Assessment of LCH Limited's SwapClear Service

December 2019

Contents

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Executive Summary

Purpose

This report presents the Reserve Bank of Australia's (the Bank's) annual Assessment of LCH Limited's (LCH Ltd's) SwapClear service, which operates in Australia under an overseas clearing and settlement (CS) facility licence. It details LCH Ltd's compliance with the *Financial Stability Standards for Central Counterparties* (CCP Standards) and with the obligation to do all other things necessary to reduce systemic risk over the 12 months ending 30 September 2019.

As a systemically important CS facility operated under an overseas licence, LCH Ltd is subject to an ongoing assessment against the CCP Standards over a rolling four-year period. The CCP Standards assessed this year were governance, margin, liquidity risk, money settlements, segregation and portability, operational risk and tiered participation arrangements.

Conclusion

In the assessment period, LCH Ltd has either met or made progress towards meeting the regulatory priorities identified by the Bank in its previous Assessment. The Bank therefore concludes that LCH Ltd has conducted its affairs in a manner that causes, or promotes, overall stability in the Australian financial system.

Progress Towards 2018/19 Priorities

During the assessment period, LCH Ltd extended its flexible opening time by one hour to 4am UK time, and provided the Bank with analysis of the challenges and considerations of further extensions to operating hours. LCH Ltd made improvements to its Protected Payment System (PPS) contingency arrangements and began exploring complementary solutions.

Other Material Developments

Other material developments relevant to the Bank's oversight of LCH Ltd that occurred during the assessment period include:

- a review of the effectiveness of recent changes to LCH Ltd's governance arrangements.
- developments related to operational and cyber risk, including in LCH Ltd's oversight and management of critical service providers.
- improvements in the areas of access to foreign exchange market liquidity and the validation of margin system add-ons.
- developments in LCH Ltd's framework for managing and monitoring tiering risks from client clearing.

Priorities for 2019/20

The Bank's practice is to set regulatory priorities where it expects LCH Ltd to conduct additional work to enhance its observance of the CCP Standards. This assessment carries over both priorities from 2018/19, regarding the extension of SwapClear's operating hours and improvements to LCH Ltd's PPS contingency arrangements.

In its supervision of LCH Ltd in the next 12 months, the Bank will also monitor: how it manages operational and cyber risks; and the governance of LCH Ltd's model validations.

1. Summary of Regulatory Priorities

This section summarises actions taken by LCH Ltd over the 2018/19 assessment period to meet the Bank's regulatory priorities, and developments related to the Bank's areas of supervisory focus. It also summarises the regulatory priorities and areas of supervisory focus identified by the Bank for the next assessment period.

In June 2019, the Bank updated its policy approach to supervising and assessing CS facility licensees.[1] The changes have sought to align the frequency, scope and level of detail of assessment of a CS facility licensee to be proportionate with the degree of systemic risk posed by the CS facility to the Australian financial system. In addition, for an overseas CS facility licensee, the approach allows for deference to the primary regulator when the home regulatory regime is sufficiently equivalent to that in Australia and there are satisfactory information sharing and cooperation arrangements with the relevant overseas authorities.[2]

In line with the revised approach, as a systemically important overseas CS facility, LCH Ltd will be assessed against the FSS over a rolling four year period. These detailed compliance assessments will not be published. Certain standards may be reviewed more frequently depending on market and business developments, as well as the priorities of the Bank.

1.1 Review of Regulatory Priorities

1.1.1 Extension of operating hours

Extension of operating hours. LCH Ltd should continue to work to extend the operating hours of the SwapClear service while ensuring the safety and resilience of its operations. LCH Ltd should finish its analysis of the technical and operational challenges to extend its operating hours, and provide it to the Bank along with a plan of how it expects to address this regulatory priority.

CCP Standards 6 (Margin) and 16 (Operational risk)

During the assessment period, LCH Ltd extended its flexible opening time by one hour to 4am UK time, and provided the Bank with a high-level analysis of the key challenges and considerations it would face when extending its operating hours further (section 2.1.1). The Bank has carried this regulatory priority forward to the 2019/20 assessment period (section 1.3.1).

1 For more information see *the Reserve Bank's Approach to Supervising and Assessing Clearing and Settlement Facility Licensees*. Available at <https://www.rba.gov.au/payments-and-infrastructure/financial-market-infrastructure/clearing-and-settlement-facilities/standards/approach-to-supervising-and-assessing-csf-licensees.html>.

2 The Corporations Act provides for two classes of CS facility licence: a 'domestic' licence granted under s824B(1); and an 'overseas' licence granted under s824B(2).

1.1.2 Protected Payment System contingencies

> **Protected Payment System contingencies.** LCH Ltd should improve its PPS contingencies to ensure payments to and from LCH Ltd can continue to occur in a timely manner, in the event of a PPS bank outage or failure. LCH Ltd should provide its plan to the Bank for how it will improve its PPS contingencies, and begin implementing it.
>
> CCP Standard 9 (Money settlements)

LCH Ltd has made progress towards improving the effectiveness of its PPS contingency arrangements by implementing enhancements to its processes and by exploring contingency arrangements that are timely and robust for its members (section 2.1.2). As some of these developments remain in the early stages and the benefits are yet to be demonstrated, this regulatory priority has been carried forward to the 2019/20 assessment (section 1.3.2).

1.2 Progress in Areas of Supervisory Focus

1.2.1 Governance

> **Governance.** The effectiveness of LCH Ltd's governance arrangements.
>
> CCP Standard 2 (Governance)

Over recent years there has been a focus on the governance arrangements in place at LCH Ltd to improve the independence and effectiveness of its Board (section 2.2.1). During this assessment period, the Bank has reviewed the outcomes of these changes and is satisfied that LCH Ltd's approach to governance has become more robust. This area of supervisory focus is now closed.

1.2.2 Operational and cyber risk management

> **Operational and cyber risk management.** LCH Ltd's ongoing work to enhance its operational risk management (including its outsourcing and critical service provider arrangements), and cyber risk management.
>
> CCP Standards 2 (Governance) and 16 (Operational risk)

LCH Ltd has continued to take action to enhance its management of operational and cyber risks (section 2.2.2). LCH Ltd has focussed on improving how it manages relationships with related entities and outsourced critical service providers, including through greater oversight and performance monitoring. LCH Ltd has also made progress on several action items related to cyber risk from its resilience program of work. As this work is ongoing, the Bank will continue to monitor LCH Ltd's management of operational and cyber risks in the next assessment period (section 1.4.1).

1.2.3 Financial risk management

Financial risk management. LCH Ltd's analysis of, and improvements to, its financial risk management in areas including: access to foreign exchange markets, including in periods of market stress; and validation of margin add-ons as well as the margin system as a whole.

CCP Standards 6 (Margin) and 7 (Liquidity risk)

During the assessment period, the Bank reviewed LCH Ltd's access to foreign exchange markets for minor currencies and its validation of the SwapClear margin system against the Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO) *Resilience of central counterparties (CCPs): Further guidance on the PFMI* (CCP Resilience Guidance) (section 2.2.3). In almost all cases, LCH Ltd's practices align with the guidance. There is one area, related to the governance of LCH Ltd's model validations, where the Bank considers further evidence of analysis is required in the next assessment period (section 1.4.2).

1.2.4 Tiering

Tiering. Developments in how LCH Ltd monitors and mitigates tiering risk with respect to client clearing.

CCP Standards 13 (Segregation and portability) and 18 (Tiered participation arrangements)

During the assessment period, LCH Ltd has taken steps to improve its management of risks associated with client clearing (section 2.2.4). In particular, LCH Ltd has clarified its approach for monitoring and managing tiering risk and has also made changes to its default fund allocation methodology to incorporate client risk directly. As a result of LCH Ltd's progress, the Bank has closed this area of supervisory focus.

1.3 2019/20 Regulatory Priorities

The Bank sets regulatory priorities for LCH Ltd based on its assessment of LCH Ltd. The Bank will engage directly with LCH Ltd regarding its progress towards these priorities.

1.3.1 Extension of operating hours

Extension of operating hours. LCH Ltd's future business developments (including the transition to risk-free benchmarks) should not negatively affect operating hours. Further extensions to the operating hours of the SwapClear service are expected to be delivered in the medium term while maintaining the resilience of its operations. In the coming period, LCH Ltd must provide the Bank with an approved timeline for the initial phase of work and keep the Bank informed of its progress by providing regular updates.

CCP Standards 6 (Margin) and 16 (Operational risk)

The regulatory priority on extending SwapClear's operating hours has been carried over from the current assessment period (sections 1.1.1 and 2.1.1). Although the flexible opening time was extended by one hour, SwapClear remains closed for at least four hours of the Australian business day. When SwapClear is open, trades are cleared within 10 seconds of being submitted (depending on the execution venue). However, trades cannot be cleared while SwapClear is closed. Therefore Australian participants must manage bilateral credit risk exposures during this time.

The Bank agrees that in the near term, facilitating benchmark reforms and its potential resilience implications (including any impact on operating hours) should be a higher priority for LCH Ltd than further operating hours extensions. Nonetheless, in the next assessment period, LCH Ltd should provide the Bank with an approved timeline of how it will continue to extend operating hours in the medium term while maintaining the safety and resilience of its operations. LCH Ltd should continue to provide the Bank with updates on its plans and progress in this area.

1.3.2 Protected Payment System contingencies

Protected Payment System contingencies. LCH Ltd should continue to implement its plans to enhance the effectiveness of its PPS contingencies, enabling the expected service level to be achieved in the event of a PPS bank outage or failure. During the next assessment period LCH Ltd should formally test its PPS contingency arrangements.

CCP Standard 9 (Money settlements)

This regulatory priority has been carried forward from the current assessment period as LCH Ltd is yet to fully develop, test and realise the benefits of enhancements to its PPS contingencies (sections 1.1.2 and 2.1.2). In the next assessment period, the Bank expects LCH Ltd to test the enhancements to its PPS contingency arrangements as part of an annual Group fire drill.

1.4 2019/20 Areas of Supervisory Focus

Areas of supervisory focus describe matters that the Bank considers will be an important part of its supervision of LCH Ltd's SwapClear service in the next assessment period. These are areas where there is significant change underway at LCH Ltd that the Bank intends to monitor, or where the Bank considers further analysis is warranted. As appropriate, the Bank will seek information regarding these matters through its participation in the Multilateral Arrangement for Regulatory, Supervisory and Oversight Cooperation on LCH Ltd (Global College), bilaterally with the Bank of England (BoE) and through its regular engagement with LCH Ltd.

1.4.1 Operational and cyber risk management

Operational and cyber risk management. LCH Ltd's work to embed operational risk management changes (including to its oversight of outsourcing and critical service provider arrangements), as well as further enhancements to its cyber risk management.

CCP Standards 2 (Governance) and 16 (Operational risk)

This area of supervisory focus has been carried forward from the current assessment period reflecting (section 1.2.2) ongoing work by LCH Ltd to enhance the effectiveness of its cyber risk management.

1.4.2 Model validations

Model validations. The governance of LCH Ltd's independent model validation processes, including the appropriate documentation of LCH Ltd's benchmarking process against industry practice.

CCP Standards 2 (Governance) and 6 (Margin)

This area of supervisory focus has arisen from the 2018/19 area of supervisory focus on financial risk management (section 1.2.3). During the next assessment period, the Bank will monitor the outcomes of changes to the governance of LCH Ltd's model validations.

1.5 Bank of England Supervisory Focus

The BoE is the primary supervisor of LCH Ltd. The BoE outlines its supervisory focus, across all financial market infrastructures (FMIs) for which it has supervisory responsibilities, in its publication *The Bank of England's Supervision of Financial Market Infrastructures – Annual Report*.[3] For the period from February 2019, the BoE will:

- further develop its supervisory approach and policy framework for operational resilience, including launching a pilot stress test of the financial services sector's resilience to cyber incidents in 2019
- conduct a range of targeted core assurance reviews to assess how FMIs are mitigating risks across their operations, including operational and financial resilience, and their compliance with expectations set out in the CPMI-IOSCO Principles for Financial Market Infrastructures (PFMI) and applicable regulations
- conduct work to oversee planned, structural changes to the payments landscape to promote the resilience of individual FMIs and the broader system. The PPS operated by LCH Ltd is regulated and overseen by the BoE as a 'recognised payment system' under the UK *Banking Act 2009*
- develop a supervisory stress test framework for UK CCPs to assess the systemic, macro-level impact of extreme market events that affect multiple CCPs at the same time
- continue its policy work to ensure the continuity of the regulatory framework for FMIs following the UK's withdrawal from the EU.

The Bank intends to engage with the BoE on these priorities (and to monitor progress), as far as they relate to LCH Ltd, through its participation in the Global College and via bilateral discussions as appropriate. The Global College is designed to facilitate information sharing and supervisory coordination among regulators, recognising the complex cross-border nature of LCH Ltd's business.

3 This document is available at <https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2019/supervision-of-financial-market-infrastructures-annual-report-2019>.

2. Material Developments

LCH Ltd has implemented a number of changes over the assessment period to support its provision of the SwapClear service to the Australian market. Some of these changes have been in response to the regulatory priorities and areas of supervisory focus set out by the Bank in the previous Assessment; others have been driven by changes to SwapClear's global product offering, risk management arrangements, governance and international developments.

2.1 2018/19 Regulatory Priorities

2.1.1 Extension of operating hours

The SwapClear service is officially open from 6am UK time to 7pm New York time.[4] Since February 2017, the service has been able to open up to one hour earlier at LCH Ltd's discretion. In September 2019, in line with the Bank's 2018/19 regulatory priority, LCH Ltd brought forward the flexible open time by an additional hour to 4am UK time. In practice, LCH Ltd has opened the service at the commencement of the flexible open on most business days during the assessment period. However, the service remains closed for at least four hours of the Australian business day. Until the SwapClear service opens and trades can be novated, firms are required to manage bilateral credit risk exposures. Trades sent for clearing will be queued up to be cleared once the service is opened. LCH Ltd also provided the Bank with analysis of the key challenges to further extensions to the operating hours of the SwapClear service.

In the next assessment period, LCH Ltd should provide the Bank with an approved timeline of how it will continue to extend operating hours in the medium term while maintaining the safety and resilience of its operations.

2.1.2 Protected Payment System contingencies

LCH Ltd operates the PPS to settle cash payments to and from participants. LCH Ltd calls funds from, or pays funds to, clearing participants across the books of PPS banks (commercial settlement banks) acting on behalf of those participants. PPS banks then make or receive payments to or from the LCH Ltd 'concentration bank' via the relevant real-time gross settlement system for each currency. In the event of a PPS bank outage, LCH Ltd expects its participants to have access to contingency arrangements so that they can continue to make payments to and receive payments from LCH Ltd. LCH Ltd has previously identified several areas where improvements are necessary to ensure the timeliness, robustness and effectiveness of its PPS contingency arrangements.

During the assessment period, LCH Ltd has made progress on improving these arrangements. This work has involved developing a plan to enhance the efficiency of its PPS contingencies, including testing and implementing changes designed to improve the automation of aspects of its existing direct funding

4 The official operating hours correspond to 3pm-9am AEST in the Australian winter, and 5pm-11am AEDT in the Australian summer. Differences in when the Australian states, New York and the UK transition in and out of daylight savings may affect these times.

contingency arrangements. In addition, LCH Ltd has engaged with participants and settlement banks to explore the feasibility of complementary contingencies, such as using backup PPS banks and leveraging existing commercial relationships.

LCH Ltd should continue to make progress against its plan to improve the effectiveness of its PPS contingency arrangements and demonstrate that its enhanced arrangements have the capacity to meet LCH Ltd's service targets in the next assessment period.

2.2 2018/19 Areas of Supervisory Focus

2.2.1 Governance

Over recent years there has been a continued focus on the governance arrangements in place at LCH Ltd. During this period, LCH Ltd has made a number of changes to these arrangements to enhance their effectiveness, including changes to the structure of the LCH Ltd Board to improve its independence. Throughout this period, the Bank has monitored the outcomes of the recent changes, including those arising from an external review into the LCH Ltd Board's effectiveness, and is satisfied that LCH Ltd's approach to governance has become more robust.

There were a number of key personnel changes at LCH Ltd and LCH Group Holdings Limited (LCH Group) during the assessment period. These changes have affected the composition of the LCH Ltd Board, as well as senior management positions and reporting lines (Appendix B.2). During the assessment period:

- Bruce Kellaway was appointed the Global Head of Rates, Securities and Collateral; this is an expanded role, replacing the existing roles of Global Head of RepoClear and Collateral (previously held by Mr Kellaway) and Global Head of Rates following Michael Davie's resignation from the latter role. Bruce Kellaway will also continue to serve in his capacity as Head of EquityClear at LCH Ltd.
- Susi de Verdelon, formerly the Chief Operating Officer for Rates at LCH Ltd, became the Head of SwapClear and Listed Rates at LCH Ltd; this is a newly created role that reports to the Global Head of Rates, Securities and Collateral.
- Isabelle Girolami has been appointed the next Chief Executive Officer (CEO) of LCH Ltd and will take up the position in November 2019 following the resignation of Martin Pluves in July. Dan Maguire, the CEO of LCH Group, is acting as the interim CEO.

While this area of supervisory focus will be closed, the Bank will nevertheless continue to monitor developments in LCH Ltd's governance, including the effects of recent changes to key personnel and the increase in LCH Group ownership by London Stock Exchange Group plc (LSEG), as part of its ongoing supervisory work.

2.2.2 Operational and cyber risk management

Over the assessment period, LCH Ltd's approach to managing operational and cyber risk has continued to evolve. LCH Ltd has implemented key aspects of its resilience framework for managing distinct types of operational risk, and is continuing to embed the relevant policies and controls to mitigate any control weakness identified based on risk and control assessments (Appendix B.4). LCH Ltd also continues to refine its approach to cyber risk management, in part based on changes in cyber threats and new technology available to combat threats. During the assessment period, LCH Ltd benchmarked its cyber risk management against the National Institute of Standards and Technology (NIST) *Framework for*

Improving Critical Infrastructure Cybersecurity and participated in CBEST testing, while continuing to implement actions through its resilience program.

LCH Ltd has made further enhancements to how it manages its outsourcing and critical service provider arrangements, including with LSEG's Business Services Ltd (BSL). LCH Ltd has made changes to its assessment survey of critical service providers in line with the CPMI-IOSCO *Assessment methodology for the oversight expectations applicable to critical service providers.* LCH Ltd has also reviewed how it manages its relationship with BSL, including through changes to service level agreements. Over the next assessment period, LCH Ltd will continue work to enhance its oversight of critical service providers.

The Bank will continue to monitor LCH Ltd's operational risk management framework, including in the area of cyber risk. The BoE has also continued to focus on operational resilience and cyber risk management in its supervision of FMIs (Appendix B.3.3). The Bank will continue to engage regularly with the BoE on its work in this area.

2.2.3 Financial risk management

The CCP Resilience Guidance, published in July 2017, clarifies and elaborates on the standards set out in the PFMI relating to CCPs' financial risk management.[5] The Bank applies this guidance in interpreting the CCP Standards, and expects CCPs active in Australia to align their practice with this guidance. In the previous assessment period, the Bank identified two areas of LCH Ltd's financial risk management where it considers further analysis is required: the validation of LCH Ltd's margin system and LCH Ltd's access to foreign exchange market liquidity.

Margin system validations

The CCP Resilience Guidance clarifies that CCP Standard 6 – which outlines the design, features, and governance arrangements that a CCP should have with respect to its margin system – applies to the system, as a whole. The SwapClear margin system consists of its base initial margin model and several add-ons designed to mitigate specific risks not captured by the base model (for more information on LCH Ltd's margin system, see Appendix B.1).

LCH Ltd's model validation policies require it to validate each component of the SwapClear margin system (including all add-ons) annually. During the assessment period, LCH Ltd completed model validations for all of its existing margin add-ons.

LCH Ltd has also introduced two new margin add-ons for SwapClear participants in this assessment period, which are designed to cover:

- the foreign exchange risk arising from a mismatch between the currency of a participant's collateral and the currency of its positions
- the risk that LCH Ltd would be required to enter into replacement trades, as part of the default management process, for any directional risk that arises from futures products effective from the point of expiry or notice to deliver. This margin add-on is only called from participants that use LCH Ltd's portfolio margining service for combined SwapClear and Listed Rates portfolios.

These add-ons will be reviewed by LCH Ltd in its next cycle of model validations.

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5 The CCP Resilience Guidance is available at <http://www.bis.org/cpmi/publ/d163.htm>.

The Bank will monitor LCH Ltd's governance of its model validations as an area of supervisory focus over the next assessment period.

Access to foreign exchange market liquidity

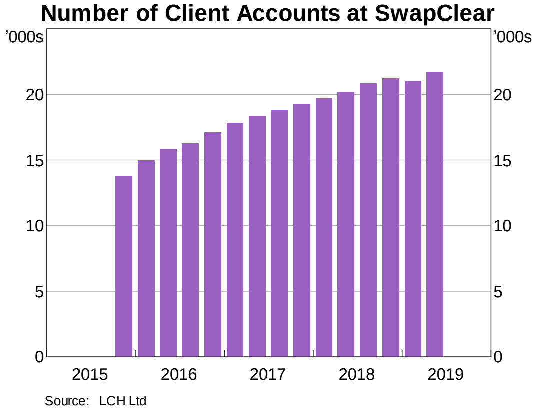
During the assessment period, LCH Ltd tested its access to foreign exchange market liquidity under stressed market conditions as part of its regular liquidity tool testing. The results demonstrated that LCH Ltd has enhanced its access to liquidity by increasing the number of its foreign exchange swap counterparties. In 2018, LCH Ltd also conducted tests of its operational capability to execute foreign exchange transactions in all currencies in which it clears products (excluding non-deliverable interest rate swaps). This aspect of the area of supervisory focus on financial risk management has been closed.

2.2.4 Tiering

Following significant growth in client clearing at LCH Ltd, the Bank set an area of supervisory focus in the previous assessment to monitor developments in how LCH Ltd manages and mitigates potential risks. Over the assessment period, total initial margin requirements at SwapClear have continued to increase, though the client share of total margin has stabilised at around 55 per cent (Appendix A.1). The number of clients has grown steadily over the assessment period, while the number of participants offering client clearing has increased to 59.[6] Some of the increase in client accounts is due to the implementation of clearing mandates and margin requirements for uncleared derivatives.

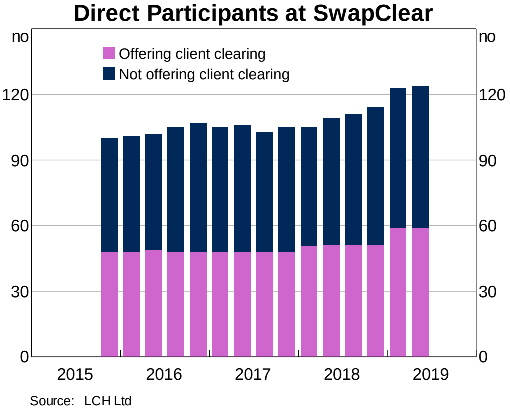
Graph 1

Number of Client Accounts at SwapClear



Graph 2

Direct Participants at SwapClear



LCH Ltd has explicitly set out standards for the management and monitoring of risks arising from tiered participation arrangements. For example, SwapClear has the power to gather relevant information from direct participants about client exposures, and has the ability to port affected clients in the event of a clearing member default.

LCH Ltd has made several changes to its risk management to account for client risk more explicitly. In June 2019, the margin period of risk for the floor component of the margin model was increased from 5 days to 7 days for clients (see Appendix B.1.2 for more detail on SwapClear's margin model). This change was made to align with the margin period of risk for the base Portfolio Approach to Interest Rate Scenarios (PAIRS) model. In March 2019, LCH Ltd began incorporating client risk directly in the allocation of default fund contributions (see section 2.3.2 for more detail). SwapClear participant

6 These data are drawn from LCH Ltd's quantitative disclosures, which are available up to the end of the June quarter 2019. These data are published under the *CPMI-IOSCO Public quantitative disclosure standards for central counterparties*, and are available at <https://www.lch.com/resources/rules-andregulations/ccp-disclosures>.

contributions to the default fund are based on their house and client shares of total stress test losses over initial margin (STLOIM); house STLOIM is applied a weighting of one, while the weighting applied to client STLOIM depends on the number of backup arrangements (and therefore portability) of the participant's clients. As a result of LCH Ltd's progress, the Bank has closed this area of supervisory focus.[7]

2.3 Other Material Developments

2.3.1 Product offering

Over the assessment period, LCH Ltd made the following changes to its product offering within the SwapClear service:

- Non-deliverable interest rate swaps denominated in BRL, CLP, COP, THB and TWD were added in March 2019. LCH Ltd also increased the maximum tenor of KRW-denominated non-deliverable interest rate swaps from 11 years to 15.5 years. Counterparties settle the net cash flows on non-deliverable interest rate swaps in USD. At the end of September 2019, the notional value of non-deliverable interest rate swaps outstanding comprised 1.4 per cent of total notional value outstanding in SwapClear.
- In February, maximum tenors for CZK, HUF, ZAR and HKD swaps were extended from 10.5 to 11 years, the maximum tenor for SGD swaps was extended from 10.5 to 21 years and for PLN and NOK swaps, the maximum tenors were extended from 15.5 to 16 years.
- In May, maximum tenors for swaps referencing the Fed Funds index and the CDOR were extended from 31 years to 51 and 41 years, respectively.
- CAD CDOR-CORRA and JPY LIBOR-TONA basis swaps were added in July 2019. CORRA and TONA both reflect the cost of overnight funding and are used as reference rates for overnight index swap (OIS). LCH Ltd also increased the maximum tenor for swaps referencing CORRA from 2.25 to 31 years.
- From October 2018, LCH Ltd's portfolio margining service was expanded to allow positions in long-term interest rate futures to be offset with positions in eligible swaps and short-term interest rate futures.

2.3.2 Changes to the default fund

The LCH Ltd Rates service default fund is a prefunded pool of mutualised resources for the SwapClear and Listed Rates services held to cover losses arising in the event of a participant default that cannot be covered first by the defaulter's own collateral and subsequently by LCH Ltd's own capital contribution to the Rates service (Appendix B.1.3). The Rates service default fund has two components: a core component and an additional component that supports the intraday provision of credit needed to facilitate real-time trade registration (RTTR). Both SwapClear and Listed Rates participants contribute to the core component of the default fund, but only SwapClear participants contribute to the RTTR component.

7 Portability refers to the ease with which LCH Ltd is able to transfer a client's positions and associated collateral from one direct participant to another.

In March 2019, LCH Ltd revised the allocation rules for SwapClear participants' contributions to the default fund. Prior to the change, each SwapClear participant's contribution was proportional to its average share of total initial margin requirements over the previous month, based on house positions only (Appendix B.1.3). The new allocation rules change the metric used for calculating contributions from initial margin requirements to STLOIM, aligning it with the metric used for sizing the core component of the default fund. The rules also now include client positions in the calculation of each participant's share of total STLOIM, adjusted for the portability of each client portfolio.

LCH Ltd also increased both the cap on the size of the core component and the size of the RTTR component of the default fund in September 2019. The cap on the core component was increased from £4.6 billion to £5.4 billion and the RTTR component was increased from £400 million to £600 million, bringing the maximum size of the Rates service default fund to £6 billion.

2.3.3 Brexit

LCH Ltd is licensed in Australia under section 824B(2) of the *Corporations Act 2001*, which provides licensing for an overseas-based CS facility subject to requirements and supervision in its home country that are considered sufficiently equivalent to those in Australia. LCH Ltd is incorporated in the UK, and is primarily regulated by the BoE under UK and EU legislation.

The UK is preparing to leave the EU on 31 January 2020. The Australian Securities and Investments Commission (ASIC) and the Bank will consider how Brexit may affect the continued sufficient equivalence of LCH Ltd's home regulatory regime. Any actions by ASIC and the Bank will depend on the nature of Brexit:

- In the event the implementation period (which has been provisionally agreed between the UK and the EU) comes into effect, EU law – including the European Market Infrastructure Regulation (EMIR) – will continue to have effect in the UK until the end of 2020.[8,9] There will be no need for the Bank and ASIC to consider any changes to the regulatory regime and the sufficient equivalence of the regime until the end of the transition period, because LCH Ltd's home regime will not change during the transition period.
- In the event the implementation period does not eventuate, there are contingency arrangements in place that will allow applicable EU law, such as EMIR, to be converted into UK law.[10] As LCH Ltd's home regime will have changed, the Bank and ASIC will consider the changes to the regime and the sufficient equivalence of LCH Ltd's home regime. The UK's HM Treasury have stated that the statutory instruments to convert EU law (including EU Regulations) into UK domestic law 'are not intended to make policy changes, other than to reflect the UK's new position outside the EU, and

8 EMIR is the European regulatory regime for CCPs (Appendix B3). It is also known as *Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories*.

9 See paragraph 1.2 in *HM Treasury's approach to financial services legislation under the European Union (Withdrawal) Act*. Available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/720298/HM_Treasury_s_approach_to_financial_services_legislation_under_the_European_Union__Withdrawal__Act.pdf>.

10 See paragraphs 1.8 and 1.9 in HM Treasury's approach to financial services legislation under the European Union (Withdrawal) Act. Available at the link in footnote 9.

to smooth the transition'. The UK has released draft statutory instruments to this effect.[11] The BoE has also released a consultation paper outlining its proposed changes to FMI-related Binding Technical Standards and the BoE's domestic rules for FMIs so that these work effectively in the UK after it leaves the EU.[12] In the event the implementation period does not eventuate, ASIC and the Bank will advise the Minister of the sufficient equivalence of the new home regime for LCH Ltd. Subject to there being no significant changes to the approach the UK authorities have published, the Bank expects the regime to continue to be sufficiently equivalent.

The EU has also confirmed that it will recognise the UK regulatory regime for CCPs as being equivalent for a limited period in the event that the UK becomes a foreign country under a no-deal scenario.

2.3.4 Benchmark reform – transition away from LIBOR

There has been significant international work over the past few years to progress the reform of the reference rate regime based on interbank offered rates (IBORs). This has resulted in the establishment of alternative risk-free rates (RFRs) being introduced and, in some cases, reforms to existing reference rate methodologies such as BBSW in Australia.[13] With widespread recognition that some existing reference rates, such as LIBOR will be discontinued, a key focus over the past year has been on developing more robust fall-back methodologies for IBORs and agreement on the pre-cessation triggers.[14] Through its consultations, ISDA has found there to be strong support for the use of a compounded RFR with an adjustment for the historical spread between the IBOR and RFR should a fall-back be required. ISDA is continuing to work with the market to determine how best to address concerns regarding the implementation of pre-cessation fall-backs for derivatives.

Trading activity in products referencing RFRs has been increasing. LCH Ltd, through its SwapClear service, now accepts a range of products for clearing referencing new RFRs, including AONIA, SONIA and SOFR. LCH Ltd began clearing €STR swaps in October 2019. LCH Ltd has also previously made changes to its Rulebook so that it may determine alternative interest rates for products to be used in the event that the original reference rate is unavailable or ceases to be published. LCH Ltd expects to transition its discounting and calculation of price alignment interest for interest rate swaps settled in EUR and USD to €STR and SOFR in June and October 2020, respectively. The Bank will continue to monitor global work on benchmark reform, including initiatives at LCH Ltd.

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11 Instruments relevant to EMIR include: draft The Central Counterparties (Amendment, etc., and Transitional Provision) (EU Exit) Regulations. Available at <http://www.legislation.gov.uk/ukdsi/2018/9780111171882/part/3>; and draft Over the Counter Derivatives, Central Counterparties and Trade Repositories (Amendment, etc., and Transitional Provision) (EU Exit) Regulations 2018. Available at <https://www.gov.uk/government/publications/draft-over-the-counter-derivatives-central-counterparties-and-trade-repositories-amendment-etc-and-transitional-provision-eu-exit-regulations>.

12 UK Withdrawal from the EU: Changes to FMI rules and onshored Binding Technical Standards, BoE consultation paper, October 2018. Available at <https://www.bankofengland.co.uk/-/media/boe/files/paper/2018/uk-withdrawal-from-eu-changes-to-fmi-rules-and-onshored-bts-complete.pdf?la=en&hash=DA90F953E776AA06A9C76C620325284050630BCD>. The BoE published a further consultation paper in July 2019 to cover changes following the Article 50 extension. Available at <https://www.bankofengland.co.uk/prudential-regulation/publication/2019/uk-withdrawal-from-the-eu-changes-following-extension-of-article-50>.

13 For further information, see G Debelle, 2019, *Progress on Benchmark Reforms* at ISDA's 34th Annual General Meeting, Hong Kong. Available at <https://www.rba.gov.au/speeches/2019/sp-dg-2019-04-11.html>.

14 For further information, see ISDA's website on *Benchmark Fallback Consultations*. Available at <https://www.isda.org/2019/07/24/benchmark-fallback-consultations/>.

Appendix A: Activity in SwapClear

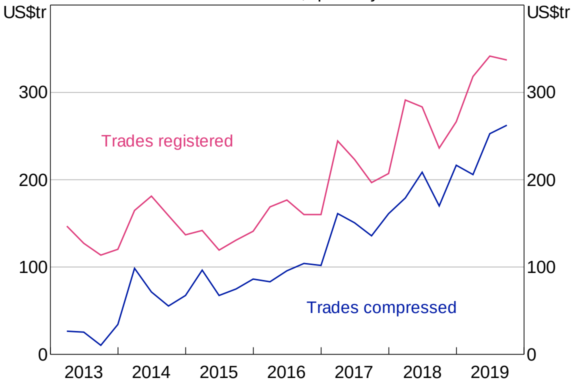
A.1 Global Activity

There were 121 direct clearing participants in the SwapClear service as at 30 September 2019, an increase of around 9 per cent over the assessment period.[15] Direct participants are domiciled in Australia, Canada, Europe, Hong Kong, Japan, New Zealand and the US.

The notional value of SwapClear trading activity grew by around 24 per cent in the assessment period (Graph 3). This was faster than in previous years and reflected a significant increase in OIS trade activity, which grew by around 40 per cent (Graph 4). In part, this growth has been attributed to activity arising in response to changing expectations regarding the likely path of monetary policy in a number of jurisdictions. Activity in forward rate agreements and interest rate swaps also grew, though by less than OIS activity. OIS, forward rate agreements and interest rate swaps account for 96 per cent of the notional value of trades registered. Basis swap activity was largely unchanged. SwapClear also clears other products including zero-coupon swaps, variable notional swaps, non-deliverable interest rate swaps and inflation swaps.

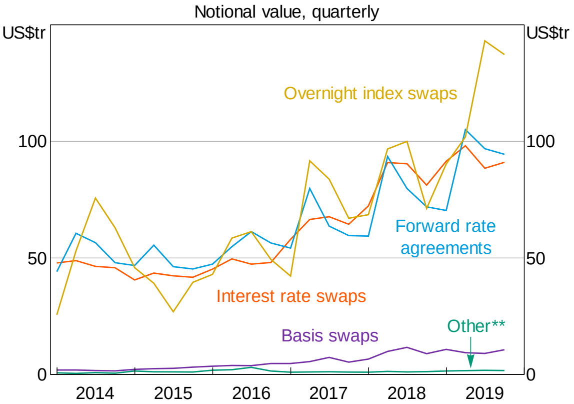
SwapClear clears over-the-counter (OTC) interest rate derivatives in 26 currencies. Around half of trades registered are denominated in USD and one quarter in EUR (Graph 5). The AUD is SwapClear's fourth most registered currency and accounts for around 5 per cent of trade registrations.

Graph 3
Trades Registered and Compressed*
Notional value, quarterly



* Data count two sides of each trade
Source: LCH Ltd

Graph 4
Trades Registered by Product*
Notional value, quarterly

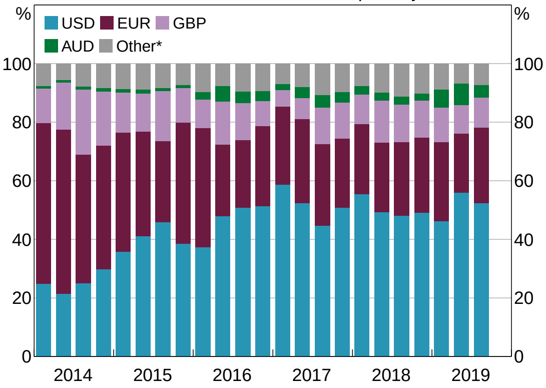


* Data count two sides of each trade
** Inflation swaps, non-deliverable interest rate swaps, variable notional swaps and zero-coupon swaps
Source: LCH Ltd

15 Unless otherwise stated, all positions data reported in this Appendix are as at the end of the assessment period (30 September 2019) while all activity data and growth rates are reported over the 12 months to the end of the assessment period.

The stock of derivatives outstanding, as measured by notional value, increased as a result of ongoing new trade registrations exceeding maturities and trade compression activity (Graph 6).[16]

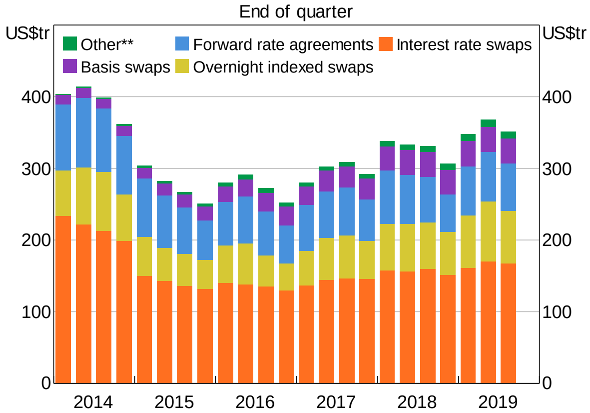
Graph 5
Trades Registered by Currency
Share of total notional value, quarterly



* Other is BRL, CAD, CHF, CLP, CNY, CZK, DKK, HKD, HUF, INR, JPY, KRW, MXN, NOK, NZD, PLN, SEK, SGD, THB, TWD and ZAR; excludes COP

Source: LCH Ltd

Graph 6
Notional Value Outstanding by Product*
End of quarter



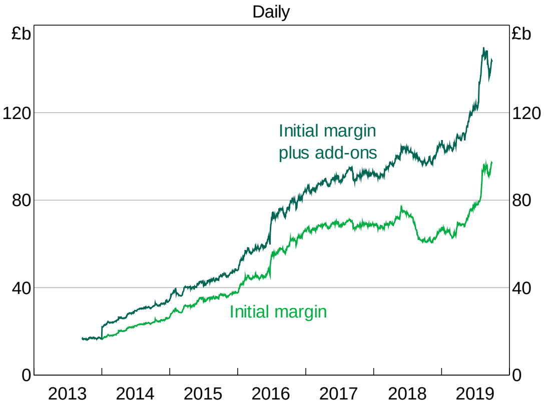
* Data count two sides of each trade

** Other includes zero-coupon, variable-notional and inflation-indexed swaps

Source: LCH Ltd

Initial margin, which is often viewed as a proxy for the level of risk the CCP manages, grew at a similar pace as notional value outstanding (Graph 7). Changes in initial margin requirements through time reflect changes in participants' portfolios, as well as changes to the parameters of the initial margin model. Initial margin add-ons are called to cover risks not captured in the base initial margin model, such as credit, liquidity, concentration and sovereign risks. Initial margin add-ons now comprise around 32 per cent of total initial margin posted by participants. After substantial growth between 2015 to 2017, the proportion of initial margin requirements met by clients has stabilised, fluctuating around 55 per cent since early 2017 (Graph 8).[17]

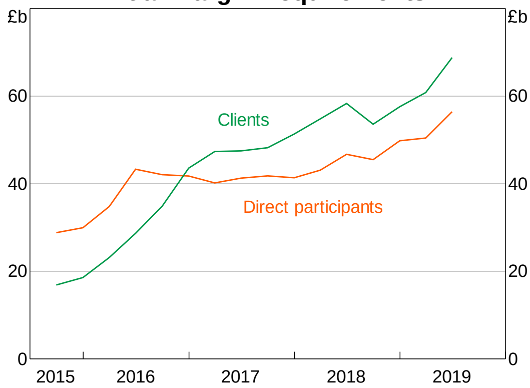
Graph 7
OTC Rates: Initial Margin Requirements*
Daily



* The OTC Rates margin class includes all SwapClear products and those Listed Rates interest rate futures that have been moved for the purposes of portfolio margining

Source: LCH Ltd

Graph 8
Rates Service: House and Client Initial Margin Requirements*



* Includes SwapClear and Listed Rates services

Source: LCH Ltd

16 Compression involves identifying offsetting trades in participants' portfolios and terminating them, while leaving those participants' market-facing exposures unchanged or within a predefined tolerance.

17 For further information on client clearing, see Box A in the 2017/18 *Assessment of LCH Limited's SwapClear Service*. Available at <https://www.rba.gov.au/payments-and-infrastructure/financial-market-infrastructure/clearing-and-settlement-facilities/assessments/lch/2018/>.

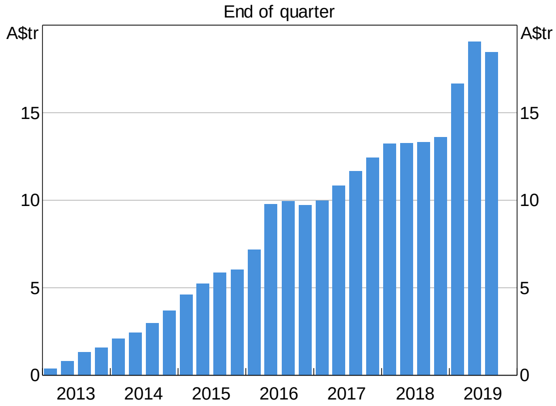
A.2 Australian Activity

A.2.1 Australian-domiciled direct clearing participants

SwapClear has six Australian-domiciled direct clearing participants – Australia and New Zealand Banking Group Ltd, Commonwealth Bank of Australia, Goldman Sachs Financial Markets Pty Ltd, Macquarie Bank Limited, National Australia Bank Limited, and Westpac Banking Corporation.

The total notional value of interest rate derivatives outstanding (in all currencies) cleared by Australian banks via SwapClear grew by 38 per cent in Australian dollar terms over the assessment period (Graph 9).

Graph 9
Notional Value Outstanding – Australian Banks*
End of quarter



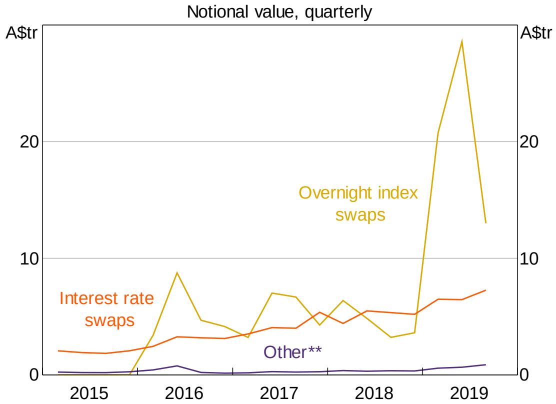
* Data are sum of Australian banks' trade sides; trades between two Australian banks will be counted twice

Source: LCH Ltd

A.2.2 AUD-denominated OTC interest rate derivatives

Globally, an estimated 88 per cent of all centrally cleared AUD-denominated OTC interest rate derivatives registered during the assessment period were cleared via SwapClear. Total AUD activity at SwapClear increased substantially, driven by strong growth in AUD OIS, which increased by 250 per cent (Graph 10). The notional value of AUD OIS trades registered can fluctuate substantially, partly reflecting the role they play in providing a short-term hedge against overnight cash rate movements. OIS now accounts for around 40 per cent of the total notional value of AUD interest rate derivatives outstanding, though interest rate swaps contribute more to the risk cleared by participants because they have longer maturities. Basis, zero-coupon and variable notional swaps remain a small share of AUD activity.

Graph 10
AUD Interest Rate Derivatives Registered*
Notional value, quarterly



* Data count two sides of each trade

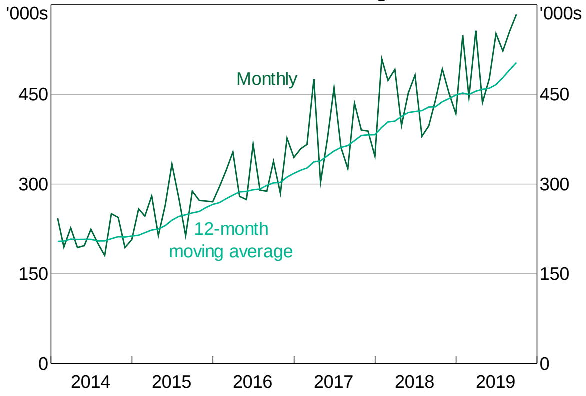
** Basis swaps, variable notional swaps and zero-coupon swaps

Source: LCH Ltd

A.3 Operational Performance

LCH Ltd targets IT system availability for the SwapClear service equivalent to at least 99.7 per cent. In effect this means that system outages should last no more than 60 minutes in any one calendar month.[18] SwapClear met this target in 11 months of the assessment period; IT system availability averaged 99.9 per cent.

Graph 11
Number of Trades Registered



Source: LCH Ltd

The average number of trades registered in SwapClear each month has increased by 17 per cent (Graph 11). LCH Ltd has met its target for maximum capacity utilisation of 50 per cent in each month in the assessment period for the SwapClear service. LCH Ltd deems its capacity utilisation target to be met if the service has the capacity to handle the greater of either (i) two times current daily peak throughput of trades registered over the previous two years, or (ii) the projected daily average throughput in 12 months' time.

18 LCH Ltd weights outages to calculate service availability: a weight of one where there is full service outage; a weight of 0.5 or 0.25 for partial outages, depending on the incident; and a weight of zero for partial losses of resilience, such as when the service is still operating but an additional server used to share the load is unavailable.

Appendix B: Risk Management, Governance and the LCH Limited Regulatory Environment

B.1 Risk Management

A CCP acts as the buyer to every seller, and the seller to every buyer, in a market. This is commonly achieved by the CCP interposing itself as the legal counterparty to all purchases and sales via a process known as novation. These arrangements provide substantial benefits to participants in terms of counterparty credit risk management as well as greater opportunities for netting of obligations. However, these arrangements result in a significant concentration of risk in the CCP. This risk can crystallise if a clearing participant defaults on its obligations to the CCP, since the CCP must continue to meet its obligations to all of the non-defaulting participants. LCH Ltd manages this risk in a number of ways, including through participation requirements, margin collection, the maintenance of pooled resources and loss allocation arrangements.

B.1.1 Clearing participation requirements

To limit its exposure to its participants, LCH Ltd only allows institutions to become SwapClear clearing participants if they meet certain financial and operational requirements. Prospective clearing participants of SwapClear are required to have net capital of at least US$50 million, as well as appropriate payment arrangements, staff with sufficient experience, and systems to manage their clearing activities. Prospective participants must also demonstrate their operational capability to participate effectively in default management processes, including their ability to value and bid on the portfolio of a defaulting participant.

B.1.2 Margin collection

LCH Ltd covers its credit exposures to its SwapClear participants by collecting several types of margin:

- *Variation margin*. All SwapClear positions are marked-to-market at the end of the day and three times intraday. At the end of each day, variation margin is collected from participants with net loss-making positions and paid to those with net profit-making positions. This practice ensures that uncovered losses on SwapClear participants' positions do not accrue over time.

- *Initial margin*. In the event of a clearing participant default, LCH Ltd would be exposed to risk arising from potential changes in the market value of the defaulting participant's open positions between the last settlement of variation margin and the close-out of these positions. LCH Ltd collects initial margin to mitigate this risk. Most trades will only be registered if, at the point of registration, there are sufficient pre-funded resources at the clearing participant level, either in the form of initial margin or the RTTR component of the default fund (Appendix B.1.3) to cover the potential future exposure of the trade (up to a given confidence level).[19]

19 Participants can register sub-block trading venue trades without this credit check.

- *Additional margin*. LCH Ltd collects various forms of additional margin to cover any risks – including credit, liquidity, concentration and sovereign risks – not captured by the base initial margin model. Additional margin is calculated at the end of each day.

LCH Ltd monitors participants' portfolios intraday to take account of changes in both prices and positions; LCH Ltd makes intraday margin calls where margin liabilities (variation margin or initial margin) exceed predetermined participant-specific credit thresholds. Margin is not paid out intraday to participants whose margin requirements have fallen.

LCH Ltd calculates initial margin requirements for SwapClear using its PAIRS model. The model sets initial margin requirements to cover potential losses over a five-day close-out period for participants with 99.7 per cent confidence, based on historical movements in yield curves and exchange rates over a 10-year lookback period. LCH Ltd also imposes a floor on initial margin requirements based on a 10-year (unscaled) lookback period to counteract procyclicality and prevent initial margin requirements falling during periods of low volatility. In 2018, the lookback period was modified to progressively increase and include the 2½ year global financial crisis period (1 January 2008 – 30 June 2010) as a set of permanent scenarios. LCH Ltd assumes that an additional two-day period will be required to close out client positions; initial margin requirements and the floor for initial margin requirements on the positions of clients of participants are scaled up accordingly.[20] LCH Ltd assesses the performance of its margin model through daily and monthly backtesting. LCH Ltd also assesses the adequacy of the model assumptions through monthly sensitivity analysis and performs annual model validation reviews of the PAIRS model and individual margin add-ons.

B.1.3 Pooled financial resources

In the event of a clearing participant default, any losses would first be covered by the margin and other collateral posted by the defaulter across all LCH Ltd services in which it participated.[21] Should these resources prove insufficient to meet LCH Ltd's obligations, LCH Ltd may draw on other resources in the Rates service default waterfall. The Rates service default fund covers the SwapClear and Listed Rates services, as LCH Ltd allows for portfolio margining between these services.[22] The available resources are depicted in Figure 1, which shows the order in which financial resources would be used to cover default losses.

Prefunded resources

The Rates service default fund is a pool of mutualised resources, prefunded by clearing participants. The Rates service default fund comprises two components: a core component and an additional component that supports the intraday provision of credit needed to facilitate real-time trade registration (see 'Default fund real-time trade registration component' below). Both components are available to cover losses from participant defaults. Both SwapClear and Listed Rates participants contribute to the core component, but only SwapClear participants contribute to the RTTR component.

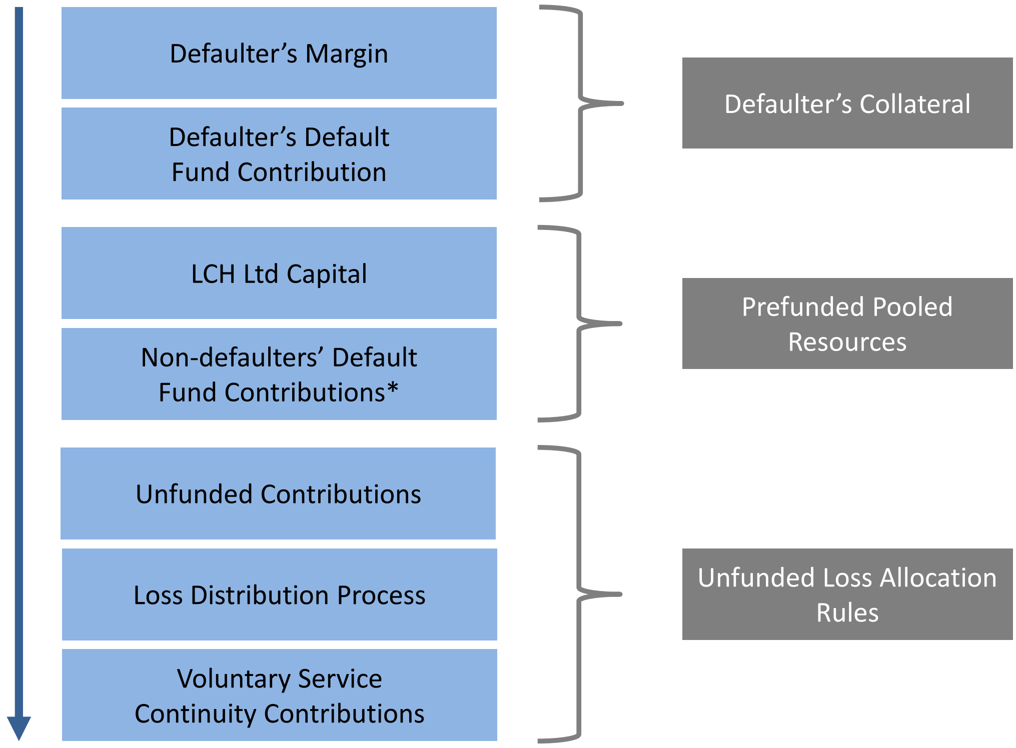
20 The additional two-day holding period for client positions allows time for clients to decide whether to seek to port their portfolio to another clearing participant, as well as time to carry out any such transfer.

21 A clearing participant that defaulted would be deemed to have defaulted in all LCH Ltd services. If any of that clearing participant's margin and default fund contributions for a given service were not required to meet losses in that service, they would be applied to losses in any other service of which that clearing participant was a member.

22 Losses in one LCH Ltd service cannot be applied to the mutualised resources of the default waterfall of another LCH Ltd service (apart from within the Rates service). In an extreme situation, a given LCH Ltd service could be closed, while the other services remained open (apart from the services within the Rates service).

In the event that all of the defaulting clearing participant's margin and other collateral, including its contribution to the Rates service default fund, were exhausted, LCH Ltd would allocate remaining losses arising from the default to its capital contribution to the default fund waterfall (€57.1 million as at 30 September 2019). Should this also prove insufficient, losses would be allocated to the Rates service default fund.

Figure 1: Rates Service Default Waterfall



* The Rates default fund comprises the core component and the real-time trade registration component
Source: LCH Ltd

Default fund core component and default fund additional margin

The core component of the default fund is calibrated to cover any losses LCH Ltd would incur if the two clearing participants (including their affiliates and clients) with the largest exposures defaulted under extreme but plausible conditions, after using the defaulters' initial margin and monthly default fund additional margin (DFAM). This is intended to meet the 'cover two' requirement under CCP Standard 4.4 and its equivalent under EMIR.

The core component is resized on the first business day of each month. LCH Ltd calculates this by summing the largest two participant STLOIM over a 60-day lookback period, adding a buffer, and then subtracting the amount of monthly DFAM called.[23]

Each SwapClear participant's contribution to the core component is equal to its average share of total STLOIM for both house and client positions over the previous month. The share of each participant's

23 The STLOIM of a participant and its affiliates is based on the stress test losses and initial margin of the participant, its affiliates, and all the clients of the participant and its affiliates.

stress test losses is adjusted according to the portability of each of its clients' portfolios.[24] Prior to March 2019, participants' contributions were based on their share of total initial margin requirements for house positions only.

Contributions are subject to a minimum of £17.5 million for SwapClear participants who are also Listed Rates participants, £10 million for SwapClear-only clearing participants and £500,000 for Listed Rates-only clearing participants. Contributions are rebalanced each month when the core component is resized. Participants are informed of their new contributions on the third business day of the month, and payments are due the following day if their contribution has changed.

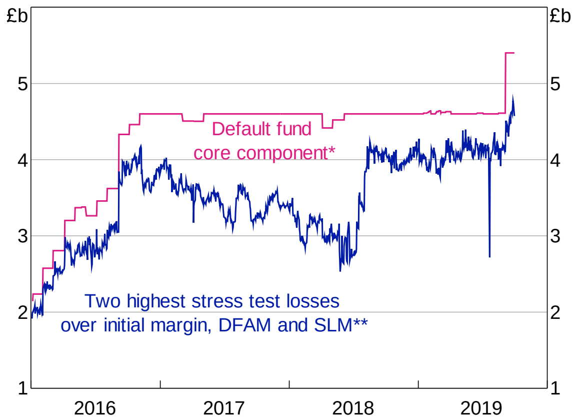
LCH Ltd uses *monthly* DFAM to achieve a balance between defaulter-pays and mutualised resources, ensuring that participants with large exposures relative to other Rates service members provide larger contributions to the resources required to cover those exposures. Monthly DFAM is called from the largest participant if its STLOIM exceeds a specified threshold of the sum of the combined stressed exposure value and buffer, determined by its internal credit score (ICS). Monthly DFAM is not mutualised; it can only be used to cover losses from the participant that posted it.

LCH Ltd also calls *daily DFAM* from those participants and affiliates with STLOIM that exceed a predefined proportion of the default fund.[25] Daily DFAM can be called from any participant. The relevant default fund proportion is based on those participants' ICSs. The amount called is the difference between the participant's STLOIM and the relevant proportion of the default fund on that day, less any monthly DFAM. Like monthly DFAM, daily DFAM is not mutualised; it can only be used to cover losses from the participant that posted it.

Over the assessment period, LCH Ltd maintained sufficient financial resources to meet the cover two requirement (Graph 12). That is, stress test losses in excess of initial margin and daily and monthly DFAM of the two participants with the largest exposures were smaller than the default fund core component. For most of the assessment period, the Rates service default fund was at its cap. LCH Ltd raised the default fund cap from £5 billion (£4.6 billion core component and £400 million RTTR component) to £6 billion (£5.4 billion core component and £600 million RTTR component) in September 2019; the cap remained binding after the increase. Where the cap is binding, LCH Ltd maintains sufficient prefunded financial resources to meet its cover two requirement by collecting monthly DFAM.

Graph 12

Rates Service: Default Fund and Stress Test Losses



* Includes intra-month new-member contributions

** DFAM is default fund additional margin (both monthly and daily); only the DFAM from the participants with the two highest stress test losses over initial margin is subtracted

Source: LCH Ltd

24 Portability refers to the ease with which LCH Ltd is able to transfer a client's positions and associated collateral from one direct participant to another. Portability is assessed with reference to the number of live backup clearing arrangements of each client account.

25 Participants can ask clients to cover their own stress test losses (rather than the member paying DFAM) through stress loss margin. Members and clients jointly agree to provide additional collateral to LCH Ltd in order to reduce the exposure generated by that client.

Default fund real-time trade registration component

To meet European regulatory requirements, SwapClear must novate or reject new trades within 10 seconds. Most trades are novated provided that the incremental margin requirement arising from the trade is covered by collateral lodged by that participant, or is below a tolerance limit set by LCH Ltd. LCH Ltd assigns these tolerance limits to participants based on their ICSs. By extending credit to participants through tolerance limits, the frequency with which LCH Ltd can register trades is not restricted by the frequency with which LCH Ltd can collect margin.

LCH Ltd mitigates the credit risk that arises from offering trade registration tolerance limits through an additional RTTR component in the default fund. The proportion of each SwapClear participant's contributions to the RTTR is based on their utilisation of their RTTR limit relative to that of other participants over the previous 20 business days, subject to a floor of £4 million and a cap of £30 million. Listed Rates-only participants do not contribute to the RTTR component of the default fund. Participant contributions to the additional component are rebalanced on the same timeline as those to the core component. Usage of this additional component is limited on a cover two basis, which means that no clearing participant may use more than half of this component at any time.

Participants can register sub-block trading venue trades without this credit check. Sub-block trading venue trades are trades below a certain size which are transacted on an electronic trading facility.[26] Participants can register these trades even if they do not have sufficient collateral held by LCH Ltd or RTTR component tolerance available. However, participants will need to meet any incremental initial margin requirement at the next intraday margin call.

Unfunded loss allocation rules

In extreme cases it is possible that prefunded financial resources could be insufficient to fully absorb default-related losses, leaving the CCP with an uncovered credit loss shortfall. In such an event, LCH Ltd would allocate remaining losses to surviving clearing participants through 'loss allocation rules':

- *Unfunded contributions*. For each default, LCH Ltd is able to call unfunded contributions from non-defaulting participants up to the value of their last default fund contribution, subject to a maximum of three defaults in any six-month period.
- *Loss distribution process*. LCH Ltd may apply haircuts to the variation margin payments owed to non-defaulting SwapClear participants whose positions make gains. Participants in the Listed Rates service would be allocated losses in proportion to their default fund contributions. These haircuts are capped at the higher of £200 million or twice a participant's default fund contribution, and the Loss Distribution Process is limited to 10 days. In the event a participant reaches the cap, or variation margin gains haircuts were likely to extend beyond 10 days, participants will vote on whether the Loss Distribution Process should continue.
- *Voluntary service continuity contributions*. Should losses remain, LCH Ltd would ask non-defaulting participants to make voluntary contributions. Participants can make these payments at any time during the default management process, but are not obliged to make any voluntary payments.
- *Service closure*. If insufficient voluntary payments were made to cover the remaining credit losses, the Rates service Default Management Group (DMG) would make an Insufficient Resources Determination and LCH Ltd would close the SwapClear and Listed Rates services. In the event the

26 Further information is available at <https://www.lch.com/system/files/media_root/sub-block%20trading%20venue%20transaction.pdf>.

SwapClear and Listed Rates services were wound down, all outstanding SwapClear and Listed Rates contracts would be terminated and the Rates service DMG would calculate a sum owing between LCH Ltd and each non-defaulting clearing participant.

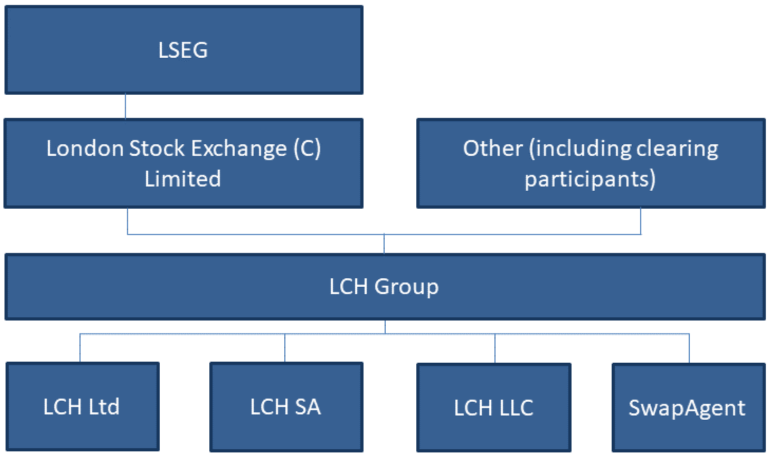
B.2 Governance

B.2.1 Structure of LCH Group

LCH Ltd is a wholly owned subsidiary of LCH Group (Figure 2). As at the end of September 2019, LCH Group is 82.6 per cent owned by the London Stock Exchange (C) Limited, a wholly owned subsidiary of LSEG, and 17.4 per cent owned by others, including clearing participants.

LCH Group is a holding company incorporated in the UK. In addition to LCH Ltd, LCH Group has another majority owned subsidiary that actively operates central clearing services, LCH SA. It also has a US CCP subsidiary, LCH.Clearnet LLC, which holds a Commodity Futures Trading Commission Derivatives Clearing Organization licence, although this licence became dormant in May 2019. The three CCPs are legally separate entities. LCH Group's SwapAgent service, which offers processing, margining and settlement services for non-cleared derivatives, is provided by a separate subsidiary.

Figure 2: LCH Group Structure

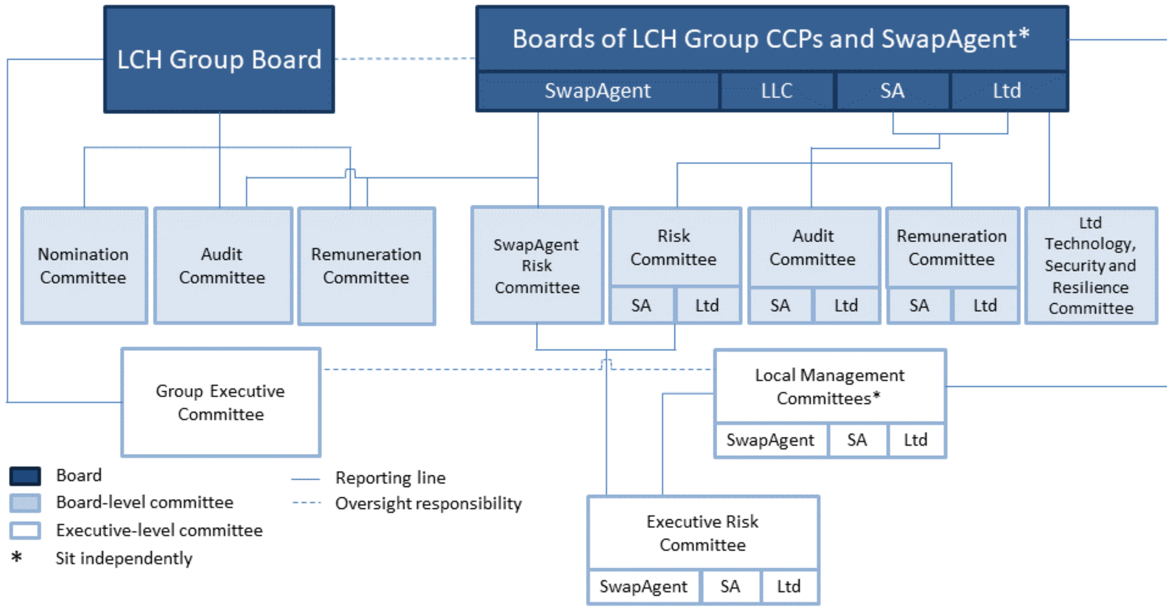


Source: LCH Ltd

B.2.2 LCH Group and LCH Ltd governance arrangements

LCH Group and LCH Ltd (as well as the other LCH Group CCPs) have independent governance structures, including their own boards, board-level committees and executive-level committees (Figure 3).

Figure 3: LCH Group Board and Committee Structure



Source: LCH Ltd

Although LCH Ltd, LCH Group and the other LCH Group CCPs each operate under independent governance arrangements, there is close coordination between each entity. To promote consistency and to avoid duplication, a number of the CCP and LCH Group board-level and executive-level committees have overlapping memberships, with some routinely sitting together (see below). Many of the key policies that govern LCH Ltd's operations – such as the Financial Resources Adequacy Policy, the Collateral Risk Policy and the Operational Risk Policy – are Group policies. Group policies are developed by LCH Group and the LCH Group CCPs in coordination, and apply across each of the CCPs. LCH Group Risk policies must be approved by the LCH Ltd Board to be applicable to LCH Ltd; all LCH Group Risk policies are approved by the LCH Ltd Board after review by the board-level Risk Committee.[27]

LCH Ltd also coordinates closely with LCH Group and the other LCH Group CCPs in day-to-day processes; some processes, such as the assignment of ICSs and model validations, are performed at the LCH Group level, rather than the individual CCP level.

LCH Group and LCH Ltd Boards

The LCH Group Board is responsible for the overall management and strategic direction of the LCH Group. The LCH Group Board has 15 members, including six independent directors (including the Chair). The LCH Group Board meets at least five times a year and on an ad hoc basis, as required. Four members of the LCH Group Board – three of the independent directors and the CEO of LCH Group – also sit on the LCH Ltd Board.

The LCH Ltd Board has ultimate responsibility for LCH Ltd. This includes responsibility for: establishing clear objectives and strategies; establishing and overseeing the risk management function; ensuring

27 The LCH Group Risk policies are: the Financial Resource Adequacy Policy; Liquidity Risk Policy; Operational Risk Policy; Investment Risk Policy; Collateral Risk Policy; Counterparty Credit Risk Policy; Contract and Market Acceptability Policy; Default Management Policy; Settlement, Payment and Custody Risk Policy; Model Governance, Validation and Review Policy; Procyclicality Policy; Information Security and Cyber Risk Policy; and the Business Continuity Risk Policy.

compliance with legal, regulatory and contractual responsibilities; overseeing the compliance and internal control functions; and monitoring LCH Ltd senior management. Where there is overlap in the matters reserved for the LCH Group and LCH Ltd Boards, the relevant matter will require the approval of both boards. The LCH Ltd Board has 10 directors, including five independent directors (including the Chair), the CEO of both LCH Group and LCH Ltd, the LCH Group Chief Risk Officer (CRO), two member representatives and one director nominated by LSEG. As at 30 September 2019, the LCH Group CEO is also the interim LCH Ltd CEO and there is a vacancy for an independent director.

Group-level, board-level and executive-level committees

LCH Ltd and LCH SA have similar board-level and executive-level committee structures. The committees have overlapping, but not identical memberships. The board-level Risk Committees routinely sit together, facilitating cooperation and coordination, and reducing repetition. The CCP board-level Audit and Remuneration Committees may also sit together with the equivalent Group-level committees. Issues specific to a particular CCP can be considered at combined meetings.

Key LCH Group and LCH Ltd board-level and executive-level committees include:

- *LCH Ltd Risk Committee*. The LCH Ltd Risk Committee is a board-level committee with key responsibilities including providing independent advice to the LCH Ltd Board on risk policy, new markets and products, and amendments to margin and stress testing methodologies. The Risk Committee considers and comments on all aspects of LCH Ltd's risk appetite, tolerance and strategy, and assists the LCH Ltd Board to fulfil its responsibility for the oversight of risk management of LCH Ltd.
- *LCH Ltd Technology, Security and Resilience Committee*. The board-level LCH Ltd Technology, Security and Resilience Committee assesses the adequacy of LCH Ltd's strategies and plans for the management of technology, security, operational and cyber risks, and assists the LCH Ltd Board in reviewing the frameworks, policies and strategies that set the internal control environment in relation to LCH Ltd's technology, operational resilience and security.
- *LCH Group Executive Committee*. The LCH Group Executive Committee is the most senior LCH Group management committee. It is an advisory body, which provides advice and recommendations to the Group CEO and the CEOs of the Group's CCPs. The Executive Committee is made up of: the Group CEO, who acts as the Chair; the CEOs of each of the Group CCPs; the business line heads; and the Group functional heads.
- *Local Management Committees*. Each of LCH Ltd, LCH SA and SwapAgent has a Local Management Committee (LMC). Unlike some of the board-level committees and other executive-level committees, the LMCs do not sit jointly. This allows the LCH Ltd LMC to consider issues from the perspective of LCH Ltd in isolation. The LCH Ltd LMC provides support and advice to the LCH Ltd CEO on risk management, strategy, financial management and reporting, operational management, audit and governance. The LCH Ltd LMC reports directly to the LCH Ltd Board and provides direction and oversight to the LCH Ltd Executive Risk Committee (ERCo). Permanent members of the LCH Ltd LMC include senior management from both LCH Ltd and LCH Group. LMC members are allowed to nominate delegates to attend in their place.
- *Executive Risk Committees*. LCH Ltd, LCH SA and SwapAgent each have an ERCo. The ERCos have overlapping membership, meet concurrently and are chaired by the Group CRO. Each ERCo is responsible for the management, monitoring and oversight of all material risks faced by the

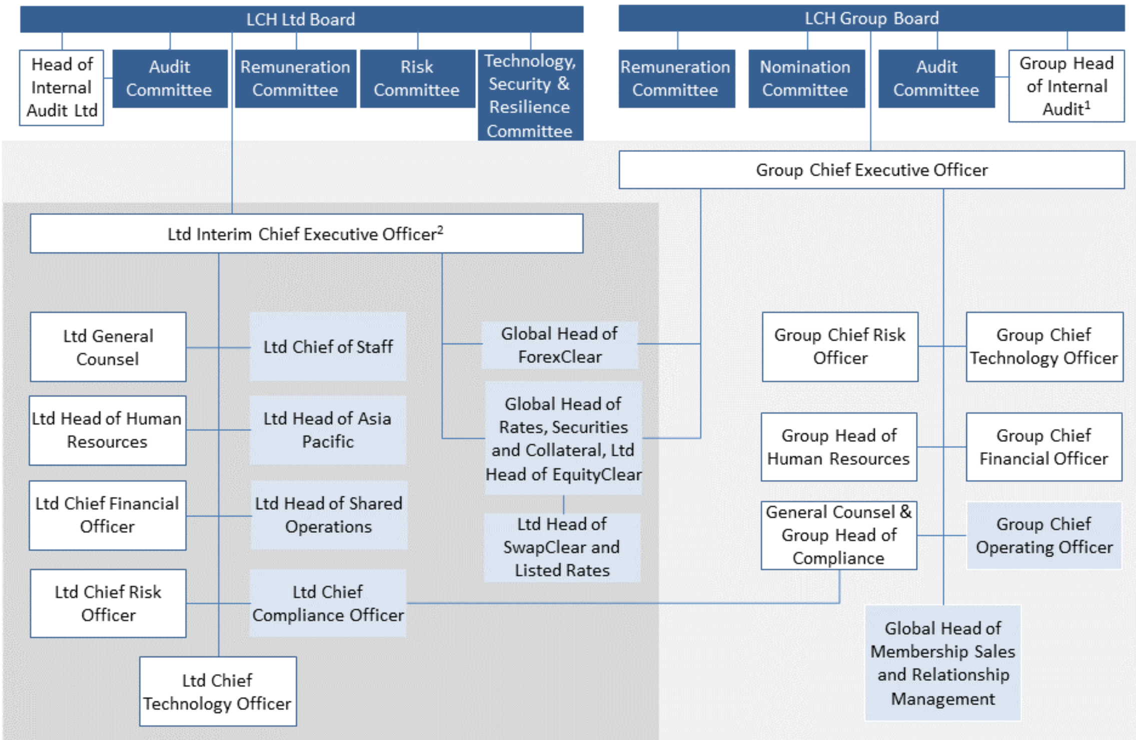
relevant entity. The LCH Ltd ERCo reports directly to the LCH Ltd Risk Committee and, via the Ltd CRO, provides regular updates on its activities to the LCH Ltd LMC.

- *Other key committees and working groups*. Various committees support decision-making within LCH Ltd. These include (among others): the Group-level Risk Resilience Committee and, at a CCP level, the Change Management Committee and Rule Change Committee. In addition, the LCH Group Financial Risk Working Group typically considers matters related to financial risk at LCH Ltd before they are submitted to the LCH Ltd ERCo for review or approval.

Senior management

LCH Group and LCH Ltd have similar senior management structures and reporting lines (Figure 4). Some positions across LCH Ltd and LCH Group are held by the same person ('double hat roles').

Figure 4: Senior Management Positions and Reporting Lines



¹ Group Head of Audit reports to Chair of Group Board and Group Audit Committee. Replicated for local CCPs to local Chair / Board Subcommittees.
² Temporary arrangement as at 30 September 2019. Both the Group and Ltd CEOs will become single hat roles with the appointment of a new Ltd CEO in November 2019.

Source: LCH Ltd

B.2.3 Departments in LCH Ltd

LCH Ltd is organised into departments based on its core functions and the products it offers. The 'functional' departments include: Audit, Collateral and Liquidity Management (CaLM), Compliance, Finance, Human Resources, Information Technology, Legal, Operations and Risk. Departments are further divided into teams. For example the Risk department includes teams responsible for credit risk, default management, risk resilience, reporting, collateral and liquidity risk. It also includes several product-specific Risk teams which operate as a second line of defence to the first-line Risk functions operated by each business. The CaLM department is responsible for ensuring investment activities are conducted in accordance with the relevant Group Risk policies and regulations and is separate to the Collateral and Liquidity Risk Management function, which is responsible for monitoring and assessing various risks against Group Risk policies. ‘Product’ departments are structured around LCH Ltd’s various clearing services and include the SwapClear business unit.

B.2.4 Governance of SwapClear

The Global Head of Rates, Securities and Collateral, a Group-level position, is responsible for developing and managing the SwapClear and Listed Rates services, and has the authority to develop and implement business strategy, operational plans, policies and budgets for SwapClear and Listed Rates. The Global Head of Rates, Securities and Collateral reports directly to the CEO of LCH Ltd and to the CEO of LCH Group and has responsibility for launching and extending the SwapAgent service. LCH Ltd also maintains regional representation for SwapClear in Australia. The Asia-Pacific Head for LCH Ltd, who reports directly to the LCH Ltd CEO, is responsible for overseeing the strategy and business operations of the SwapClear and other services in Australia and the Asia-Pacific region.

SwapClear operates as a distinct business unit within LCH Ltd, although it is not a separate legal entity. SwapClear has its own executive management team overseeing its operations and has a dedicated team that performs risk management functions consistent with policies set at the LCH Ltd and LCH Group levels. The Rates service risk management team’s responsibilities include determining stress test scenarios and sizing the Rates default fund, pricing positions and calling variation margin, calling additional margin, determining and performing backtesting for initial margin, and determining SwapClear default management protocols. The Head of the Rates service Risk team reports directly to the Global Head of Rates, Securities and Collateral. The Group-level Risk department performs the second line of defence including the maintenance of risk policies aligned to the LCH Ltd Board’s risk appetite, analysis of margin and default fund adequacy and methodologies, risk aggregation and reporting, default management coordination, determination and monitoring of ICSs and monitoring of credit risk related limits, new product approvals and the risk governance process.

B.3 Regulatory Environment

LCH Ltd is licensed in Australia under section 824B(2) of the *Corporations Act 2001*, which provides licensing for an overseas-based CS facility subject to requirements and supervision in its home country that are considered to be sufficiently equivalent to those in Australia. LCH Ltd is incorporated in England, and is primarily regulated by the BoE under UK and EU legislation.

The Bank has a memorandum of understanding in place with the BoE regarding supervision of CS facilities.[28] The memorandum provides a framework for bilateral cooperation, including information sharing and investigative assistance. The Bank also engages with the BoE on LCH Ltd supervision matters through the LCH Ltd Global College, which was established in 2012 (see below).

B.3.1 The regulatory regime

LCH Ltd’s operations are subject to a number of regulatory regimes:

- *EU regulation.* In July 2012, the EU introduced EMIR, a harmonised framework for the regulation of FMIs, including CCPs, incorporated in the region. In May 2018, EMIR was incorporated into the European Economic Area Agreement.[29] EMIR is therefore in force in the European Economic Area,

28 The memorandum is available at <http://www.rba.gov.au/payments-and-infrastructure/payments-system-regulation/pdf/memorandum-2015-05-25.pdf>.

29 More information is available at <http://www.efta.int/EEA/news/EEA-Joint-Committee-incorporates-22-EMIR-acts-508781>.

which covers the EU and Iceland, Liechtenstein and Norway. EMIR and its associated technical standards largely implement the PFMI in the EU. Under EMIR, primary regulatory authority over a CCP is given to the national competent authority in the country in which that CCP is established; since LCH Ltd is established in the UK, this is the BoE.

- *UK regulation.* Within the UK, LCH Ltd is regulated by the BoE as a 'recognised central counterparty' under the UK Financial Services and Markets Act 2000. This sets recognition requirements for UK CCPs including EMIR compliance, maintaining a recovery plan and loss allocation rules, and instituting measures to monitor and reduce potential market abuse. The PPS operated by LCH Ltd is regulated and overseen by the BoE as a 'recognised payment system' under the UK Banking Act 2009.
- *Regulation in other jurisdictions.* LCH Ltd's operations span several jurisdictions. Outside the European Economic Area and Australia, LCH Ltd has been formally licensed or granted an exemption in the US, Switzerland, Japan, the Canadian provinces of Ontario and Québec, Mexico, Hong Kong and Singapore, allowing it to offer a range of clearing services in those jurisdictions.

B.3.2 The EMIR College and the Global College

EMIR provides a framework for cooperative oversight of CCPs among EU authorities, requiring that a supervisory college be established for each EU-based CCP.

The EMIR supervisory college for LCH Ltd (EMIR College) is chaired by the BoE and plays a role in the ongoing supervision of LCH Ltd, including when LCH Ltd applies to the BoE to expand its services or make significant changes to its risk models. The EMIR College also facilitates the exchange of information among its members.

The BoE has also established a Global College for LCH Ltd, membership of which extends beyond the EMIR College. The Bank is represented on the Global College.

B.3.3 The Bank of England's oversight approach and supervisory priorities

The BoE has a mandate to protect and enhance the stability of the UK financial system. In its role as supervisor, the BoE aims to ensure FMIs are 'managed in a manner that is consistent with the public interest including reducing systemic risk'.[30] The BoE takes a risk-based approach to oversight, prioritising its supervisory efforts in areas where it considers risks to financial stability are greatest.

The BoE conducts at least an annual assessment of the risks each UK FMI presents to financial stability. Based on its assessment, the BoE sets expectations of risk-mitigating actions the FMI should take, in the form of supervisory priorities. The BoE provides LCH Ltd with a single set of supervisory priorities, covering its operations as a CCP and as a payments system. The BoE also conducts thematic reviews across all CCPs for which it has oversight responsibility.

The BoE publishes an annual report on its oversight of UK CCPs and other FMIs. The latest report, published in February 2019, summarised the BoE's supervisory priorities and thematic reviews during

30 BoE (2013), *The Bank of England's approach to the supervision of financial market infrastructures*. Available at <http://www.bankofengland.co.uk/financialstability/Documents/fmi/fmisupervision.pdf>.

the period from February 2018 to February 2019, as they applied across all FMIs, and the FMIs' progress against them.[31] The relevant priorities and reviews, focusing on their applicability to the UK CCPs, were:

- *Operational resilience.* The BoE continued work on developing an approach to operational resilience stress testing for FMIs, and are planning a pilot test of the approach in 2019. In collaboration with the Prudential Regulation Authority and the Financial Conduct Authority, the BoE published a discussion paper on operational resilience, which will help inform policy development.[32]
- *Cyber security and IT resilience.* The BoE reviewed CCPs' adherence to the CPMI-IOSCO *Guidance on Cyber Resilience for Financial Market Infrastructures* (the Cyber Resilience Guidance). The review concluded that CCPs have continued to maintain their focus on enhancing cyber resilience, and that progress has been made in a number of areas. The BoE also conducted CBEST tests of relevant UK FMIs. CBEST is a framework for controlled, bespoke, intelligence-led cyber security tests assisting financial institutions to remain resilient to cyber attack.
- *Financial resilience*. The BoE completed an evaluation of CCPs' self-assessments against the CCP Resilience Guidance. The review found that CCPs' financial risk management frameworks were broadly consistent with the guidance but identified some areas requiring further work. The BoE also performed a cross-CCP review of model governance, and core assurance reviews of financial resilience, including margin and default fund calculation processes, liquidity risk management and collateral management. The BoE initiated reviews into indirect clearing, and the capital positons and business models of the CCPs it supervises.
- *EU withdrawal.* The BoE has been focusing on ensuring continuity of essential payment, clearing and settlement services in the event of a no-deal Brexit. This includes working with CCPs to ensure they are able to identify potential risks and have robust contingency plans in place. The BoE has also worked to ensure the domestic regulatory framework, including the BoE's new responsibilities, will be fully effective once European law ceases to apply.

The BoE's supervisory priorities for the period from February 2019 are discussed in section 1.5.

B.3.4 Resolution

As a UK-based CCP, any resolution of LCH Ltd would be governed by UK law. Under the UK's legal framework, resolution of CCPs is governed by the UK *Banking Act 2009* (which was extended to include CCPs by the UK *Financial Services Act 2012*). In August 2014, secondary legislation was introduced to enter the resolution regime into force for CCPs.[33] The BoE is the resolution authority for UK CCPs. Dependent on the timing and nature of the UK's withdrawal from the EU, clarification as to how a resolution scenario would work in practice is expected to develop in light of the UK's HM Treasury's negotiations with the European Commission about the pending EU regime for CCP recovery and resolution.

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31 BoE (2019), *The Bank of England's supervision of financial market infrastructures – Annual Report*. Available at <https://www.bankofengland.co.uk/-/media/boe/files/annual-report/2019/supervision-of-financial-market-infrastructures-annual-report-2019>.

32 BoE, PRA and FCA (2018), *Building the UK financial sector's operational resilience*. Available at <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/discussion-paper/2018/dp118.pdf>.

33 More information on the circumstances under which resolution tools would be used is available at <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411563/banking_act_2009_code_of_practice_web.pdf>.

The BoE leads the LCH Ltd Crisis Management Group (CMG), of which the Bank is a member. The role of the CMG is to discuss and facilitate development of a resolution plan for LCH Ltd.

B.4 Operational Risk Management

Operational risk is the risk that deficiencies in information systems, internal processes and personnel, or disruptions from external events, will result in the reduction, deterioration or breakdown of services provided by a CCP. Operational failures can damage a CCP's reputation or perceived reliability, lead to legal consequences, and result in financial losses incurred by the CCP, participants and other parties. In certain cases, operational failures can also be a source of systemic risk.

LCH Ltd uses a 'three lines of defence' approach to assign responsibilities for identifying, monitoring and managing operational risks:

- The first line of defence is embedded within business lines and support functions, including the Business, First Line Risk, Operations and IT departments. These areas are responsible for the day-to-day management of operational risks within risk appetite, including maintaining effective internal controls and ensuring that all material risks are identified.
- The second line of defence is provided by LCH Ltd Risk Resilience department and the LCH Group Risk Resilience Committee and is responsible for maintaining and supporting the development of policies consistent with the Operational Risk Management Framework. It provides oversight, support and challenge to the first line of defence in relation to risk management activity and adherence to the framework. The second line also produces aggregated risk reporting to senior executive committees and the LCH Ltd Board.
- The third line of defence is internal audit, encompassing the LCH Ltd Internal Audit department and the LCH Ltd Audit Committee, who are responsible for reviewing the effectiveness of the management and governance of operational risk, including the system of internal controls and the operational risk framework, and providing assurance to the Board.

LCH Ltd classifies the different aspects of operational risk into distinct 'resilience' risks and maintains policies, procedures and controls to address each of these risks:

- *Technology risk* is the risk technological failures disrupt critical services provided by LCH Ltd. As the primary objective of IT systems is to support LCH Ltd's services, IT systems are managed to minimise the potential for the disruption of service. This includes maintaining sufficient capacity for service growth, service availability targets and technology change management processes to ensure critical systems maintain a high level of performance.
- *Business continuity risk* refers to potential losses arising from a failure to recover from the disruption of critical business or IT processes due to adverse circumstances or events. The LCH Ltd Board expects that adequate processes are in place to minimise disruption. These processes include service availability targets, the regular testing of back-up and recovery plans to recover critical systems within two hours of a disruptive event, and the operation of geographically distinct secondary processing sites capable of running all critical functions.
- *Information and cyber security risk* refers to the risk to LCH Ltd's operations, assets, staff and partners arising from unauthorised access, use, disclosure, disruption, modification, or destruction of information and/or information systems. To manage these risks, LCH Ltd expects that appropriate checks are performed prior to information leaving LCH Ltd in the normal course of

business and cyber security threats are appropriately evaluated and key controls remain adequate. This is complemented by employing the NIST cyber security framework and the Cyber Resilience Guidance.

- *Default management risk* covers the risk that adequate processes are not in place prior to a default event, which leads to a material deterioration in the market value of assets held by LCH Ltd. To minimise this risk, LCH Ltd has policies and procedures in place that set out the key roles and responsibilities in managing a clearing participant default. LCH Ltd conducts Group-wide and partial fire drills at least annually to test both clearing participants' and the CCP's awareness of and ability to implement the default management process.
- *Operational risk*, as defined within the LCH Group Risk Governance Framework, refers to all other risks where loss may arise from inadequate or failed internal processes, people and systems, or from external events. The LCH Ltd Board has a low appetite for operational risks and requires these risks to be managed in a proactive manner to minimise the impact to LCH Ltd.

When any resilience risk is assessed to be outside or near LCH Ltd's risk appetite, a mitigation plan must be developed and implemented to bring the risk within the specified risk appetite. Any outside appetite risks that will take longer than six months to return within LCH Ltd's risk appetite must be notified to the LCH Ltd Board. The LCH Ltd Board is responsible for determining the LCH Ltd appetite for operational risk.

Abbreviations

ASIC	Australian Securities and Investments Commission
Bank	Reserve Bank of Australia
BoE	Bank of England
BSL	Business Services Ltd
CaLM	Collateral and Liquidity Management
CCP	Central counterparty
CCP Resilience Guidance	Resilience of Central Counterparties: Further guidance on the PFMI
CCP Standards	Financial Stability Standards for Central Counterparties
CEO	Chief Executive Officer
CFTC	Commodity Futures Trading Commission
CMG	Crisis management group
CPMI	Committee on Payments and Market Infrastructures
CRO	Chief Risk Officer
CS	Clearing and settlement
Cyber Resilience Guidance	Guidance on cyber resilience for financial market infrastructures
DFAM	Default fund additional margin
DMG	Default Management Group
EMIR	European Market Infrastructure Regulation (Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories)
EMIR College	EMIR supervisory college for LCH Ltd
ERCo	Executive Risk Committee
FMI	Financial market infrastructure
Global College	Multilateral Arrangement for Regulatory, Supervisory and Oversight Cooperation on LCH Ltd
IBOR	Interbank offered rate
ICS	Internal credit score
IOSCO	International Organization of Securities Commissions
LCH Group	LCH Group Holdings Limited
LCH Ltd	LCH Limited
LSEG	London Stock Exchange Group plc
NIST	National Institute of Standards and Technology
OIS	Overnight index swap
OTC	Over-the-counter

PAIRS	Portfolio Approach to Interest Rate Scenarios
PFMI	Principles for Financial Market Infrastructures
PPS	Protected Payments System
RFR	Risk-free rate
RTTR	Real-time trade registration
STLOIM	Stress test losses over initial margin