding markets when compounded with vulnerabilities existing at multiple levels of the financial system.

Increased margin calls

Figure 23



IM = initial margin; VM = variation margin; MMF= money market funds. VM transferred between clearing members and CCPs is generally paid in cash. IM can be paid in a combination of cash and securities.

Source: FSB Working Group on Interconnectedness Mapping.

7 Key findings and next steps

Drawing on the findings presented in the rest of this report and feedback received during the consultation, this section outlines six areas for further work in view of potential international policy consideration.

7.1 Increasing transparency in centrally cleared markets

As noted in Section 4, there is a varied range of practice around IM model transparency, and, generally, low levels of transparency around modelling choices and governance practices, including aspects that may lead to procyclicality during periods of high volatility.

Increased transparency of CCP IM models, which could include forward-looking (predictive) and backward-looking (performance) disclosures – as well as more sophisticated tools/simulators – should enable clearing members and clients to understand ex ante how individual models respond to various market scenarios and to better plan for stressed liquidity needs through increased predictability. The role that clearing members can play to facilitate transparency for their clients should also be considered. Measures to enhance transparency would balance, among other things, differences across asset classes with sufficient consistency where possible across CCPs offering services in the same asset classes.

Further international work is proposed to explore consistent metrics, and disclosures concerning procyclicality, responsiveness to volatility and model performance. This should take into account outcomes from Section 7.5 below. This work should also consider good practices with respect to provision of tools/simulators. Additional international work could also consider the role that disclosure of modelling choices by individual CCPs, could have in enhancing understanding of and comparisons among CCP model behaviour. This further work should include exploration of improvements to existing expectations for disclosures to both clearing members⁵³ and the public.⁵⁴

In particular, this work will seek to explore improvements to existing expectations for disclosures, with regard to quality, content and frequency. Future work should also consider improvements to governance around disclosure and communication channels between CCPs and their members, for example whether improvements to the clarity of CCPs' disclosures, and additional accountability mechanisms for them, should be introduced to improve their quality and timeliness. Responses have also highlighted the need for setting expectations with regard to tools and simulators, and information on forward-looking hypothetical margin changes, to increase the predictability of margin calls during stress events. In addition to the consistent metrics and disclosures noted above, the work will also consider the benefits of CCPs providing regulatory and/or public disclosures regarding areas such as risk appetite, model parameters and methodologies, calibration of add-ons, the extent of APC tool use, and/or notice periods.

7.2 Enhancing liquidity preparedness of market participants as well as liquidity disclosures

Both intermediaries and clients benefited from central bank interventions, which were a source of liquidity during the period March–April 2020, the period of heightened margin calls. Clients varied in the size of margin calls they faced and their level of preparedness for margin calls during March 2020 with some clients facing liquidity needs materially greater than anticipated (Section 5). While a number of clients have incorporated insights from the Covid-19 stress into their risk management, the Covid-19 stress can act as

⁵³ See Principle 23 in CPSS-IOSCO (2012).

⁵⁴ See CPMI-IOSCO (2015).

an additional impetus to resolve what are in some cases longer-standing issues regarding the preparedness of market participants, particularly non-banks, for margin requirements.

Additional international work can identify ways to further enhance liquidity preparedness, including:

- the use and disclosure of appropriate liquidity measures in the NBFIs sector;
- elucidating ways that clearing members can encourage and facilitate greater liquidity preparedness of clients through appropriate information-sharing; and
- the use by clearing members of clear, transparent and more standardised disclosures, and automated margin processes/procedures.

Work could include analysis related to NBFIs sector liquidity arrangements and intermediaries' provision of liquidity to clients to facilitate the fulfilment of margin obligations, and the effectiveness of those arrangements during periods of extreme stress and/or volatility.

As one means to further enhance liquidity preparedness, this work will consider the use of enhanced disclosures from CCPs – in relation to work undertaken as per Section 7.1 – and how these can help plan for margin calls during stress events. Work on liquidity preparedness by NBFIs, as well as non-financial entities, to meet stress margin calls will need to factor in the extent to which liquidity sources such as repo markets can be relied upon under stress, building on existing analyses on this issue. In addition, the proposed work will review the effectiveness of tools used in non-stress times on mitigating procyclicality, such as collateral posted in excess of IM requirements.

7.3 Identifying data gaps in regulatory reporting

Data and regulatory requirements for the NBFIs sector are much more heterogeneous and sparse than in the banking sector (Section 2). Further international work to identify gaps in current regulatory data would help to provide a more comprehensive picture of the preparedness of market participants, particularly non-banks, for margin requirements. This work could help to inform future policy where appropriate and facilitate collaboration and information-sharing between authorities (where appropriate gateways exist).

This work could consider what additional regulatory disclosures or data points could provide authorities with a more comprehensive picture of NBFIs sector preparedness and intermediaries' provision of liquidity to clients. This could allow for comparability, data quality checks, and usable reporting data from both banks and non-banks. This work could also take into account the role that existing or previous initiatives could play in addressing regulatory data gaps – for example, the more widespread use of Legal Entity Identifiers or resolving barriers to usability and the international aggregation of the trade repository data.

This work will consider gaps in regulatory data for non-centrally cleared markets. This work will consider the case for further implementation of existing or previous initiatives, such as the CPMI-IOSCO guidance on the harmonisation of critical OTC derivatives data elements, and subsequent initiatives, to address such regulatory data gaps.⁵⁵ With regard to resolving barriers to usability and aggregation, this work will explore the need for further regulatory cooperation and the ways in which existing information-sharing and trade repository data usability could be improved.

⁵⁵ CPMI-IOSCO, *Governance arrangements for critical OTC derivatives data elements (other than UTI and UPI)*, October 2019 and the Regulatory Oversight Committee, *Harmonisation of critical OTC derivatives data elements (other than UTI and UPI) – Revised CDE Technical Guidance – version 2*. September 2021.

7.4 Streamlining VM processes in centrally and non-centrally cleared markets

VM payments are designed to increase in step with price volatility. Nevertheless, in some cases the processes for collecting and passing on the VM payments from market participants with mark-to-market losses to those that experienced mark-to-market gains may have been challenging for clients, increasing the need to hold liquid resources (see Section 5.2). CCPs also have different practices when calculating and passing through ITD margin calls (Section 2). It is important that market participants and CCPs learn from the Covid-19 stress and, where appropriate, adapt processes and systems so as to support efficient collection and distribution of VM.

Further international work is proposed to consider ways to foster market participants' preparedness for above-average VM calls through efficient collection and distribution of VM and other means. A stocktake of industry initiatives to strengthen business-as-usual post trade allocation protocols between clients, executing brokers and clearing members may also be useful.

In addition, further international work is proposed to identify good practices for VM collection and distribution by CCPs, including the value of passing VM payments back into the marketplace on a timely basis while ensuring the availability of resources to meet obligations to clearing members. This work could also look at the trade-offs between more frequent VM calls intraday and the additional liquidity burden this can place on participants or clients.

Particular attention will be given to an examination of intraday variation margin calls. In addition, the work will examine the effect of intermediaries/clearing members' practices in increasing/decreasing liquidity pressures on clients.

7.5 Evaluating the responsiveness of centrally cleared IM models to market stresses with a focus on impacts and implications for CCP resources and the wider financial system

In March 2020, IM increased significantly when market volatility spiked (Section 2). CCP IM models should produce appropriate IM levels in normal and stressed times, while also reflecting the specific features of the markets that CCPs serve. While parameters would not be expected to be identical across all CCPs, at a granular level there was a wide range of CCP IM model types and calibration choices for key IM model parameters (Section 3.2) and the size and speed of IM increases differed not just across asset classes, but also within asset classes (Section 2.2).

Further international work is proposed to understand the degree and nature of CCP margin models' responsiveness to volatility and other market stresses – including the impact, costs and benefits of this responsiveness for CCP resources and the wider financial system – as well as to explore appropriate ways to analyse, compare and set baseline expectations as to procyclicality in various settings.

Additional work could also review IM levels in non-stress times in the light of this responsiveness, potentially including a review of the effectiveness of tools that lessen the procyclicality of margin models and the consistency of their use.

This work could help inform and/or complement existing international standards and guidance as to anti-procyclicality. In addition, this work may consider the merits of additional guidelines for supervisors' assessments of model attributes that together can determine model responsiveness to volatility. This could include lookback periods, identification of stress periods, decay factors, anti-procyclicality measures and MPOR. Coordination across regulators is advisable, given the global nature of clearing.

Further work could also consider the role of clearing members' practices when passing on CCP margin calls to clients in dampening or amplifying the procyclicality of margins.

In the light of the consultation responses, the proposed work will be proceeding as planned on this item, with three key adjustments. First, with regard to exploring appropriate ways to analyse, compare and set baseline expectations as to procyclicality in various settings, the work will include examining the merits of forward-looking and outcomes-based approaches to monitoring and reviewing APC implementation and performance, reflecting market dynamics and product/portfolio characteristics, as well as potential trade-offs between APC and other goals of margin systems. Second, to aid and facilitate supervisors' assessments of margin practices that can influence a margin model's responsiveness to volatility, including model attributes and their calibration and governance, the work will consider model characteristics associated with market risk as well as other margin features (including lookback periods, identification of stress periods, decay factors, APC measures, MPOR, margin floors, volatility floors, margin offsets, margin confidence levels or other model components that might contribute materially to margin responsiveness, as well as concentration charges, illiquidity charges and margin add-ons). Third, the work will also examine clearing members' practices when setting IM requirements for clients, and the transparency of these practices.

7.6 Evaluating the responsiveness of non-centrally cleared IM models to market stresses

Non-centrally cleared markets experienced a smaller adjustment in margin requirements than centrally cleared markets did, due primarily to model construction and the low responsiveness of their models (such as SIMM) to volatility changes. However, under SIMM, intermediaries on non-centrally cleared transactions reported substantially more backtesting exceedances in March 2020 (Section 3).

Bearing in mind that the relative unresponsiveness of non-centrally cleared IM to increasing volatility due to market stress is an intended attribute of internal models, further work could look into the timeliness of mechanisms for taking into account stress periods in the calibration of internal models. It could also look into the timely remediation of IM shortfalls and the level of disclosure regarding the performance of non-centrally cleared IM models. This could be conducted as part of the ongoing monitoring of the implementation of the non-centrally cleared IM requirements.

The work will be extended in scope to also examine non-centrally cleared markets. In particular, the work to examine the responsiveness of non-centrally cleared models should distinguish between responsiveness of discretionary and regulatory IM calls and consider the appropriateness and implications of the threshold for exchanging regulatory required IM and the counterparty coverage. Further, the work will also include an examination of backtesting practices to evaluate how backtesting results might lead to a change in the model or shortfall remediation, and consider the transparency of these practices.

References

Basel Committee on Banking Supervision, Committee on Payments and Market Infrastructures, Financial Stability Board and International Organization of Securities Commissions (2018): *Analysis of central clearing interdependences*, August.

Basel Committee on Banking Supervision and International Organization of Securities Commissions (2019): *Margin requirements for non-centrally cleared derivatives*, July.

——— (2020): *Margin requirements for non-centrally cleared derivatives*, April.

Committee on Payments and Market Infrastructures and International Organization of Securities Commissions (2015): *Public quantitative disclosure standards for central counterparties*, February.

——— (2017): *Resilience of central counterparties (CCPs): further guidance on the PFMI*, July.

Committee on Payment and Settlement Systems and International Organization of Securities Commissions (2012): *Principles for financial market infrastructures*, April.

Financial Stability Board (2020): *Holistic review of the March market turmoil*, November.

Glasserman, P and Q Wu (2018): "Persistence and procyclicality in margin requirements", *Management Science*, vol 64, no 12, December.

Gurrola-Perez, P (2020): "Procyclicality of CCP margin models: systemic problems need systemic approaches", *WFE Working Paper*, World Federation of Exchanges, December.

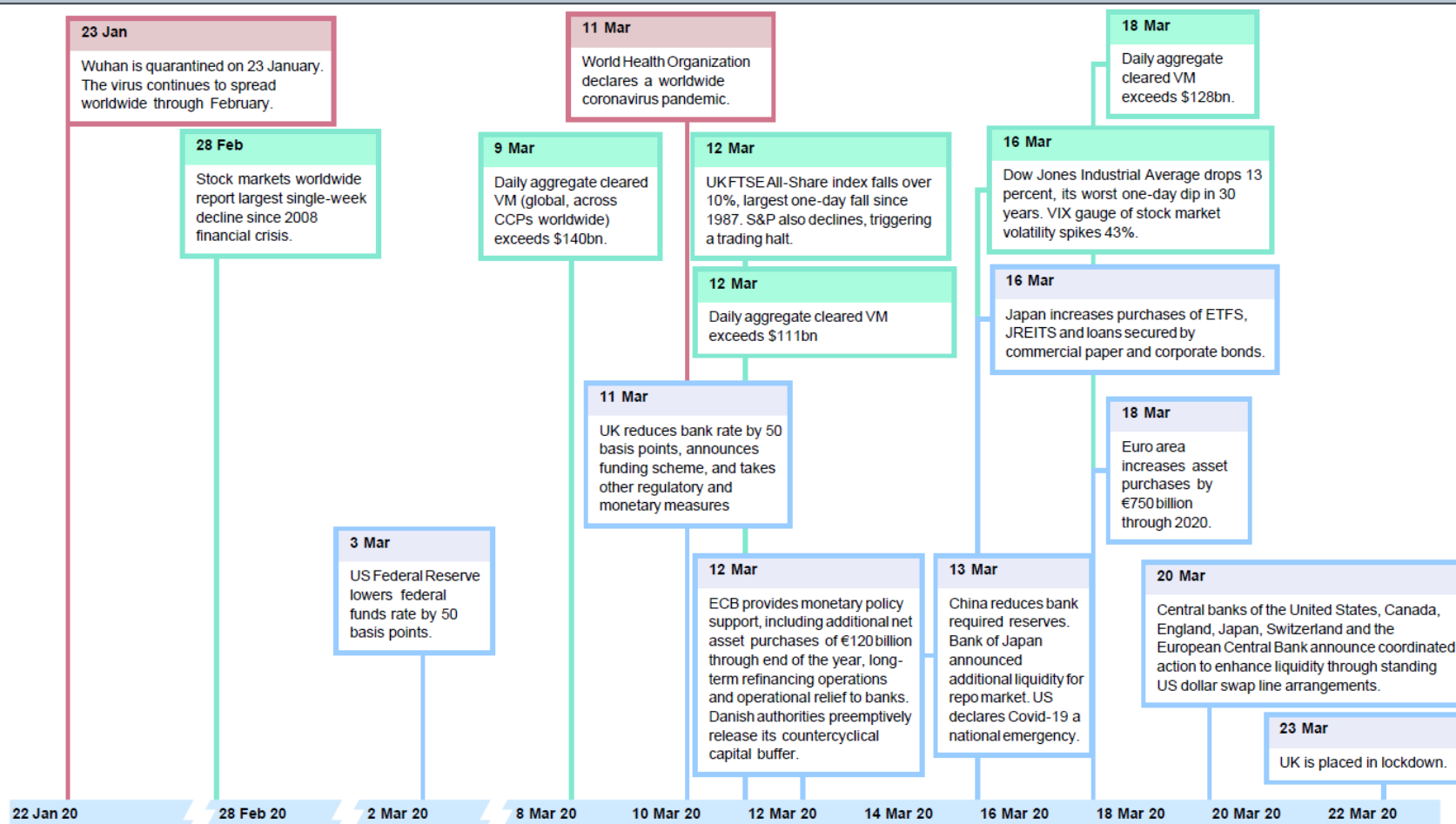
International Swaps and Derivatives Association (2013): *Standard initial margin model for non-cleared derivatives*, December.

Abbreviations

APC	anti-procyclicality
API	application programming interface
BCBS	Basel Committee on Banking Supervision
CCP	central counterparty
CDS	credit default swap
CPMI	Committee on Payments and Market Infrastructures
EoD	end-of-day
ETD	exchange-traded derivatives
FSB	Financial Stability Board
FX	foreign exchange
GFC	Great Financial Crisis
IM	initial margin
IOSCO	International Organization of Securities Commissions
IRS	interest rate swaps
ISDA	International Swaps and Derivatives Association
ITD	intraday
MMF	money market fund
MPOR	margin period of risk
NBFI	non-bank financial intermediation
OFI	other financial institutions
OTC	over-the-counter
PFMI	Principles for Financial Market Infrastructures
SIMM	Standard IM Model
VM	variation margin

Annex A: Illustrative timeline of events in Q1 2020

March 2020 - Examples of public health events, asset shocks and margin calls, and governmental/central bank actions



Annex B: Overview of the surveys

To support this work, four detailed surveys were issued and responses were collected between May and August 2021: (i) a survey of central counterparties (CCP survey); (ii) a survey of clearing members/broker-dealers (intermediaries survey); (iii) a survey of other market participants active in global cleared and non-centrally cleared derivative and securities markets (client survey), and (iv) a survey of/data collection from regulatory authorities (“authorities survey”).

The surveys focus on a broad set of margin-related topics, and included questions related to:

- margin in cleared and non-centrally cleared markets during the March 2020 market turmoil, including clearing member-client dynamics;
- margin model transparency, predictability and volatility during the market turmoil across various markets, jurisdictions and margining models; and
- liquidity management preparedness of market participants to meet margin calls.

In addition to the surveys, the group received data on margin in non-centrally cleared markets on an ad hoc basis from:

- Acadia, which provided aggregated data on margin calls and related collateral exchanges where it facilitated this process
- ISDA, which provided information on the results of the SIMM backtesting.

CCP survey

This was a survey of CCPs from around the world that are responsible for clearing derivatives and securities. The data collection was facilitated by the IOSCO Financial Stability Engagement Group’s Data Working Group. The survey leveraged definitions in the CCP quantitative disclosures. Sixty-nine CCP services⁵⁶ associated with around 50 CCPs from across the world responded to the survey. CCPs clearing all types of assets are represented in the sample (Table A.1).

CCP service

February–April 2020, USD billions

Table A.1

Asset class	Number	Per cent
ETD	28	41
Debt securities	10	14
Equity securities	10	14
OTC IRS	9	13
OTC FX	5	7
OTC CDS	4	6
Mixed	3	4

ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS = over-the-counter interest rate swaps; OTC FX = foreign exchange.

Source: IOSCO Financial Stability Engagement Group’s Data Working Group survey of CCPs.

⁵⁶ Products covered by a segregated default fund; the products may represent a mix of different classes of assets.

Intermediaries survey

This survey targeted bank and non-bank intermediaries that act as dealers in cleared and non-centrally cleared derivative and securities markets. Responses from banks were collected through the BCBS Quantitative Impact Study process, while responses from non-bank intermediaries were collected via IOSCO. In total 63 survey responses were received – 10 from firms headquartered in the Americas, 26 from firms based in the Asia-Pacific region and 27 from firms in Europe. It is estimated that the same included 18 globally systemically important banks.

Client survey

This survey targeted firms that trade derivatives and securities primarily on their own behalf and access clearing services primarily as clients of other clearing members. Such firms include but are not limited to asset managers, banks that are not intermediaries for cleared derivatives and securities, hedge funds, insurers, money market funds, and pension funds/managers. Industry groups were also invited to respond on behalf of clients. In addition, three industry roundtables with different groups of clients were held on 9 July, 15 July and 5 August 2021.

The demarcation between “intermediary” and “client” firms was as follows:

Intermediaries are firms that:

- consider themselves “intermediaries” or “dealers” in derivative and/or securities markets;
- seek to make markets and collect bid/ask;
- are direct clearing members of CCPs and provide clearing access for clients; or
- are registered swap dealers, broker/dealers or similar.

Clients are firms that:

- consider themselves “clients”;
- manage and invest the assets of others, such as pension funds, investment managers, mutual funds, trust banks, hedge funds etc;
- manage and invest their own funds, such as family offices and insurance companies;
- are generally price-takers and are not active market-makers collecting bid/ask; and
- are direct clearing members of CCPs but do not provide clearing access for clients.

Forty-eight clients responded to this survey. Just under two thirds of respondents were primarily located in Europe, 15% were primarily located in the Asia-Pacific and the remainder in the Americas. There was a mix of firm types amongst respondents, with just under a third being asset managers.

Authorities survey

Regulatory authorities for which the analysis of the impact of cleared and non-centrally cleared margin calls on financial markets/financial market participants falls under their mandate(s) were also surveyed. Such authorities include, but are not limited to, central banks, market regulators and regulators/supervisors of various market participants such as banks, investment funds, hedge funds, insurance corporations and pension funds.

Twenty-six authorities responded to the survey. Of these, 11 authorities were central banks, 12 authorities belonged to securities or markets regulators, while three other authorities regulate specific sectors (eg insurance sector, banks). The number of submissions amounted to 24 as in two cases, two authorities from the same jurisdiction contributed to one data submission. In three jurisdictions, more than

one authority submitted the survey, resulting in coverage of 21 jurisdictions (eight from Asia, seven from Europe, two from Central/South America, two from North America, one from Oceania and one from Africa).

Annex C: Additional figures

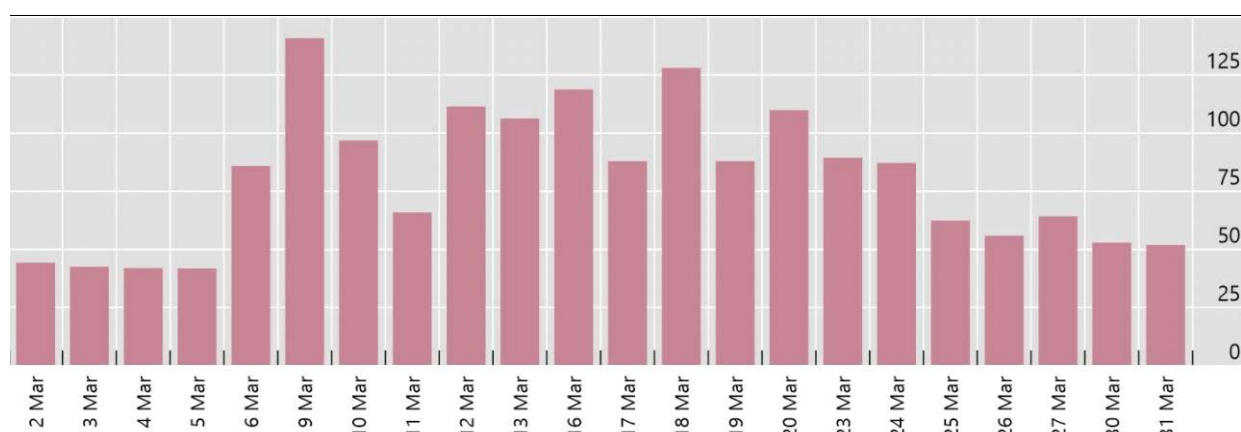
This Annex provides additional figures resulting from analysis of the data collected. The caveats on the data discussed in Section 1.3 apply. The figures are organised according to relevant discussion in the body of the report; the headings in this annex refer to the relevant sections of the report.

1 Size and composition of margin calls

Daily aggregate CCP variation margin paid

March 2020, in billions of US dollars

Figure C.1

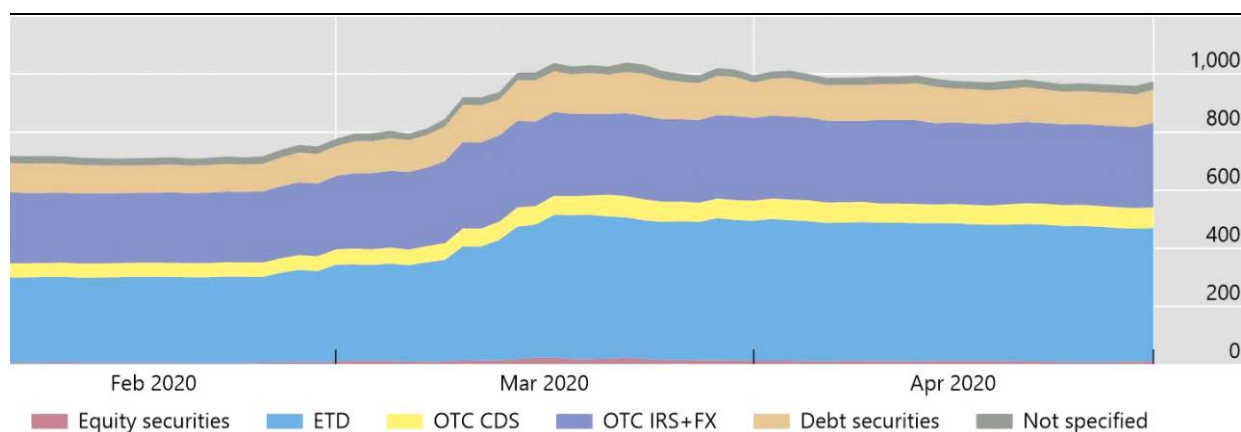


Source: IOSCO Financial Stability Engagement Group's Data Working Group survey of CCPs.

Total CCP initial margin required

In billions of US dollars

Figure C.2



ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

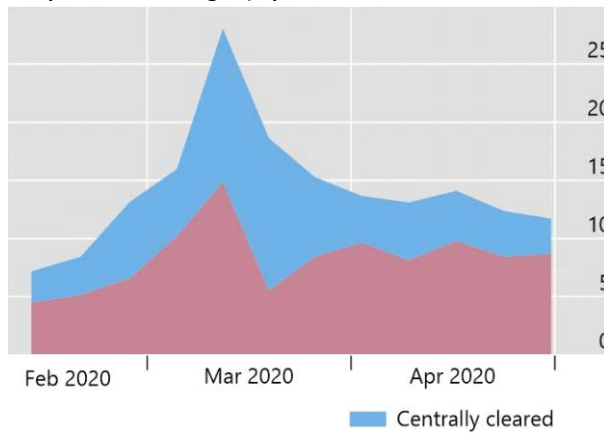
Source: IOSCO Financial Stability Engagement Group's Data Working Group survey of CCPs..

Breakdown of demands on intermediaries' resources¹

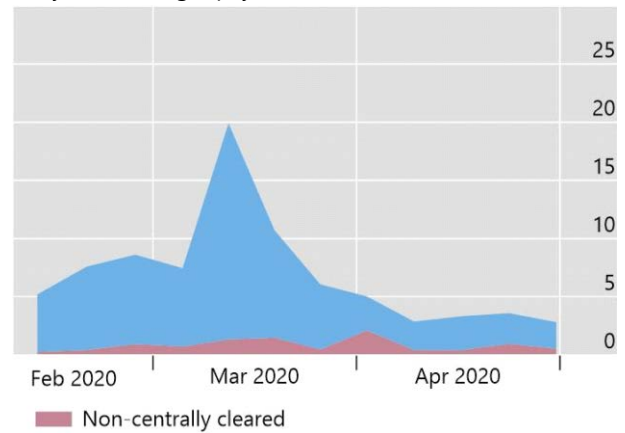
In billions of US dollars

Figure C.3

Daily variation margin payments



Daily initial margin payments



¹ Based on 24 responses.

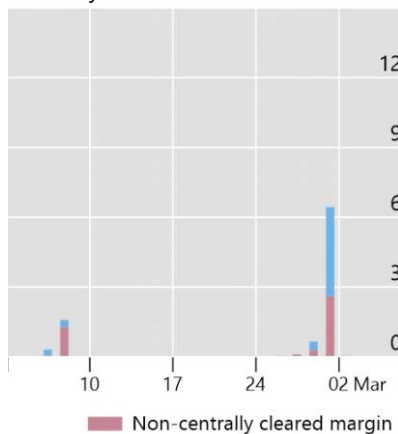
Source: Survey of clearing members/broker-dealers.

Peak margin payments by clients¹

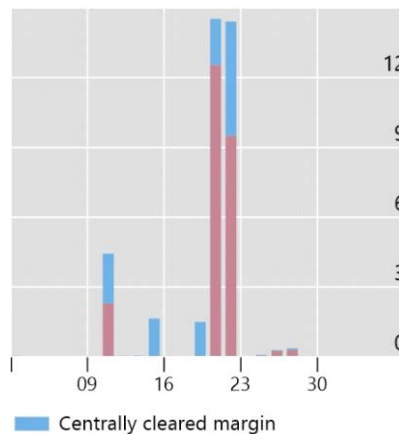
In billions of US dollars

Figure C.4

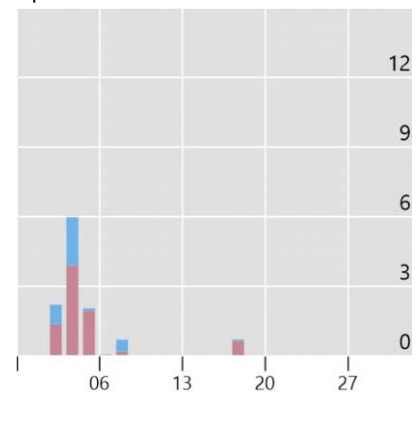
February 2020



March 2020



April 2020



¹ Clients were asked to report their peak total margin payment for centrally and non-centrally cleared derivatives in each of February, March and April 2020. These data do not therefore make explicit nor imply any trend in the pattern of margin payments across the March–April 2020 period as a whole. Further, these data serve only as a snapshot of peak margin demands on certain dates for individual survey respondents. Where more than one client reported a peak margin payment on a given day, the aggregate value is shown. For confidentiality reasons, where only one client reported a peak margin payment on a given day this is not shown. Based on 22 responses.

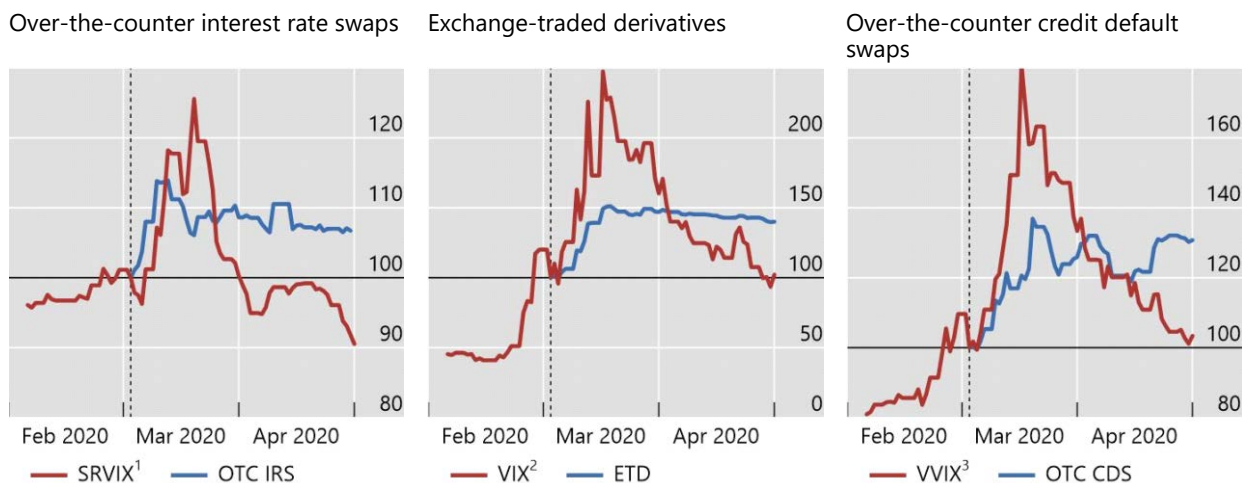
Source: Client survey.

2 Drivers of IM calls

Change in CCP initial margin on static portfolios vs change in the volatility proxy

2 March 2020 = 100

Figure C.5



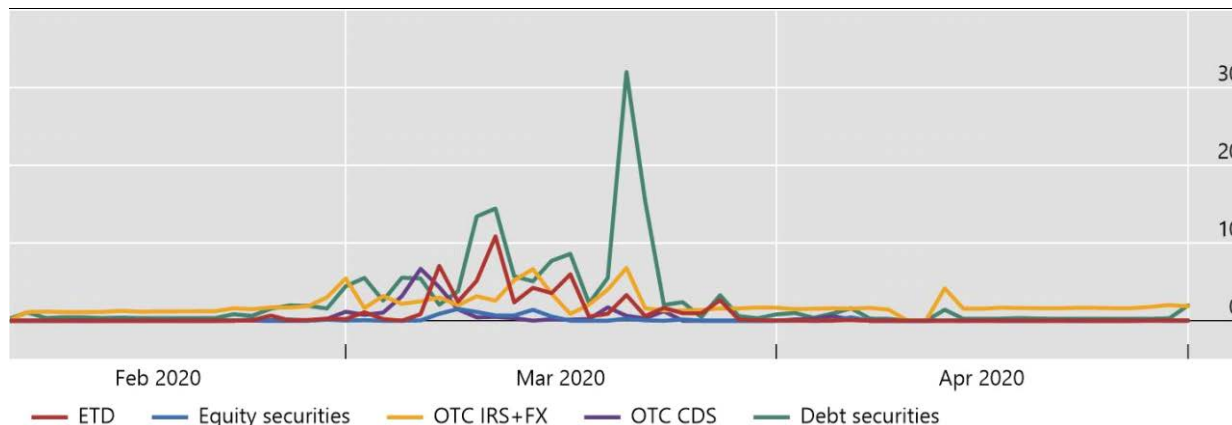
¹ SRVIX Index is the Chicago Board Options Exchange IRS volatility index and is based on the volatility of one-year swaptions on 10-year USD IRS. ² VIX is the Chicago Board Options Exchange Volatility Index derived from the prices of S&P 500 index options. ³ The Chicago Board Options Exchange VVIX Index is a volatility of volatility measure and represents the expected volatility of the 30-day forward price of VIX.

Sources: IOSCO Financial Stability Engagement Group's Data Working Group survey of CCPs; Chicago Board Options Exchange.

Top two initial margin exceedances/default funds across CCPs by asset class¹

In per cent

Figure C.6



ETD = exchange-traded derivatives; OTC CDS = over-the-counter credit default swaps; OTC IRS+FX = over-the-counter interest rate swaps and foreign exchange.

¹ Chart values represent the sum of the loss exceeding initial margin for the two clearing members with the largest loss exceeding initial margin on a particular day at each CCP aggregated across all CCPs within a given asset class, divided by the sum of default fund contributions for all CCPs within the same asset class.

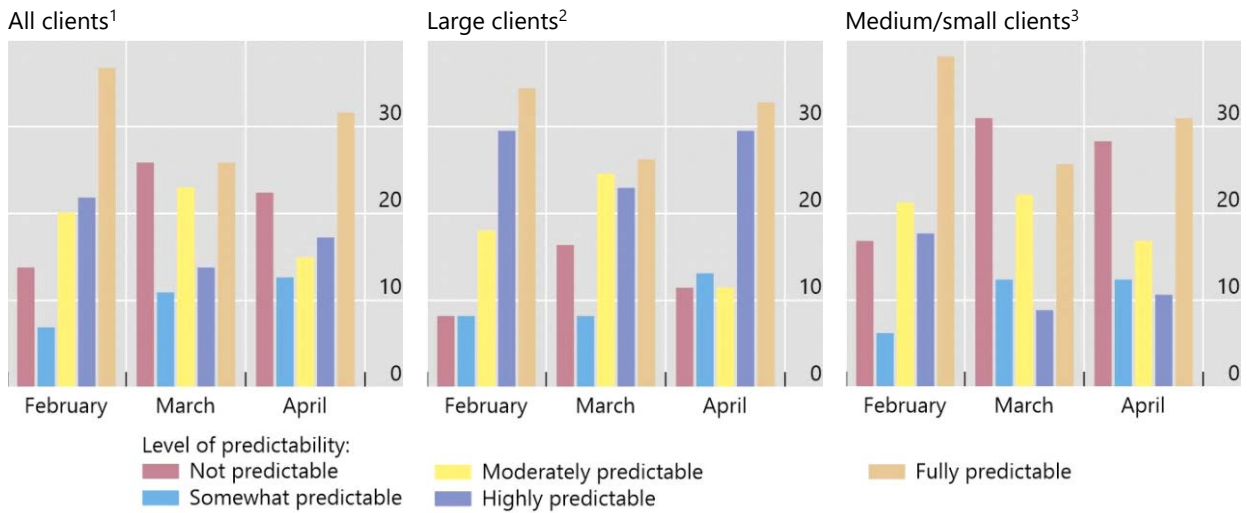
Source: IOSCO Financial Stability Engagement Group's Data Working Group survey of CCPs.

3 Transparency of margining practices

Respondents with a given level of predictability over time

Percentage of respondents reporting a given level of peak margin predictability

Figure C.7



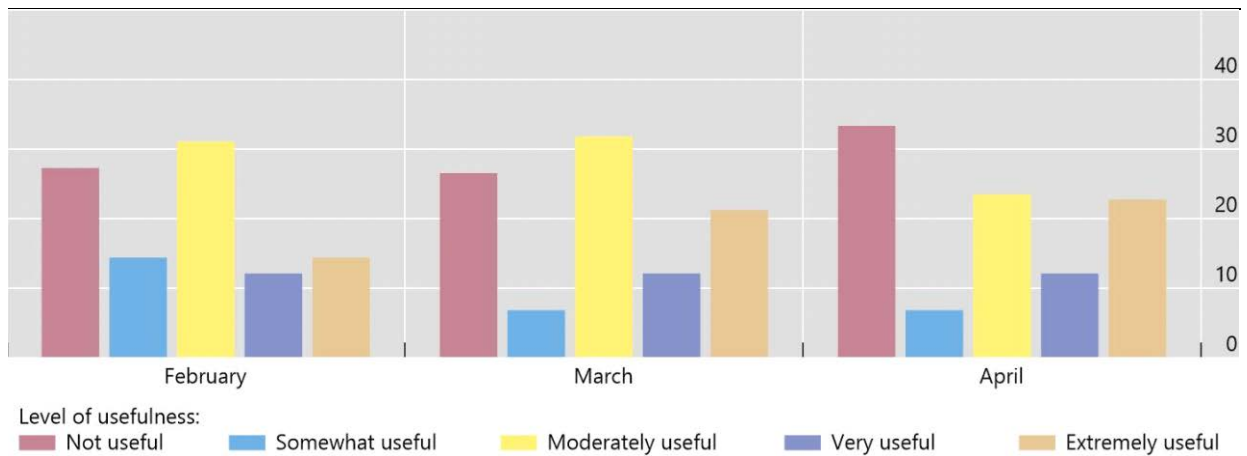
¹ Based on 47 responses. ² Based on 16 responses. ³ Based on 31 responses.

Source: Client survey.

Respondents reporting a given level of usefulness of support over time

Percentage of respondents reporting a given level of usefulness of tools/support¹

Figure C.8



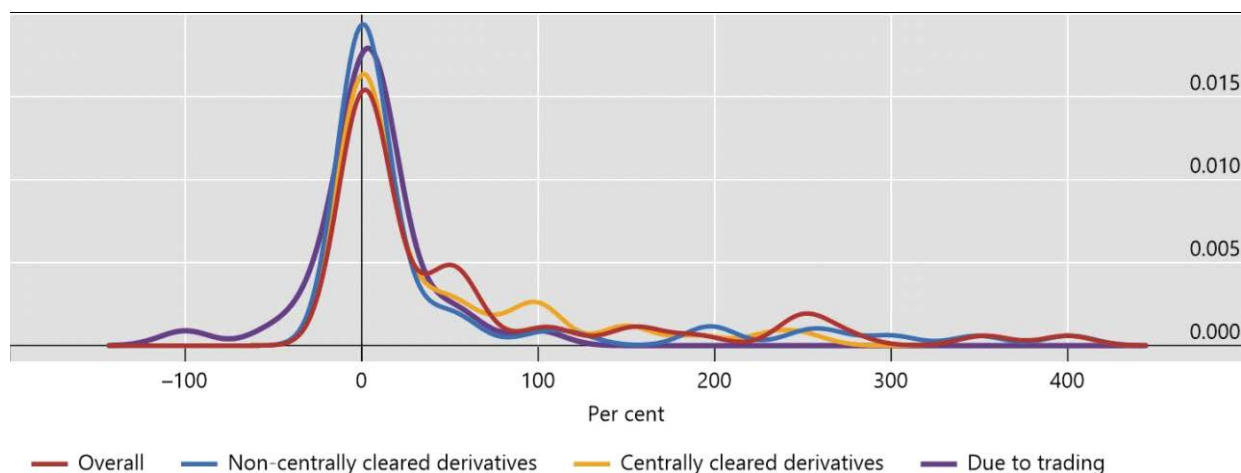
¹ Based on 47 responses.

Source: Client survey.

4 Preparedness of market participants

Distribution of changes in liquidity needs¹

Figure C.9

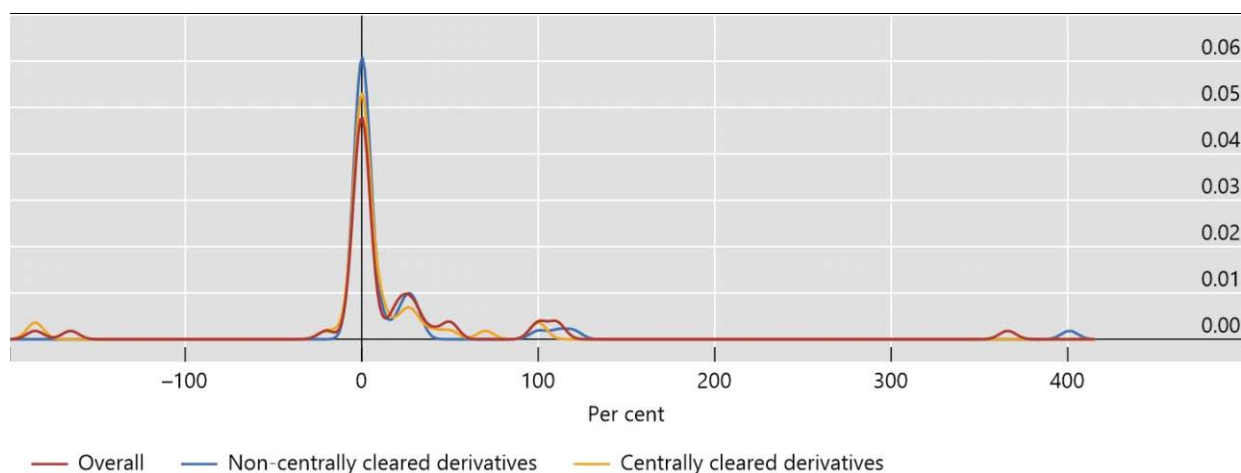


¹ A kernel density estimate has been used to plot the probability density function of the changes in liquidity needs reported by respondents for each category: overall liquidity needs; liquidity needs due to non-centrally cleared derivatives; liquidity needs due to centrally cleared derivatives; and liquidity needs due to trading activities. The kernel smoother allows for the visualisation of the data on a continuous interval where peaks in the distribution indicate a higher concentration of data points contained in that continuous interval in the data. The “overall”, “non-centrally cleared derivatives” and “centrally cleared derivatives” curves are estimated based on 47 responses; “not applicable” responses were removed for the “due to trading” curve, which is based on 31 responses.

Source: Client survey.

Distribution of deviations from estimates of liquidity needs in March 2020¹

Figure C.10



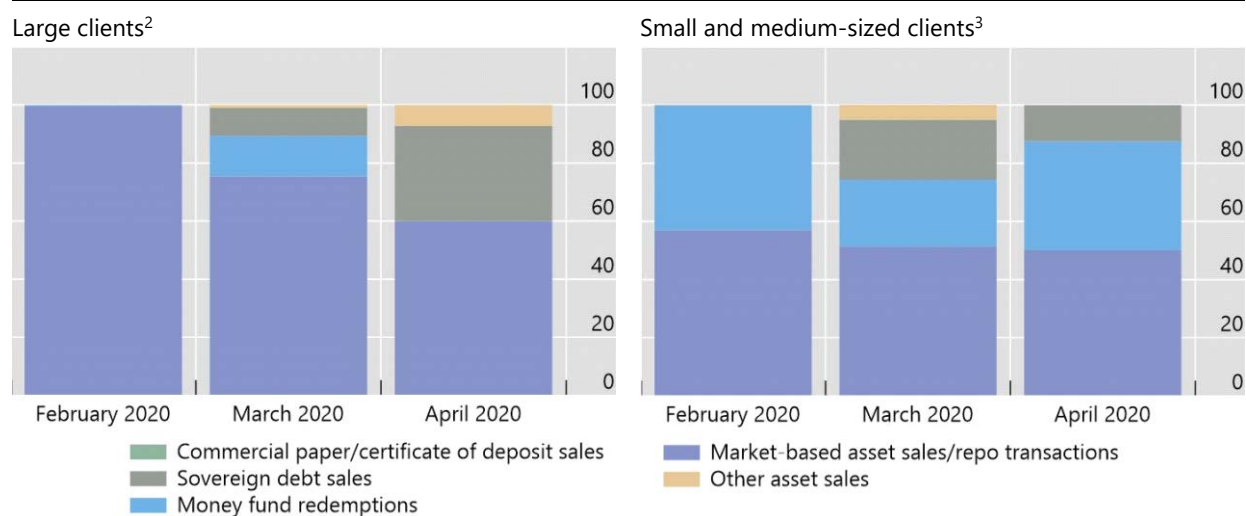
¹ A kernel density estimate is used to plot the probability density function of the deviations from estimates of liquidity needs reported by respondents for each category: deviations from estimates of overall liquidity needs; deviations from estimates of liquidity needs due to non-centrally cleared derivatives; and deviations from estimates of liquidity needs due to centrally cleared derivatives. The kernel smoother allows for the visualisation of the data on a continuous interval, where peaks in the distribution indicate a higher concentration of data points contained in that continuous interval in the data. All curves are estimated based on 47 responses.

Source: Client survey.

Overall liquidity management by client size¹

Cross-sectional average fractions of total asset sales by category, in per cent

Figure C.11



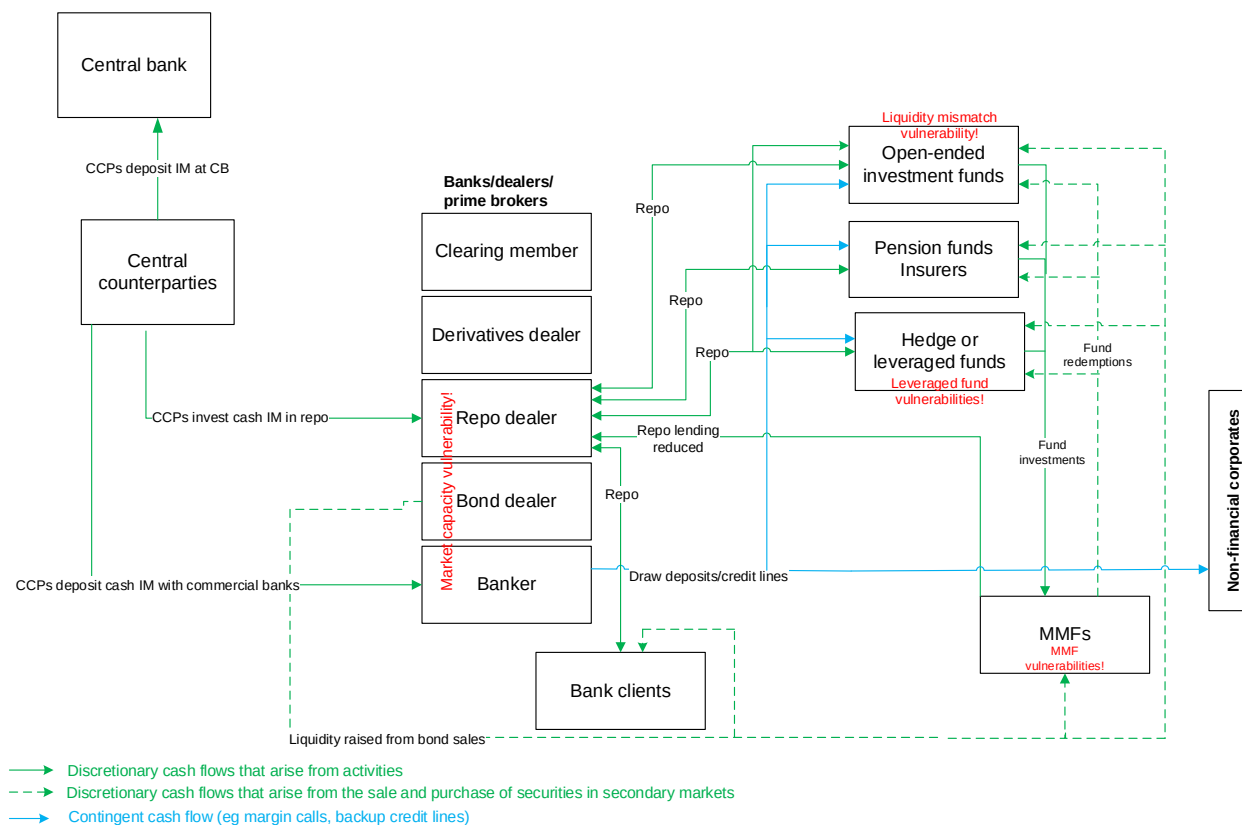
¹ Given the relatively small number of respondents, results may not be fully representative of client experiences during the February–April 2020 period. ² Based on four responses in February, five responses in March and five responses in April. ³ Based on seven responses in February, 10 responses in March and eight responses in April.

Source: Client survey.

Annex D: Additional interconnectedness maps

The resulting liquidity-raising

Figure D.1

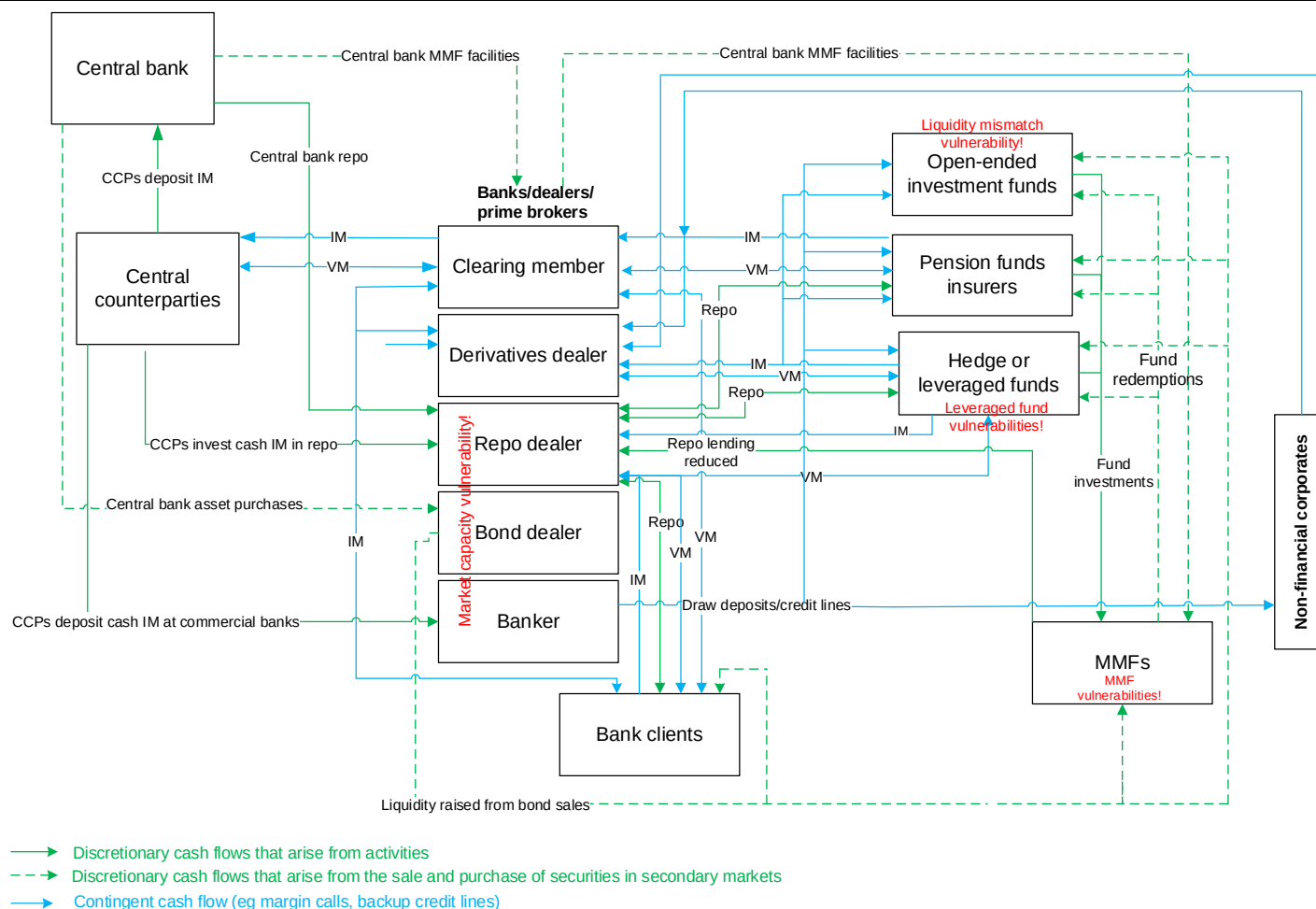


IM = initial margin; MMF= money market funds; VM = variation margin. Repo includes both repurchase agreements as well as transactions that are economically similar to repurchase agreements, such as securities lending transactions.

Source: FSB Working Group on Interconnectedness Mapping.

Margin calls, liquidity-raising and central bank support

Figure D.2



IM = initial margin; MMF= money market funds; VM = variation margin. VM transferred between clearing members and CCPs is generally paid in cash. IM can be paid in a combination of cash and securities. Repo includes both repurchase agreements and transactions that are economically similar to repurchase agreements, such as securities lending transactions.

Source: FSB Working Group on Interconnectedness Mapping.

Annex E: 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)	Sarah Harris (until Apr 2021) Ellis Connolly (from Apr 2021) Matt Gibson*
European Central Bank (ECB)	Ulrich Bindseil (until Jul 2021) Daniela Russo (from Jul 2021) Francesco Vacirca* (from Jul until Aug 2021) Simonetta Rosati* (from Sep 2021) Linda Fache Rousová*
European Commission	Gilles Herve*
European Securities and Markets Authority	Klaus Löber Benjamin Schiessle*
Bank of France (BdF)	Thomas Carré* (until Jul 2021) Katia Pascarella* (from Jul 2021) Alexandre Garcia* Frederic Hervo*
Bundesanstalt für Finanzdienstleistungsaufsicht	Marcus Hein Benjamin Stricker*
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	Tokio Morita (until Aug 2021) Yuji Yamashita (from Aug 2021) Oi Hidetoshi* Yuya Oshima*
Bank of Mexico (CBM)	Orlando Luisillo*

Comisión Nacional Bancaria y de Valores	Jose Antonio Quesada Mireya Suarez* Sara Gonzalez*
Netherlands Bank (DNB)	Olaf Sleijpen Luc Blommers (until Jun 2021)* Menno Broos (from Jun 2021)* Arlette Westdorp (until Jun 2021)* Robert Hofman (from Jun 2021)*
Central Bank of the Russian Federation**	Ivan Osipov (until Feb 2022)* Anastasia Andronova (until Feb 2022)* Yury Osintsev (until Feb 2022)*
Monetary Authority of Singapore (MAS)	Nathanael Lim (until Mar 2021)* Ian Chung (from Mar 2021)* Yolanda Constantine*
Swiss Financial Market Supervisory Authority (FINMA)	Michael Piller*
Bank of England (BoE)	Christina Segal-Knowles# Barry King* Jelena Bjelanovic (until May 2021)* Mark Dufford (from May 2021)*
UK Financial Conduct Authority	Carmel Deenmamode*
Board of Governors of the Federal Reserve System (FRB)	Jennifer Lucier Travis Nesmith* Anna Amirdjanova (until Jun 2021)* John Feid (from Jun 2021)*
Federal Reserve Bank of New York (FRBNY)	Sishush Maru*
Office of the Comptroller of the Currency, US (OCC)	Chris McBride Ang Middleton*
US Commodity Futures Trading Commission (CFTC)	Suyash Paliwal Richard Haynes# Nancy Doyle*
US Securities and Exchange Commission (SEC)	Jeff Mooney David Li* Roy Cheruvelil*
FSB Analytical Group on Vulnerabilities Chair	Denis Beau

Secretariats

Basel Committee on Banking Supervision	Carolyn Rogers (until Dec 2021) Neil Esho Tomas Edlund Verena Seidl (from Jan 2022)
Committee on Payments and Market Infrastructures	Tara Rice Takeshi Shirakami Jenny Hancock
International Organization of Securities Commissions	Martin Moloney (from Sep 2021) Tajinder Singh Patricia Saenz de Maturana Shane Worner Kosuke Kishimoto Kris Nathanail-Brighton

Working group co-chair; * Working group member; ** The access of the Central Bank of the Russian Federation to all BIS services, meetings and other BIS activities has been suspended.

The Senior group on margin would like to extend its thanks to the:

- *Working group chairs:* Christina Segal-Knowles (BoE) and Richard Haynes (CFTC)
- *Workstream leads:* Linda Fache Rousová (ECB), Jeffrey Hasterok (CFTC), David Li (US Securities and Exchange Commission), Ang Middleton (OCC), Travis Nesmith (FRB) and Daniel Wright (BoE).
- *Members of the editing and data analysis teams:* Anna Amirdjanova (FRB), Pierre-Loïc Benoit (BdF), Martin Birn (BCBS), Ilaria Capelli (ECB), Jin-Wook Chang (FRB), Roy Cheruvellil (SEC), Pavel Chichkanov (BoE), Steven Cho (CFTC), Sarah Crowley (BoE), Nancy Doyle (CFTC), Moin El-Herroui (CFTC), Alexandra End (BIS), Linda Fache Rousová (ECB), Elena Falcettoni (FRB), John Feid (FRB), Thomas Ferry (BoE), Mark Fischer (FRBNY), Bernat Gual-Ricart (BoE), Jenny Hancock (CPMI), Jeffrey Hasterok (CFTC), Andrew Hawley (FRB), Dominic Hemming-Brown (BoE), Wenqian Huang (BIS), Amamaria Illes (BIS), Hulusi Inanoglu (FRB), Rehim Kilic (FRB), David Li (SEC), David Macdonald (BoE), Meghan Tente (CFTC), Rahul Nayee (BoE), Travis Nesmith (FRB), Lovrenc Orazem (BIS), Taejin Park (BIS), Samantha Riley (BoE), Patricia Saenz de Maturana (IOSCO), Thomas Shen (BIS), Oleg Sokolinskiy (FRB), Ricardo Torres (CFTC), Francesco Vacirca (ECB), Bernard van den Boom (DNB), Ellen van der Woerd (DNB), Daniel Wright (BoE), Vasileia Xezonaki (BIS), Huiming Yang (BIS), Sebastiano Michele Zema (ECB), Xiaobin Zhou (CFTC) and Markus Zoss (BIS).
- *Other members of the workstreams:* Nahiomy Alvarez (Federal Reserve Bank of Chicago, FRBC), Michelle Beck (SEC), Carlo Calvaruso (BoI), Melissa Cavers (CFTC), Kyle Clelan (CFTC), Mark Fischer (FRBNY), Fabiola Fonseca Lira (CBM), Roman Goldstein (OCC), Ryan Goodman (CFTC), Richard Hanrahan (BoE), William Heitner (CFTC), Markus Hyvonen (RBA), Nick Jackson (BoE), Argyris Kahros (ECB), Mary Kaminski (CFTC), Diego Monorchio (CONSOB), Adam Mortillaro (SEC), Charles O'Donnell (ECB), Ketan Patel (FRBC), Matt Roberts-Sklar (BoE), Kelly Rutz (OCC), Alberto Saavedra Espinosa (CBM), Sheila Swartz (SEC) and Justin Teo (MAS).
- *Data Working Group of IOSCO's Financial Stability Engagement Group.*