

Central Counterparty Margin Frameworks

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A central counterparty's (CCP's) margin framework can affect the activity of market participants and the broader functioning of the financial system. This potential impact on financial stability is an area of focus for authorities – in Australia and overseas – particularly as central clearing has grown in recent years. Additionally, the margin collected by CCPs is the first layer of financial resources held by a CCP to cover counterparty credit risk, so it is critical that a CCP's margining system is effective.

Introduction

A key role of a CCP is to manage counterparty credit risk (the risk that a counterparty does not fully meet its financial obligations) and liquidity risk (the risk that a counterparty has insufficient funds to meet its obligations) (Hancock, Hughes and Mathur 2016). CCPs stand between counterparties to a financial market trade. When a bilateral trade is 'novated' to a CCP, the original trade is replaced by two identical contracts between the CCP and each of the counterparties.¹ In this way, participants in centrally cleared markets are not directly exposed to credit or liquidity risks arising from the participant on the other side of the trade, though they remain exposed to market risk (the risk of financial losses due to price and valuation changes) on their positions. By contrast, a CCP is not exposed to market risk in the usual course of business because it stands between counterparties with opposite positions.

However, if a clearing participant defaults, the CCP must continue to meet its obligations to its surviving participants. The CCP therefore faces potential losses from further changes in the value of the defaulting participant's portfolio until it is able to close out or liquidate that participant's positions. CCPs manage this risk by holding prefunded financial resources in the form of margin and a default fund. Clearing participants must meet any margin requirements and contributions to the default fund by posting collateral (cash or high-quality liquid assets) with the CCP.

The Reserve Bank has supervisory responsibilities for the four CCPs licensed to operate in Australia (ASX Clear, ASX Clear (Futures), LCH Ltd's SwapClear service and CME Inc).² It carries out these responsibilities partly by assessing CCPs against a set of Financial Stability Standards (FSS) (RBA 2012).³ One of the areas the Bank pays particular attention to is CCPs' margin frameworks. CCP Standard 6 (Margin) in the FSS

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1 In markets that use an 'open offer' system, there is never a contractual relationship between the buyer and seller. Instead, when the counterparties agree to a trade, contracts are immediately established between the CCP and each of the counterparties.

2 The Bank works closely with the Australian Securities and Investments Commission in its supervision of CCPs.

3 The Bank's assessments of the licensed CCPs are available at <<https://www.rba.gov.au/payments-and-infrastructure/financial-market-infrastructure/clearing-and-settlement-facilities/assessments.html>>.

sets out the Bank’s expectations for the design and operation of a CCP’s margining framework.⁴

This article describes the role of margin in CCP risk management. It also discusses the broader effect that CCP margin can have on participants and the financial system, and outlines international regulatory work to enhance CCPs’ financial risk management in relation to margin.

How Margin Works

CCPs regularly collect three types of margin from their participants:

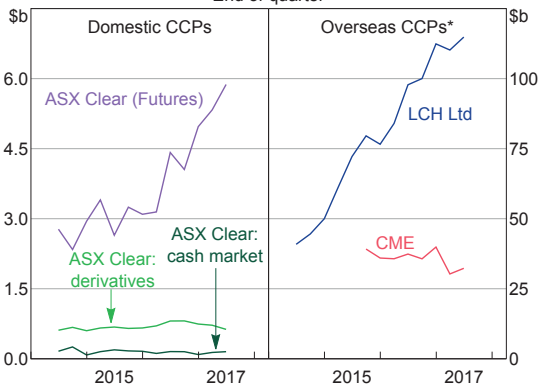
- *Variation margin*, which covers changes in the value of a participant’s positions resulting from actual changes in market prices. Variation margin prevents the build-up of current exposures; it is typically collected at least daily from participants with mark-to-market losses on their positions and is typically (although not always) paid out to participants with gains
- *Initial margin*, which is intended to cover a CCP’s potential future exposures on a participant’s positions in the event that the participant defaults. Initial margin is sized to cover adverse price changes, up to a specified amount (known as the confidence interval), during the length of time the CCP expects it will take to terminate or hedge its exposures to the defaulter’s positions. This period is known as the close-out period or margin period of risk. Initial margin is typically estimated with a model (see ‘Box A: Initial Margin Models’)
- *Additional margin*, which is levied to cover risks that are not necessarily captured in a

CCP’s initial margin model. For example, CCPs may collect additional margin to account for the risk that bid/ask spreads widen in periods of market stress, or the risk that it may take longer than expected to close out illiquid or highly concentrated portfolios.

As initial margin is an estimate of the potential future exposures of the CCP to its participants, it is an indicator of the magnitude of risks managed by a CCP (Graph 1). There is substantial variation between CCPs in the value of initial margin they collect, broadly in line with the size and nature of risks in the markets they serve. The total value of initial margin held at ASX Clear (Futures) and LCH Ltd SwapClear has increased significantly in recent years. This largely reflects increasing use of central clearing – especially for over-the-counter (OTC) derivatives, certain classes of which are subject to mandatory central clearing requirements in some jurisdictions, including Australia (CFR 2015).

Changes in initial margin held by a CCP can also reflect changes in the models used to estimate margin, the parameters used in those models, and the composition of participant portfolios. For example, initial margin held by ASX Clear (Futures)

Graph 1
Initial Margin – Australian-licensed CCPs
End of quarter



* OTC interest rate derivatives services only (covering all currencies); AUD equivalent
Sources: ASX; CME; LCH Ltd; RBA

4 The FSS implement the financial stability-related requirements in the international Principles for Financial Market Infrastructures (PFMI), published by the Committee on Payment and Market Infrastructures (CPMI) and the International Organisation of Securities Commissions (IOSCO) (2012).

increased in June 2016 as the CCP increased margin rates in response to the UK referendum on EU membership. The increase since mid 2016 has been driven largely by strong growth in trading in 10-year Treasury bond futures.

The effectiveness of a CCP's margining framework also depends on the broader operational and technological arrangements of the CCP. Margin calculations require a large amount of accurate and timely data on positions and prices. These calculations need to be done at least daily, and ad hoc calculations may need to be produced quickly in response to significant market developments. CCPs also need to issue margin calls and receive and pay margin amounts quickly and accurately, so margining systems must be well integrated with operational processes.

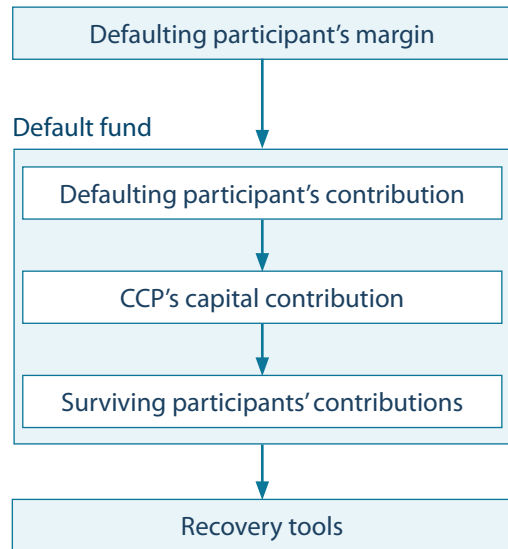
Margin and the default waterfall

CCPs maintain prefunded resources (in the form of margin and a default fund) to cover losses incurred during the close-out of a defaulting participant's portfolio. The order of application of these resources, as well as the CCP's other loss-allocation tools, is known as the CCP's default waterfall (Figure 1).

In a typical CCP default waterfall, the defaulting participant's margin (initial margin and any additional margin held by the CCP) is used first to cover losses during the close-out process. Margin is a 'defaulter-pays' resource; it is not mutualised, so the margin of non-defaulting participants cannot be used to cover losses.

In contrast, the default fund (which generally comprises contributions from the CCP and its participants) is mutualised. This means contributions from surviving participants can be used to cover losses of the defaulting participant if the defaulting participant's margin is exhausted. Typically, losses are first applied to

Figure 1: Typical CCP Default Waterfall



Source: RBA

the defaulting participant's contribution to the default fund, then the CCP's contribution and, lastly, to the surviving participants' contributions. In the event that the CCP's total prefunded resources are not sufficient to cover losses on a defaulting participant's positions, CCP rulebooks provide for 'recovery tools' to allocate remaining losses (for more detail on recovery tools, see CPMI-IOSCO (2017a)). Globally, authorities are also establishing resolution regimes for CCPs so that CCPs' critical services continue to operate even in times of extreme stress (which could include scenarios in which a CCP is unable to effectively implement its recovery tools).

The four CCPs licensed to operate in Australia size their total prefunded resources (margin and default fund) to cover the default of the largest two participants and their affiliates in extreme but plausible market conditions. This is the 'Cover 2' regulatory requirement, and is the internationally agreed standard that applies to CCPs that clear complex products or are systemically important in more than one jurisdiction.

Box A

Initial Margin Models

The FSS and Principles for Financial Market Infrastructures (PFMI) impose principles-based requirements, and do not prescribe the type of model CCPs must use to determine initial margin requirements. Instead, they set standards for how these models are designed to ensure they are robust and appropriately conservative. CCPs commonly use either a Standard Portfolio Analysis of Risk (SPAN) model or a Historical Value at Risk (HVaR) model to calculate their initial margin requirements.

In SPAN models, margin requirements are determined based on hypothetical market shocks, which in turn are derived using historical data on changes in price and volatility. Initial margin requirements are calculated separately for each product cleared by the CCP. Inter-product offsets may then be applied, which reduce the margin requirement on a portfolio of positions. This recognises the fact that prices of economically related products tend to be correlated. For example, the prices of Treasury bond futures with different durations tend to move together; therefore, at ASX Clear (Futures), a portfolio with long positions in 10-year Treasury bond futures and short positions in 3-year Treasury bond futures receives an inter-product offset because losses from one contract are likely to be partly offset by gains in the other contract.

In HVaR models, the margin requirement is calculated by valuing the participant's entire portfolio using historical price moves. The portfolio is valued for each day in a historical time series, as if the participant's current portfolio faced

the same price moves as occurred in each period in the past. The initial margin requirement is set to cover losses up to a certain level implied by the resulting distribution of historical valuations. Because the margin requirement is calculated at the portfolio level (rather than for each product individually), explicit adjustments to recognise offsets are not required. CCPs may also make certain adjustments to the basic HVaR model to better capture current market conditions.

Neither SPAN nor HVaR models consistently produce higher margin requirements than the other. Instead, it depends on how they are implemented. In particular, there are three key parameters on which all initial margin models rely:

- *Lookback period*, which is the sample period of historical price data used in the model. A lookback period that includes periods of market stress will produce a higher margin requirement
- *Margin period of risk (close-out period)*, which is the assumed length of time that it would take to close out or hedge a defaulting participant's portfolio, during which the CCP is exposed to adverse price movements. A longer margin period of risk tends to produce higher margin requirements
- *Confidence interval*, which is the target coverage of initial margin over potential future exposures. The FSS require CCPs to size their initial margin to be able to cover at least 99 per cent of estimated future exposures (for example, due to potential future price

changes). A higher confidence interval will produce a higher margin requirement.

CCPs most commonly use SPAN models to margin exchange-traded derivatives, while variants of the HVaR model are most common for OTC interest rate derivatives (CPMI-IOSCO 2016). This partly reflects that in a SPAN model, the hypothetical market shocks for each product need to be set explicitly. Although this is relatively simple for exchange-traded futures and

options, it is burdensome for complex products such as OTC interest rate derivatives. The Bank's periodically published assessments of the ASX CCPs, LCH Ltd's SwapClear service and CME Inc provide further detail on the margin models used by these CCPs.

The FSS require that CCPs conduct rigorous analysis of their initial margin models to ensure that they adequately capture the risks associated with the products they clear.

Despite the important loss-absorbing role of CCP default funds, in most cases they are a relatively small proportion of a CCP's total balance sheet (Graph 2). That said, while initial margin holdings in aggregate are large, in general the only part that can be used to cover losses arising from a participant default is the margin posted by that particular participant.

The trade-off between margin and the default fund

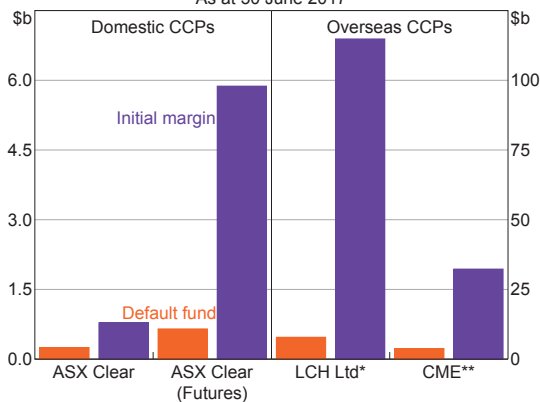
The FSS give CCPs discretion over the composition of their prefunded resources, providing they meet minimum requirements. As described above, margin and the default fund are tools for meeting the same objective – covering exposures to potential future losses. However, how a CCP allocates its prefunded resources between (i) defaulter-pays resources (initial and additional margin), and (ii) mutualised resources and a CCP's own resources (together, the default fund) affects the costs and incentives faced by participants. When potential future exposures are covered with initial margin, an individual participant bears the costs of the trades it brings to the CCP. By contrast, when they are covered with the default fund, costs are shared across participants and also borne by the CCP.

These costs and incentives play out through several channels, most notably:

- the cost of trading, which increases with margin requirements; as well as affecting participants, this also affects CCPs through reduced revenues

Graph 2
Prefunded Financial Resources
– Australian-licensed CCPs

As at 30 June 2017



* Initial margin for OTC interest rate derivatives service only (covering all currencies); default fund covers OTC interest rate derivatives and listed rates services; AUD equivalent

** OTC interest rate derivatives service only (covering all currencies); AUD equivalent

Sources: ASX; CME; LCH Ltd; RBA

- the risk that a participant or the CCP itself will bear losses resulting from the default of another participant; this risk declines as margin requirements increase.

Ultimately, the balance of margin and default fund chosen by a CCP will depend on the weight placed on each of these factors.⁵ These trade-offs are discussed further in Carter and Garner (2015).

From a system-wide perspective, authorities may take a different set of factors into account when considering a CCP's margin framework. Factors may include the moral hazard associated with low margin requirements (whereby participants may not fully bear the costs of their positions, which may encourage riskier behaviour) and the effect on incentives facing participants to appropriately manage risk and monitor the CCP. In part to avoid the risk that CCPs respond to competitive pressures to reduce margin rates below a prudent level, the PFMI and FSS place some limits on the composition of a CCP's prefunded resources by requiring CCPs to cover at least 99 per cent of potential future exposures with initial margin.

System-wide Effects of CCP Margin

As discussed above, the robustness of a CCP's margin framework is critical for its risk management, and is therefore a key focus for the Bank in its oversight of licensed CCPs. But CCP margin requirements can have broader implications for market participants and the financial system more generally. This is recognised in the PFMI and FSS, which require CCPs to consider the stability of the financial system and other relevant public interest considerations in their decision-making. In addition, the *Corporations Act 2001* states that

a clearing and settlement facility must, as well as complying with the FSS, do all other things necessary to reduce systemic risk, to the extent that it is reasonably practicable to do so.

Interdependencies and demand for collateral

The greater use of central clearing over recent years has increased the amount of risk managed by CCPs. Consequently, CCP initial margin (and default fund) requirements have also risen. For example, aggregate initial margin held by LCH Ltd's global SwapClear service has more than tripled since 2014 to \$115 billion (Graph 1). Participants must meet margin requirements and default fund contributions by posting collateral to the CCP. CCPs restrict the types of collateral they accept to cash or high-quality liquid non-cash collateral to ensure that it can be liquidated in a timely manner, with minimal loss of value. Although CCPs require these resources for the narrow purpose of managing their counterparty credit risk, this demand for high-quality liquid assets has broader effects on the financial system.

CCP margin has been identified as an important driver of the increasing demand for high-quality liquid assets, adding to demands resulting from other reforms such as Basel III capital requirements and initial margin requirements for non-centrally cleared derivatives (Manning 2014). Authorities and market participants continue to debate the effect of these demands on the functioning of collateral markets. For example, it is possible that participants that do not typically have holdings of high-quality collateral may need to borrow it, further increasing links among financial institutions (Committee on the Global Financial System 2013).

The large and growing collateral holdings of CCPs are also increasing these entities' systemic importance, although these collateral holdings

⁵ Haene and Sturm (2009) and Carter, Hancock and Manning (2016) develop models of a CCP's choice between margin and default fund, taking into account these incentive effects under different scenarios.

are driven by necessary CCP risk management. CCPs invest cash collateral they receive from participants, typically through outright purchases of government bonds, reverse repurchase agreements (secured by government bonds) or deposits at commercial banks or central banks. This means that CCPs are also exposed to the risks of their investment counterparties defaulting. Recent international analysis on interdependencies between 26 of the largest global CCPs and their clearing participants and service providers found that a relatively small set of large counterparties provided investment services to many of these CCPs. There is also evidence that more active clearing participants are also likely to be CCPs' main investment counterparties (BCBS, CPMI, FSB and IOSCO 2017). The PFMI and FSS require a CCP to monitor and mitigate the risks its investment counterparties pose. International work continues in order to better understand the potential risks that arise from CCPs' links to the rest of the financial system.

Variation margin may also have a systemic impact by affecting the distribution of liquidity among participants. Most notably, to meet variation margin payments, participants with mark-to-market losses may need to liquidate assets or positions relatively quickly (Pirrongo 2011). Although variation margin calls can impose significant liquidity costs on individual participants with mark-to-market losses, a CCP typically directly passes this through to participants with gains. Such variation margin calls therefore do not directly affect the aggregate liquidity available in the financial system.

Procyclicality

Margin requirements are procyclical if they are positively correlated with market fluctuations. For example, it is not unusual for margin to increase in periods of heightened volatility. Such

increases may be appropriate and necessary to ensure the CCP maintains sufficient coverage against counterparty credit risk. However, rapid increases in margin requirements during a period of heightened volatility may exacerbate market stress. This is because margin calls must be funded with cash or other high-quality collateral, potentially at a time when participants already face high demand for this collateral and shortages in liquidity.

A notable example of the effects of procyclicality on the broader market occurred during the 2011 eurozone sovereign debt crisis. In November 2011, as the spread between yields on Italian and German government securities widened, two CCPs that clear repurchase agreements (LCH SA and Cassa Di Compensazione e Garanzia SPA) significantly increased their margin requirements on Italian securities (IMF 2013). The Italian central bank has suggested that these margin calls led to a further widening of this spread and reduced liquidity in the system when it was most needed (Banca d'Italia 2012).

Consequently, procyclicality in margin requirements has been a focus of authorities over recent years. Under the PFMI and FSS, CCPs should limit destabilising procyclical changes in margin – to the extent practicable and prudent – by adopting forward-looking, conservative and relatively stable margin requirements. This recognises that, while mitigating procyclicality is important, CCPs should ensure they still maintain adequate margin coverage.

CCPs commonly mitigate procyclicality by placing floors on margin rates or model parameters, and by including data from stressed market episodes in the calibration of margin models. Imposing floors can limit declines in margin rates in periods of low volatility, so that margin rates do not increase so much when volatility does. Including stressed market

episodes in the lookback period results in higher margin requirements, even when current conditions are relatively stable.⁶ For example, the lookback period for ASX Clear (Futures)' OTC derivatives model starts in June 2008, so it includes the global financial crisis.

International Regulatory Developments

As part of international efforts to enhance the resilience of CCPs, CPMI and IOSCO monitor the implementation of the PFMI, both by relevant authorities within jurisdictions as well as by specific financial market infrastructures. In 2016, CPMI and IOSCO published a report examining the financial risk management practices, including margin arrangements, of 10 derivatives CCPs (CPMI-IOSCO 2016). This report found that, although the surveyed CCPs had made important and meaningful progress in implementing the PFMI, there were some differences in interpretation or approach that could materially affect resilience. With respect to CCP margin arrangements, the report highlighted that not all surveyed CCPs systematically took into account all relevant factors in their choice of margin model. It also noted some differences across CCPs in the conservatism of assumptions for key model parameters.

The results of this exercise were a key motivating factor behind the July 2017 publication by CPMI and IOSCO of additional guidance on the PFMI (CPMI-IOSCO 2017b). The additional guidance seeks to clarify and elaborate on existing requirements in the PFMI related to CCP resilience, including margin practices. Notably, the guidance clarifies the expectation that CCPs should have clear analytical justification for the assumptions behind key margin model parameters, provides further detail regarding

margin model testing and review, and sets further expectations regarding the management of procyclicality of margin.

The Bank has adopted the new guidance and will apply it in interpreting the relevant standards in the FSS. The Bank will consider how the Australian-licensed clearing and settlement facilities' risk management aligns with this guidance as part of its supervision over the period ahead.

Conclusion

Margin is fundamental to how a CCP manages counterparty credit risk. In the event that a participant defaults, this participant's initial margin is the first layer of resources available to the CCP to cover any losses incurred while it closes out the defaulting participant's portfolio. Given the importance of margin, the PFMI and FSS require that CCPs ensure their margin frameworks are effective and robust, and that margin is set at levels commensurate with the risks of the products the CCP clears.

As this article has discussed, the design of a CCP's margin framework also affects the broader financial system. CCP margin requirements have contributed to increased demand for high-quality liquid assets, alongside increasing demand arising from regulatory reforms to financial markets more broadly. The need for CCPs to invest this collateral may also further increase the links these entities have to the broader financial system. In addition, potential procyclical changes in CCP margin requirements might exacerbate stress in volatile market conditions.

Authorities internationally continue to consider the effect of these reforms on financial markets, and the interdependencies of CCPs to other financial institutions. The new international guidance for CCPs clarifies existing requirements in the PFMI to further enhance the resilience of

⁶ See Murphy, Vasios and Vause (2014) for more information on procyclicality in initial margin models.

CCPs while recognising the possible systemic impact of margin frameworks (and risk management more broadly). ❖

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