

Assessment of ASX Clearing and Settlement Facilities

September 2017

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Executive Summary

- Purpose** In accordance with its responsibilities under the *Corporations Act 2001*, the Reserve Bank of Australia (the Bank) presents its annual Assessment of the ASX clearing and settlement (CS) facilities. ASX operates four CS facilities: two central counterparties (CCPs) – ASX Clear Pty Limited and ASX Clear (Futures) Pty Limited – and two securities settlement facilities (SSFs) – ASX Settlement Pty Limited and Austraclear Pty Limited. The report details the CCPs’ and SSFs’ compliance with the Bank’s *Financial Stability Standards for Central Counterparties* (CCP Standards) and *Financial Stability Standards for Securities Settlement Facilities* (SSF Standards) (together, the Financial Stability Standards or FSS), respectively, as well as the facilities’ more general obligation to do all other things necessary to reduce systemic risk. The assessment is as at the end of June; however, where relevant, developments after this time are discussed.
- Conclusion** It is the Bank’s assessment that, except for ASX Clear (Futures), the ASX CS facilities ‘observed’ all relevant requirements under the FSS as at 30 June and ASX Clear (Futures) ‘observed’ or ‘broadly observed’ all relevant requirements in the FSS. The Bank therefore concludes that the ASX CS facilities have conducted their affairs in a manner that causes or promotes overall stability in the Australian financial system.
- Progress towards previous priorities** ASX has made material progress against the Bank’s regulatory priorities identified in its September 2016 Assessment report:
- **Investment risk.** From 1 July 2017, the CCPs have limited unsecured exposures to non-government counterparties in their investment portfolio to the level of capital set aside for general business risk losses (\$75 million). The CCPs have also modified their investment policy to restrict the assets eligible to meet their minimum liquid resource requirement to government/semi-government securities or cash.
 - **Liquidity risk management.** The CCPs have refined and expanded their liquidity-specific stress testing framework. This framework now considers foreign currency liquidity exposures in ASX Clear (Futures). It has also more clearly defined the strategy for covering exposures in the cash market. Both CCPs have now clearly defined the process they would follow if a breach of their liquidity targets were to occur.
 - **Default management.** The SSFs have significantly enhanced the documentation supporting their Default Management and Recovery Framework (DMRF), and ASX has published additional information on particular aspects of the CS facilities frameworks.¹ The CCPs have also made some enhancements to their fire drills, and further enhancements are planned in the coming assessment period.
 - **Cyber resilience.** The Bank conducted a detailed assessment of the CS facilities against the governance chapter of *Guidance on cyber resilience for financial market infrastructures* (Cyber Guidance), which was jointly published by the Committee on Payments and Market Infrastructures (CPMI) and International Organization of Securities Commissions (IOSCO). The results of this assessment have been shared

1 The CS facilities’ DMRFs were previously called ‘default management frameworks’ or DMFs.

with ASX. The facilities have initiated an external review of their cyber resilience arrangements against industry standards and plan to conduct a self-assessment against the remaining chapters of the guidance by November 2017. ASX has also developed a plan to improve the CS facilities' capabilities to recover from a cyber attack.

Other material developments

Other material developments relevant to the supervision of the ASX CS facilities that occurred during the assessment period include:

- *Operational risk review.* In light of a recent series of significant operational incidents, ASX is undertaking an external review of its operational and technological risk management arrangements, including those of its CS facilities.
- *Clearing House Electronic Sub-register System (CHES) replacement.* ASX continued its development work on a project to replace CHES, the clearing and settlement system that supports the cash equities market. ASX is currently considering the use of a system using distributed ledger technology (DLT) and intends to make a decision as to whether to proceed with a DLT solution at the end of 2017.
- *Risk management systems enhancements.* ASX has modified and reprioritised certain aspects of its technology transformation program. Rather than developing a new risk management system for the CCPs, ASX will instead be making incremental enhancements to the CCPs' existing risk management systems as part of a five-year plan to be developed over the next assessment period.

Priorities for the next assessment period

The Assessment includes recommendations for the ASX CS facilities to either observe or continue to observe the requirements under particular FSS. These recommendations relate to:

- the management of exposures during the ASX Clear (Futures) Night Session
- the analytical basis for the CCPs' margin period of risk (MPOR) assumptions
- the management of liquidity and concentration risk in the CCPs' margin models for exchange-traded derivatives
- the addition of a second default broker in ASX Clear
- the analysis of the CCPs' credit stress test scenarios, models and underlying parameters and assumptions
- the frequency of external validations of the CCPs' risk models.

The Assessment also identifies areas that will be an important part of the Bank's supervisory engagement with ASX over the next assessment period. These relate to work ASX has underway to strengthen the facilities' risk management arrangements, developments in international standards, and regulatory priorities that carry over from previous Assessments, and include:

- recently issued guidance from CPMI and IOSCO, the *Resilience of Central Counterparties: Further guidance on the Principles for financial market infrastructures* (CCP Resilience Guidance)
- the reviews of the CS facilities' cyber resilience arrangements
- the project to replace CHES
- the external review of ASX's operational risk management arrangements.

1. Summary of Regulatory Priorities

This section summarises actions taken by the ASX CS facilities during 2016/17 (the Assessment period) in relation to recommendations identified in the Bank's 2015/16 Assessment of ASX Clearing and Settlement Facilities (the September 2016 Assessment), and summarises the recommendations identified by the Bank in its September 2017 Assessment of the facilities against the FSS. Further detail is provided in Section 2, which describes the material developments in the ASX CS facilities relevant to the FSS, and Section 3, which provides the results of a detailed assessment conducted by the Bank of the ASX CCPs' margin arrangements against the CCP Standard on margin.

1.1 Progress against 2015/16 Recommendations

In the Bank's September 2016 Assessment, the ASX CS facilities were rated 'observed' for all FSS, except for the CCPs, which were rated 'broadly observed' for CCP Standard 15: Custody and investment risks. The September 2016 Assessment made a recommendation for steps to be taken by the CCPs in order for them to 'observe' Standard 15, as well as other recommendations in order for the ASX CS facilities to continue to observe various standards. Table 1 summarises actions taken by the ASX CS facilities in relation to these recommendations during the Assessment period.

Table 1: Summary of Progress against 2015/16 Recommendations to Observe or Continue Observing the FSS

Recommendation	Standard	Facility	Actions
<p>Liquidity stress testing. ASX Clear and ASX Clear (Futures) should implement plans to expand and refine their liquidity-specific stress scenarios and integrate these into their liquidity stress test frameworks. For ASX Clear (Futures), the expanded scenarios should include stress tests of non-Australian dollar liquidity exposures.</p> <p>ASX Clear should continue to refine and enhance the sensitivity analysis of its liquidity stress test model. This includes examining further the sensitivity of outcomes to certain underlying assumptions, such as the level of priming of securities.</p> <p>ASX Clear should ensure that its liquidity stress test framework is aligned with a clearly defined strategy for managing liquidity obligations in a default scenario. ASX Clear should implement plans to maintain sufficient liquid resources to cover a pre-specified value of stressed liquidity exposures arising from cash market transactions, while continuing to maintain sufficient liquid resources to cover stressed liquidity exposures arising from derivatives transactions. For both ASX Clear and ASX Clear (Futures), processes should be in place to respond promptly to any breaches of target liquidity coverage; these processes should be clearly documented.</p>	CCP Standard 7	Both CCPs	<p><i>Mostly addressed. The Bank will be seeking further detail on ASX's foreign currency liquidity stress testing arrangements during the next assessment period.</i></p> <p>The ASX CCPs have refined their liquidity-specific stress test scenarios and incorporated them into their liquidity risk management framework. ASX Clear (Futures) has also developed a foreign currency liquidity stress test framework.</p> <p>ASX Clear has enhanced its liquidity stress test model sensitivity analysis by conducting analysis on the effect of the priming assumption on stress test exposures. This analysis will be performed annually.</p> <p>ASX Clear has implemented a clearly defined strategy for managing liquidity obligations in a default scenario. The new strategy involves maintenance of a formal 'cash market liquidity buffer' designed to cover a portion of stressed liquidity exposures arising from cash market transactions, while continuing to maintain sufficient liquid resources to cover stressed liquidity exposures arising from derivatives transactions. The CCPs have also documented their processes for responding to a breach of their liquidity targets, including the cash market buffer in ASX Clear.</p> <p>For more information see Section 2.1.2.</p>

<p>Liquidity risk management. ASX Clear should conduct appropriate due diligence on its participants' ability to understand, quantify and manage any contingent liquidity obligations under its Rules. ASX Clear should ensure that its disclosures remain consistent with its liquidity risk management framework and assist participants in understanding their contingent exposure to the use of tools to address a liquidity shortfall.</p> <p>ASX Clear should enhance and formalise its processes for conducting due diligence on the ability of its committed liquidity providers to perform as required under those commitments.</p>	<p>CCP Standard 7</p>	<p>ASX Clear</p>	<p><i>Fully addressed.</i></p> <p>ASX Clear has continued to provide its participants with regular disclosures on participants' contingent exposures to offsetting transaction agreements. ASX Clear's annual liaison with participants now includes a discussion on the results of these disclosures to ensure that participants understand and can manage these contingent exposures. These disclosures remain consistent with ASX Clear's liquidity risk management framework.</p> <p>ASX Clear has implemented regular processes for conducting due diligence on its liquidity providers. This includes periodic checks of whether ASX Limited continues to meet the requirements set out in its agreement with the major bank liquidity provider and whether it has enough funds to deliver on its portion of the facility.</p> <p>For more information see Section 2.1.2.</p>
<p>CCP default management. ASX Clear and ASX Clear (Futures) should continue enhancing their approach to the testing and review of their default management arrangements. Such enhancements should include increasing the complexity and scope of their default management fire drills. Both CCPs should also ensure that these fire drills involve all relevant internal and external stakeholders and committees, and test the interaction between all relevant stakeholders.</p> <p>ASX Clear and ASX Clear (Futures) should more prominently involve their default brokers in the testing of default management arrangements for exchange-traded products. On an annual basis, both CCPs should engage with their default brokers on the default brokers' proposed method for closing out the hypothetical portfolio used in the fire drill, including expected close-out prices and timeframes.</p> <p>ASX Clear and ASX Clear (Futures) should also involve the Risk Consultative Committees and other clearing participants in future default management fire drills that test the CCPs' recovery arrangements.</p> <p>As part of their annual review of the DMRF, ASX Clear and ASX Clear (Futures) should assess the potential implications of any changes to the resolution regimes that govern their participants. This includes the resolution regimes of any offshore-based participants.</p> <p>ASX Clear and ASX Clear (Futures) should also review their DMRF in light of the proposed establishment of a special resolution regime for financial market infrastructures (FMIs) in Australia, once the regime has been finalised.</p> <p>ASX Clear (Futures) should validate through its testing and review processes its expectation that its default management arrangements take appropriate account of stability interests in other jurisdictions in which it has material activity, most notably in New Zealand.</p>	<p>CCP Standard 12</p>	<p>Both CCPs</p>	<p><i>Mostly addressed. The Bank will assess ASX's plans to enhance its default management fire drills as part of its ongoing supervision of ASX.</i></p> <p>The CCPs have:</p> <ul style="list-style-type: none"> engaged more deeply with their default brokers on the close-out process run an internal fire drill that tested their recovery arrangements reviewed the implications of changes to the resolution regimes applicable to the CCPs' participants given some initial consideration to how ASX Clear (Futures) would validate its expectation that its default management arrangements take appropriate account of stability interests in New Zealand. <p>Work to respond to the recommendations will nonetheless continue into the next assessment period. In particular, ASX plans to enhance the CCPs' default management fire drills. ASX also intends to engage the CCPs' Risk Consultative Committees in future years.</p> <p>The CCPs have not reviewed their DMRF in light of the proposed special resolution regime, since the regime has not been finalised.</p> <p>For more information, see Section 2.3.</p>

<p>SSF default management. ASX should carry out further work to enhance the facilities DMRF documentation for its SSFs, including the documents that set out the specific procedures to be followed in the event of default of an Austraclear participant, ASX Settlement participant, participating bank, or payment provider. In particular, these documents should provide guidance on the discretionary decisions that may need to be taken by the Participant Incident Response Committee and other relevant parties, including elaborating on relevant factors for consideration in making these decisions.</p>	<p>SSF Standard 11</p>	<p>Both SSFs</p>	<p><i>Mostly addressed. The Bank will assess ASX's plans to enhance its default management fire drills as part of its ongoing supervision of ASX.</i></p>
<p>ASX Settlement and Austraclear should formalise the review of their default management procedures within ASX's broader framework for testing and review of the DMRF.</p>			<p>The SSFs have:</p> <ul style="list-style-type: none"> • significantly enhanced the documentation supporting the DMRF, which now provides guidance on discretionary decisions • established a framework for reviewing the SSF default management arrangements on an annual basis • enhanced the disclosures available to participants on key aspects of the DMRF by creating or updating guidance notes available to participants on ASX's website.
<p>ASX Settlement and Austraclear should carry out their plans to enhance participant and client education and communication regarding their default management arrangements. As part of this:</p>			<p>Work to respond to the recommendations will nonetheless continue into the next assessment period. In particular, ASX will run its first settlement-focussed fire drill in Q4 2017 and aims to develop and enhance these fire drills over time.</p>
<ul style="list-style-type: none"> • ASX Settlement should extend the scope of its Guidance Note on the suspension and termination of ASX Settlement participants to explain the potential implications of the default of a participant or payment provider on other ASX participants, and develop an accessible information note on the ASX Settlement back-out algorithm. • Austraclear should complete its planned updates of participant disclosures on the key aspects of its default management arrangements, including releasing a Guidance Note on the suspension and termination of Austraclear participants which explains the potential implications of the default of a participant or participating bank on other ASX CS facilities. 			<p>ASX is considering what changes to its default management processes may be necessary to implement with the replacement system for CHES.</p>
<p>Any disclosures should be easily accessible, preferably in a centralised location.</p>			<p>For more information, see Section 2.3.</p>
<p>In developing its new system for clearing and settlement of cash market securities, ASX Settlement should ensure that any default management processes are clearly documented, and that the effectiveness of these processes can be tested and reviewed on an ongoing basis.</p>			
<p>ASX Settlement and Austraclear should continue enhancing their approach to the testing and review of their default management arrangements. Such enhancements should include increasing the complexity and scope of the ASX default management fire drills. ASX Settlement and Austraclear should also ensure that these fire drills involve all relevant internal stakeholders and committees, and test the interaction between all relevant stakeholders.</p>			
<p>As part of the annual ASX default management fire drills, consideration should be given to the implications of the default of an Austraclear participant, ASX Settlement participant, participating bank or payment provider for other ASX CS facilities.</p>			

<p>Investment risk. ASX Clear and ASX Clear (Futures) should implement plans to:</p>	<p>CCP Standard 15</p>	<p>Both CCPs</p>	<p><i>Fully addressed.</i></p> <p>From 1 July 2017, the CCPs have limited unsecured exposures to a non-government investment counterparty to the level of capital set aside for general business risk losses (\$75 million). The CCPs have also set a target on their investments to ensure that their minimum liquid resource requirement is met by investments in government/semi-government securities or cash. All other investments are with highly creditworthy obligors.</p> <p>For more information, see Section 2.1.1.</p>
<ul style="list-style-type: none"> • limit unsecured exposures to individual non-government investment counterparties/issuers to the level of capital set aside for non-participant-default or general business risk losses • ensure that other investments are with government-related obligors or secured by assets issued by government-related or other highly creditworthy obligors, subject to prudent concentration limits • ensure that ASX Clear and ASX Clear (Futures)' minimum liquid resource requirement (under CCP Standard 7.3) is invested in or secured by government/semi-government securities or cash. Other investments should be able to address effectively any additional liquidity shortfalls (e.g. be investments in, or secured by, securities eligible for repo with the Bank). 			
<p>Cyber resilience. The CS facilities should review their cyber risk management arrangements in light of CPMI-IOSCO Cyber Guidance. As part of this review, the CS facilities should:</p>	<p>CCP Standard 16, SSF Standard 14</p>	<p>All facilities</p>	<p><i>Ongoing. The Bank will assess the outcome of reviews currently being undertaken of ASX's cyber resilience arrangements through its ongoing supervision.</i></p> <p>The Bank conducted a detailed assessment of the CS facilities against the governance chapter in the CPMI-IOSCO Cyber Guidance. ASX has initiated an external review of its cyber resilience arrangements against industry standards and will be conducting a self-assessment against the remaining chapters of the guidance, which it aims to complete in November 2017. ASX has also developed a plan to improve the CS facilities' capabilities to recover from a cyber attack, which will be progressed in the next assessment period. In addition, ASX has reviewed the case for developing participant requirements in the area of cyber resilience and will update guidance notes supporting the CS facilities' admission requirements to underscore the importance of cyber risk and observance of international best practice.</p> <p>For more information, see Section 2.4.2.</p>
<ul style="list-style-type: none"> • consider developing participant requirements in the area of cyber resilience, liaising as appropriate with the Bank and other relevant authorities • develop concrete plans to improve their capabilities to meet the two-hour recovery time objective following an extreme cyber attack. 			
<p>Resolution planning. The CS facilities will need to review their operational arrangements in light of the proposed special resolution regime for FMI in Australia, once the regime has been finalised. In particular, the CS facilities will need to ensure that their operations are organised in such a way as to facilitate effective crisis management actions under that regime.</p>	<p>CCP Standard 16, SSF Standard 14</p>	<p>All facilities</p>	<p><i>Ongoing.</i></p> <p>The Australian special resolution regime for FMI in Australia is not yet in place, so there has been no progress.</p> <p>For more information, see Section 2.2.</p>

The Bank's September 2016 Assessment also made recommendations that support continuous improvement of the ASX CS facilities risk management arrangements. In line with these recommendations, ASX has:

- enhanced the documentation of its risk management framework, including updating its recovery plan
- implemented processes to periodically test the CCPs' procedures for accessing their liquid resources
- made significant enhancements to the CCPs' DMRF.

The Bank will follow up ASX's progress against the outstanding recommendations for continuous improvement through its ongoing supervision (for further details see Appendix A).

1.2 2017 Assessment and Regulatory Priorities

It is the Bank's assessment that, except for ASX Clear (Futures), the CS facilities 'observed' all relevant requirements under the FSS as at 30 June; ASX Clear (Futures) 'observed' or 'broadly observed' all relevant requirements in the FSS (Table 2).² The Bank therefore concludes that the facilities have conducted their affairs in a way that causes or promotes overall stability in the Australian financial system.³ Compared to the September 2016 Assessment, the Bank has raised the ASX CCPs' rating to 'observed' for CCP Standard 15 since they have fully addressed the recommendation in this area. The Bank has lowered ASX Clear (Futures)' rating for CCP Standard 6: Margin to 'broadly observed', reflecting issues identified as part of the Bank's detailed assessment of this CCP's margin arrangements (see Section 3).

Table 2: Ratings of FSS Observance^{(a),(b)}

Standard	ASX Clear	ASX Clear (Futures)	ASX Settlement	Austraclear
CCP and SSF Standard 1: Legal Basis	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP and SSF Standard 2: Governance	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP and SSF Standard 3: Framework for the Comprehensive Management of Risks	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP and SSF Standard 4: Credit Risk	Observed (→)	Observed (→)	N/A	N/A
CCP and SSF Standard 5: Collateral	Observed (→)	Observed (→)	N/A	N/A
CCP Standard 6: Margin	Observed (→)	Broadly observed (↓)	---	---
CCP Standard 7 and SSF Standard 6: Liquidity Risk	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 8 and SSF Standard 7: Settlement Finality	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 9 and SSF Standard 8: Money Settlements	Observed (→)	Observed (→)	Observed (→)	Observed (→)
SSF Standard 9: Central Securities Depositories	---	---	Observed (→)	Observed (→)
CCP Standard 10: Physical Deliveries	N/A	Observed (→)	---	---
SSF Standard 10: Exchange-of-value Settlement Systems	---	---	Observed (→)	Observed (→)
CCP Standard 11: Exchange-of-value Settlements	Observed (→)	Observed (→)	---	---
CCP Standard 12 and SSF Standard 11: Participant Default Rules and Procedures	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 13: Segregation and Portability	Observed (→)	Observed (→)	---	---

2 In undertaking its Assessment, the Bank has applied the rating system used in the *Principles for Financial Market Infrastructures: Disclosure Framework and Assessment Methodology* produced by CPMI and IOSCO in December 2012. See Appendix C for more detail on this system.

3 Section 821A(aa) of the Corporations Act requires that a CS facility licensee, to the extent reasonably practicable to do so, comply with the FSS and do all other things necessary to reduce systemic risk.

CCP Standard 14 and SSF Standard 12: General Business Risk	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 15 and SSF Standard 13: Custody and Investment Risks	Observed (↑)	Observed (↑)	N/A	Observed (→)
CCP Standard 16 and SSF Standard 14: Operational Risk	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 17 and SSF Standard 15: Access and Participation Requirements	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 18 and SSF Standard 16: Tiered Participation Arrangements	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 19 and SSF Standard 17: FMI Links	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 20 and SSF Standard 18: Disclosure of Rules, Key Policies and Procedures, and Market Data	Observed (→)	Observed (→)	Observed (→)	Observed (→)
CCP Standard 21 and SSF Standard 19: Regulatory Reporting	Observed (→)	Observed (→)	Observed (→)	Observed (→)

- (a) The arrows in brackets indicate the change in ratings from last year: a horizontal arrow indicates no change; a single vertical up arrow indicates a single upgrade (e.g. from 'broadly observed' to 'observed'); and a single vertical down arrow indicates a single downgrade (e.g. from 'observed' to 'broadly observed').
- (b) 'N/A' means that the Bank has determined that the standard is not applicable to the ASX facility; '---' means that an equivalent standard does not exist for the type of facility (e.g. for CCP Standard 6, there is no equivalent standard for SSFs).

The Bank has made recommendations that the CS facilities should address to observe or continue to observe relevant requirements in the FSS. This includes recommendations for ASX Clear (Futures) to address the concern identified by the Bank in relation to its management of intraday exposures in the Night Session. These recommendations are set out in Table 3 and will be a key part of the Bank's regulatory priorities in the next assessment period.

Table 3: Recommendations to Observe or Continue Observing the FSS

Recommendation	Standard	Facility
<p>Risk model validation. The ASX CCPs should review the frequency of the independent validation of their credit risk models to ensure that they align with the CCP Standards.</p> <p>For more information, see Section 2.1.4.</p>	CCP Standard 4	Both CCPs
<p>Analysis of credit stress testing. The ASX CCPs should ensure that they perform comprehensive and thorough analysis of their credit stress test scenarios, models and underlying parameters and assumptions on at least a monthly basis.</p> <p>For more information, see Section 2.1.3</p>	CCP Standard 4	Both CCPs
<p>Intraday exposures. By the end of 2017, ASX Clear (Futures) should implement its plans to introduce a scheduled intraday margin call during ASX 24's Night Session to improve its management of intraday exposures created during this session.</p> <p>By 30 June 2020, ASX Clear (Futures) should put in place arrangements to be able to monitor and manage intraday exposures created during ASX 24's Night Session on a near real-time basis, or take other steps to ensure comprehensive management of intraday exposures created during ASX 24's Night Session.</p> <p>For more information, see Section 3.6.2.</p>	CCP Standard 6	ASX Clear (Futures)
<p>Margin period of risk. ASX Clear and ASX Clear (Futures) should conduct and document analysis of the margin period of risk assumptions used in their initial margin models for all products, and review these assumptions in light of this analysis.</p> <p>For more information, see Section 3.2.</p>	CCP Standard 6	Both CCPs

Liquidity risk. ASX Clear and ASX Clear (Futures) should complete the implementation of add-ons to manage liquidity risk for cash equities and products margined using the Chicago Mercantile Exchange Standard Portfolio Analysis of Risk (CME SPAN) model. For more information, see Section 3.1.4.	CCP Standard 6	Both CCPs
Default broker. ASX Clear should implement its plans to secure an additional default broker. For more information, see Section 2.3.	CCP Standard 12	ASX Clear

With a view of streamlining the Assessment report, unlike last year, the Bank will not include specific recommendations to encourage continuous improvement in this report. There are nevertheless areas that the Bank has identified that will be an important part of its supervisory engagement with ASX in the next assessment period. These relate to developments in international standards and work ASX has underway to strengthen the facilities' risk management arrangements, and are summarised in Table 4.

Table 4: Supervisory Focus

Development	Standard	Facility
Developments in International Standards		
CCP Resilience Guidance. The alignment of the CCPs' risk management arrangements with the new CPMI-IOSCO Resilience Guidance. For more information, see Section 2.2.	CCP Standards 2, 3, 4, 5, 6, 7 and 14	Both CCPs
Updated FMI Recovery Report. The alignment of the facilities' recovery planning arrangements with the revised CPMI-IOSCO guidance on recovery. For more information, see Section 2.2.	CCP Standards 3, 4, 7 and 14, SSF Standards 3, 4, 6 and 12	All facilities
Cyber resilience. The CS facilities' self-assessment against the CPMI-IOSCO Cyber Guidance and the implementation of the facilities' concrete plans to improve their capabilities to recover from a cyber attack. For more information, see Section 2.4.2.	CCP Standard 16, SSF Standard 14	All facilities
Review of Planned Work		
Risk system enhancements. The ASX CCPs' progress in developing and implementing their short-term risk system enhancements over the next assessment period, as well as the development of ASX's five-year plan to improve its risk systems. For more information, see Section 2.1.7.	CCP Standards 4, 5, 6 and 7	Both CCPs
Settlement prices. The ASX CCPs' consultation with their participants on the determination of settlement prices during an outage of ASX Trade and ASX 24. For more information, see Section 3.7.	CCP Standard 6	Both CCPs
Margin model sensitivity analysis. The implementation of the CCPs' new sensitivity analysis framework, and the expansion of the product scope covered by the analysis. For more information, see Section 3.8.	CCP Standard 6	Both CCPs
Default management. The CS facilities' plans to enhance their default management fire drills, including the introduction of SSF-specific fire drills. For more information, see Section 2.3.	CCP Standard 12, SSF Standard 11	All facilities

<p>Operational risk review. The external review of the CS facilities' operational risk management arrangements and ASX's response to the findings of the review.</p> <p>For more information, see Section 2.4.1.</p>	<p>CCP Standard 16, SSF Standard 14</p>	<p>All facilities</p>
<p>CHESS replacement. The development of the new clearing and settlement system for cash securities transactions, including: how the new system aligns with the requirements in the FSS; the clarity, effectiveness and documentation of the default management processes; contingency plans regarding the replacement of CHESS should the decision be taken not to proceed with a DLT solution.</p> <p>For more information, see Section 2.4.3.</p>	<p>CCP Standard 14</p>	<p>ASX Clear and ASX Settlement</p>

In addition to the recommendations and supervisory focus, the Bank expects ASX to work towards continual strengthening of its risk management arrangements. This is in accordance with the general obligation on CS facilities to do all things necessary to reduce systemic risk. ASX recognises this and has governance arrangements in place to motivate and encourage continuous improvement. As part of its ongoing supervisory engagement, the Bank will continue to discuss with ASX areas where there may be opportunities for improvement.

2. Material Developments

This section discusses material developments relevant to the ASX CS facilities that have occurred during 2016/17. Developments between the end of 2016/17 and the finalisation of this report on [x August] are also discussed, where relevant.

To complement this section, background information on activity and participation in the facilities, and governance and risk management in the facilities is set out in Appendix B. A detailed assessment of how the facilities meet each of the FSS (incorporating developments discussed in this section) is presented in Appendix C.

2.1 CCP Risk Management

2.1.1 Investment Risk

ASX Clearing Corporation (ASXCC) invests cash margin posted by participants and prefunded pooled financial risk resources in highly rated short-dated assets in accordance with a treasury investment policy endorsed annually by the CCPs' Boards. For a number of years, the Bank and ASX have discussed the appropriate credit and liquidity risk profile for its treasury investments and, in the 2014/15 Assessment, the Bank clarified its expectations in this area, with an implementation date of the end of June 2017. In particular, ASX was expected to:

- limit its credit exposures to individual non-government investment counterparties/issuers to the level of capital set aside for non-default or general business risk losses
- ensure that other investments are with government-related obligors or secured by assets issued by government-related or other highly creditworthy obligors, subject to prudent concentration limits
- ensure that the CCPs' minimum liquid resource requirement (under CCP Standard 7.3) is invested in, or secured by, government/semi-government securities or cash, with other investments able to address effectively any additional liquidity shortfalls (e.g. investments in, or secured by, securities eligible for repo with the Bank).

After a multi-year transition period, ASX has now met the Bank's expectations. From 1 July, over half of the CCPs' investment portfolio has been invested in government or semi-government bonds, or reverse repurchase agreements secured by such bonds. The remainder of the portfolio is invested in securities issued by highly rated commercial banks, or held in deposits with these banks. Individual unsecured exposures to non-government-related issuers or counterparties are limited to the level of business risk capital held across the two CCPs (currently \$75 million).

2.1.2 Liquidity risk management

Changes to eligible liquid assets and targets

A conservative investment risk policy is also an important aspect of the CCPs' liquidity risk management framework. This helps ensure that the CCPs can liquidate their investments quickly to meet payment obligations under extreme but plausible scenarios. For instance, a CCP may need to liquidate its investments quickly to cover the cost of closing out a defaulting participant's positions or to return collateral if participants were to significantly reduce their positions.

Consistent with the Bank's regulatory priorities, effective 1 July, ASX is restricting the liquid assets eligible to meet the CCPs' primary liquidity target – the 'core liquidity requirement' – to cash held in accounts at central banks or creditworthy commercial banks and securities issued by the Australian or state governments or the New Zealand Government (held outright or via repo).⁴ Previously, certain highly rated commercial bank securities were also eligible to be held to meet this requirement. ASX will be reviewing whether it meets the core liquidity requirement on a daily basis.

ASX has also introduced a new 'additional liquidity requirement', which is designed to meet potential unexpected non-default-related liquidity needs. ASX has calibrated this requirement to ensure that it has sufficient liquid assets to cover the peak historical one-day outflow from the ASXCC investment portfolio in percentage terms since 2008 (the earliest date from which data are available). Certain highly rated commercial bank securities that are eligible collateral under the Bank's standing facilities, as well as assets that are eligible to meet the core liquidity requirement, are eligible to meet the additional liquidity requirement.⁵

From August 2016, ASX has applied haircuts to the value of its investments when assessing the adequacy of its liquid resources against its core and additional liquidity requirements. These haircuts incorporate extreme but plausible (once-in-20-year) movements in the prices of securities over a three-day holding period, as well as the relevant haircut that would apply if these securities were used to access liquidity via the Bank's standing facilities. Non-Australian dollar-denominated cash and investments held to meet AUD margin requirements in ASX Clear (Futures) are also adjusted by a haircut calibrated to the worst single-day foreign exchange movement in the last 20 years.

Liquidity risk management framework

Consistent with the Bank's regulatory priorities, ASX has also made broader changes to the CCPs' liquidity risk management framework. During the Assessment period, ASX formally implemented a 'cash market liquidity buffer' of \$100 million. This buffer is designed to better align ASX Clear's liquidity stress test framework with its expected strategy for managing liquidity obligations in a default scenario. ASX now aims to maintain resources to cover a pre-specified value of stressed liquidity exposures arising from cash market transactions, while continuing to maintain sufficient liquid resources to cover the stressed liquidity exposures arising from derivatives transactions.

In May 2017, ASX formally documented its processes for responding to breaches of its liquidity requirements, including the core and additional liquidity requirements and the cash market liquidity

4 The core liquidity requirement includes the results from each CCP's Cover 2 liquidity stress test, as well as an estimate of potential margin outflows from non-defaulting participants. For more information see Appendix C.1, CCP Standard 7.3.

5 Through the Bank's standing facilities, eligible counterparties (including ASXCC, on behalf of the ASX CCPs) can access liquidity on pre-specified terms via repurchase agreements.

buffer. Any breach of these requirements is reported to the Chief Risk Officer (CRO) and Chief Financial Officer (CFO) immediately, and to ASX's internal Capital and Liquidity Committee (CALCO) on a quarterly basis. In addition, if there were three breaches in a quarter, this would require an emergency meeting of CALCO, which would decide on a response. In all cases, ASX would also review the circumstances and nature of the breach, the size of the breach and possible mitigants before taking any actions.⁶

Liquidity stress testing

Consistent with the regulatory priorities, ASX has refined liquidity-specific stress test scenarios developed in 2015/16 and formally incorporated them into its liquidity risk management framework. These scenarios consider stresses to outflows of margin posted as cash arising from a variety of extreme but plausible scenarios across both CCPs. The scenarios are:

- *Market contraction resulting from a market stress event.* An extreme but plausible market event is assumed to result in a significant decline in cash market turnover and derivatives open interest, resulting in margin outflows.
- *Market contraction resulting from the default of two ASX participants.* The close-out of two defaulted participants' portfolios is assumed to result in a decline in open interest from non-defaulting participants, resulting in margin outflows. These liquidity obligations are in addition to payment obligations arising directly from the default (for example, variation margin outflows associated with the defaulted participants' portfolios).
- *Historical scenario (decline in open interest from other sources).* ASX applies historical declines in open interest to current participant portfolios in order to determine hypothetical margin outflows. The liquidity stress test result is based on the largest hypothetical margin outflow based on historical three-day changes in open interest since 2004.
- *Collateral substitution.* Participants are assumed to replace a portion (currently 25 per cent) of cash collateral with non-cash collateral, across all markets.

ASX conducts its liquidity-specific stress tests on a monthly basis. The results from these scenarios are presented to CALCO on a quarterly basis, and are used to assess the adequacy of the liquidity requirements related to the CCPs' investment portfolio and the actual liquidity of the portfolio.

ASX has also recently developed a foreign currency liquidity stress test framework. This framework measures ASX's potential stressed liquidity exposures arising from its clearing of NZD-denominated products and its acceptance of foreign currency-denominated collateral. The framework considers both default-related and non-default-related liquidity outflows in each currency and assesses these potential outflows against liquid assets held in the relevant currency. The results from these stress tests have been monitored on a daily basis since 1 July 2017. To date, these results have indicated that ASX holds sufficient liquid assets in each relevant currency to meet potential stressed outflows.

Consistent with the Bank's regulatory priorities, ASX conducted sensitivity analysis on the effect of the priming assumption on ASX Clear's liquidity stress test exposures (see Appendix C.1, CCP Standard

6 The potential response to a breach also depends on the particular requirement: for example, a breach of the cash market liquidity buffer may require an increase in ASX Clear's default fund, whereas a breach of the core liquidity requirement may require a rebalancing of the ASXCC investment portfolio.

7.8).⁷ The analysis involved varying the priming assumption to 70 and 80 per cent in its liquidity stress tests in ASX Clear, from the current assumption of 90 and 100 per cent. The results suggested that the change in stress test exposures is immaterial (below 2 per cent) when the assumption is lowered to 70 per cent. ASX intends to run this sensitivity analysis annually.

Testing and due diligence

To meet its payment obligations in the event of a participant default, the ASX CCPs may be required to sell their investments or non-cash collateral or to post them as collateral. Consistent with the Bank's regulatory priorities, ASX has improved its processes for testing the CCPs' ability to access liquidity in this way. ASX now reviews every six months the range of transactions conducted over the period to confirm that it has tested its operational capability to conduct transactions to liquidate the full range of assets held by the CCPs. ASX will also access the Bank's standing facilities and conduct repurchase agreements with commercial banks on at least a six-monthly basis to confirm its ongoing operational readiness to conduct such transactions. The results from this periodic testing will be reviewed by CALCO.

ASX Clear also has access to a \$150 million liquidity commitment with ASX Limited to meet default-related liquidity obligations, of which \$100 million is backed by a committed facility provided to ASX Limited by a major bank. During the Assessment period, ASX introduced additional due diligence to ensure that the committed liquidity facility from ASX Limited to ASX Clear could be drawn upon if needed. This included six-monthly checks of whether ASX Limited continues to meet the requirements set out in its agreement with the major bank liquidity provider and whether it has enough funds to deliver on its portion of the facility.

ASX Clear may further supplement its liquidity resources with offsetting transaction arrangements (OTAs) – a form of contingent liquidity provided by participants – to meet securities-related payment obligations (see Appendix C.1, CCP Standard 7.1). In the previous Assessment period, ASX Clear began to disseminate monthly disclosures to individual participants on their contingent liquidity exposures to the use of OTAs. These disclosures show each participant's 'worst-case' liquidity exposure arising from the default of the largest two clearing participants and their affiliates on each day in the preceding month. ASX discussed the results of these disclosures with participants during the Assessment period, to ensure that its participants understood their contingent exposures, and understand how participants would manage these obligations.

2.1.3 Analysis of credit stress testing

On at least a monthly basis, CCPs are expected to perform comprehensive and thorough analysis of credit stress test scenarios, models and underlying parameters and assumptions to ensure that they are appropriate in light of current and evolving market conditions. Before 2016/17, the ASX CCPs met this requirement through routine quarterly reverse stress testing (RST), combined with running 'for information' stress test scenarios that ASX considers go beyond 'extreme but plausible', and reviewing market conditions on a monthly basis to determine whether there is any evidence of stress that would support a change to scenarios. The RST was used to identify scenarios under which stress test exposures would exceed prefunded financial resources. The RST scenarios took into account the impact of systematic shocks to the market or across multiple contracts, as well as changes to other

⁷ The priming assumption refers to the proportion of securities that are assumed to be lodged in the defaulting participants' respective settlement accounts prior to default.

model assumptions. These included assuming the default of multiple participants, and varying assumptions on the size, concentration or directionality of participants' portfolios.

In 2016/17 ASX decided to revise its approach to RST and suspended RST calculations while developing a modified approach. In July 2017, ASX re-commenced RST using a modified approach, which it subsequently ran retrospectively using information from 2016/17. The Bank will be reviewing the comprehensiveness of ASX's revised approach over the coming assessment period.

Recommendation. In order to continue observing CCP Standard 4, the ASX CCPs should ensure that they perform comprehensive and thorough analysis of their stress test models on at least a monthly basis.

2.1.4 Independent model validation

Under the CCPs' model validation framework, ASX has established a methodology to determine a 'score' for each of its models, which represents ASX's assessment of the relative risk posed by the model. ASX then uses the score to determine the frequency of independent model validation based on a set of thresholds. During 2016/17, ASX reassessed the risks inherent in each model and changed the thresholds, resulting in a potential reduction of the frequency of independent validation in most cases (Table 5).

Recommendation. In order to continue observing CCP Standard 4, the ASX CCPs should review the frequency of the independent validation of their credit risk models, to ensure that they align with the CCP Standards.

2.1.5 Membership requirements

A key risk control in both CCPs is the imposition of risk-based requirements on participants (see Appendix B.3). During the Assessment period, ASX implemented three material changes to the CCPs' membership requirements:

- *New liquidity risk management requirements.* In August 2016, ASX Clear published a guidance note that sets out new requirements in respect of ASX Clear participants' liquidity risk management frameworks. The guidance note requires that participants establish a formal liquidity risk management framework and prepare an annual liquidity plan. Participants are also required to allocate overall liquidity risk management responsibility to a named individual and maintain robust liquidity-related operational and management reporting processes. Participants that are authorised deposit-taking institutions (ADIs) or non-bank subsidiaries of ADIs (subject to ASX's approval) would be exempt from the enhanced requirements if their arrangements are deemed to be adequately covered by an equivalent prudential supervisory framework. ASX Clear participants have been required to comply with the requirements of this guidance note since the end of February 2017.
- *Changes to capital-based position limits (CBPLs).* In May, ASX amended ASX Clear (Futures)' CBPL framework. Under this framework, a limit is set on the ratio of a participant's initial margin relative to its liquid capital, net tangible assets (NTA) or Tier 1 Capital. The changes were primarily motivated by the fact that banks are now subject to prudential supervision and capital adequacy requirements under new international prudential requirements that are more

comprehensive than ASX's CBPL methodology. Under the changes, a bank or subsidiary of a bank or a bank holding company (where the subsidiary has a minimum \$200 million of NTA) can be exempt from a CBPL. In order to qualify for the exemption, the bank or bank holding company must be subject to prudential supervision by a prudential supervisory authority in a jurisdiction approved by ASX; a bank holding company must also be designated as a global systematically important bank by the Financial Stability Board (FSB). Rather than have a CBPL, ASX Clear (Futures) imposes an aggregate limit of \$1.5 billion on exempt institutions' initial margin liabilities. As part of the changes, for the remaining participants, the CBPL ratio has also been increased from two to three, which aligns the ASX Clear (Futures) ratio with that used by ASX Clear.

- *Changes to core capital requirements.* To better recognise the complexity and breadth of participants' business models, ASX Clear is proposing to implement rule changes to impose additions to participants' existing base minimum core capital requirement to reflect their activities in own-account business, non-ASX client activity, and client written exchange-traded options (ETO) activity. The changes are expected to be implemented in 2017/18. ASX's proposed changes would apply an additional capital requirement of nil, \$2.5 million or \$5 million for each of these activities, depending on the level of materiality. Under the proposed requirements, the minimum amount of core capital required would range from \$5 million to \$35 million, up from the current range of \$5 million to \$20 million. ASX is proposing to grant participants an initial transitional period of up to 12 months to meet any increased capital requirements. Subsequently, ASX would expect to review the capital requirements on at least a quarterly basis, and allow a transitional period of at least six months for participants to meet any subsequent increases.

2.1.6 Collateral haircuts

In September 2016, ASX Clear changed the methodology it uses to calculate haircuts for non-cash collateral. Prior to this date, ASX Clear applied a flat 30 per cent haircut on all eligible securities. This figure was based on the largest price fall used in its capital stress test scenarios, which are calibrated to a once-in-20-year event. Under the changes, ASX Clear has introduced three haircut tiers of 15, 20 and 30 per cent. Eligible securities are assigned to each tier based on the fifth largest price fall over a three-day period over the past 20 years, corresponding to a 99.9 per cent confidence level. ASX Clear also stresses the value of its collateral beyond this haircut in its stress tests.

These changes are consistent with changes made to ASX Clear (Futures)' haircut methodology for non-cash and foreign currency collateral during the previous assessment period. That is, in June 2016, ASX Clear (Futures) moved from using the worst to the fifth-worst price fall over a 20-year look-back period to calibrate haircuts. However, ASX Clear (Futures)' credit stress test framework will require changes and associated system enhancements in order to also subject collateral to extreme but plausible price moves (i.e. beyond the haircut).⁸ ASX is planning to implement this change as part of planned changes to its risk management systems (see Section 2.1.7). In the meantime, over 2016/17, ASX developed quarterly reporting of the impact of the worst stress over the last 20 years on the value of non-cash and FX margin collateral. The Bank will continue to monitor the materiality of the issue over the next assessment period, as well as ASX Clear (Futures)' progress in incorporating extreme but plausible haircuts to collateral in its stress testing framework. This monitoring will be

⁸ ASX Clear already uses haircuts based on extreme but plausible price moves to value collateral in its stress testing framework.

conducted as part of the broader work to review the CCPs' arrangements against new international guidance on CCP resilience (see Section 2.2).

2.1.7 Risk systems enhancements

During the Assessment period, ASX modified and reprioritised certain aspects of its technology transformation program. Rather than developing a new risk management system for the CCPs, ASX will instead be making incremental enhancements to the CCPs' existing risk management systems as part of a five-year plan to be developed over 2017/18. ASX will also be making a number of more immediate enhancements to its risk management systems over 2017/18. These immediate plans include:

- a new tool to facilitate more frequent and detailed risk reporting
- the expansion of its credit stress testing system capabilities
- enhancements to over-the-counter (OTC) default management capabilities to allow more sophisticated risk sensitivity analysis
- system automation for overnight margin calls
- the implementation of liquidity margin and stress test add-ons

The Bank will monitor ASX's progress in developing and implementing its short-term risk system enhancements over the next assessment period, as well as the development of its five-year plan.

2.2 Resilience, Recovery and Resolution

In July 2017, CPMI-IOSCO published new guidance on CCP resilience and updated its guidance on FMI recovery (see Box A). The Bank has adopted the new and updated guidance and will be applying the two documents in interpreting the relevant Standards in the FSS. The Bank will review the alignment of the CCPs' risk management and recovery arrangements against these guidance documents over the next assessment period.

During the Assessment period, ASX updated and refined the documentation supporting its recovery plan. This update included amendments to address some of the matters that had been identified by the Bank in the September 2016 Assessment. In particular, the updated recovery plan includes greater consideration of the critical services provided by the CS facilities and a methodology for assessing and reviewing these services on an annual basis. The recovery plan also identifies links with FMIs within and outside of the ASX Group and considers the need for communication with these FMIs in a recovery situation.

During 2017, the Council of Financial Regulators (CFR) has continued work towards the development of draft legislation to implement an Australian resolution regime for FMIs. This regime will build on a February 2015 consultation paper and feedback received through the consultation process. The FSB's *Guidance on Central Counterparty Resolution and Resolution Planning*, published in July, will also be an input into the development of these arrangements (see Box A).

Box A: New International Guidance on CCP Resilience, Recovery and Resolution

In recognition of the increasingly important role of CCPs in the financial system, in 2015 the international standard setting bodies established a 'joint CCP workplan'. The workplan called for the development of further guidance in the areas of CCP resilience, recovery planning and resolvability.

Resilience and recovery

In July 2017, as part of this workplan, CPMI and IOSCO published a report *Resilience of Central Counterparties: Further Guidance on the PFMI* (the Resilience Guidance). The genesis of this report was a CPMI-IOSCO review of selected major market CCPs' implementation of the *Principles for Financial Market Infrastructures* (PFMI), which found a range of inconsistencies in how the PFMI had been interpreted and adopted. The report takes into account industry comments received as part of a CPMI-IOSCO consultation on CCP resilience and recovery conducted in August 2016.

The Resilience Guidance provides further guidance on the Principles and Key Considerations in the PFMI regarding financial risk management by CCPs. The guidance does not create additional standards beyond those set out in the PFMI, but instead is intended to enhance CCP resilience by providing clarity on an acceptable way (although not necessarily the only way) of observing the PFMI.

The Resilience Guidance focuses on five key aspects of a CCP's financial risk management framework:

- governance of financial risk management
- stress testing for both credit and liquidity exposures
- coverage of financial resources
- margin
- a CCP's contribution of its financial resources to losses.

Although the guidance does not impose additional standards beyond the PFMI, CCPs may need to make changes to their practices to be consistent with the guidance. CCPs are expected to implement any such changes by the end of 2017.

In July, CPMI and IOSCO also published revisions to their 2014 report *Recovery of Financial Market Infrastructures*. As with the Resilience Guidance, this was prompted by CPMI-IOSCO implementation monitoring work and responses to an industry consultation. The revised report, which applies to all FMI, provides additional clarifications in four areas of recovery planning: (i) operationalisation of the recovery plan; (ii) replenishment; (iii) non-default-related losses; and (iv) transparency with respect to recovery tools and how they work.

CCP resolution

Also as part of the international CCP workplan, in July, the FSB published *Guidance on Central Counterparty Resolution and Resolution Planning*. This guidance covers a number of aspects of CCP resolution planning which authorities will need to consider when developing their frameworks for resolving failing CCPs, including:

- policy objectives for CCP resolution
- powers for resolution authorities to support effective resolution of CCPs
- steps authorities should take for CCP resolution planning
- cooperation and information sharing arrangements regarding resolution and resolution planning for CCPs that are systemically important in more than one jurisdiction.

2.3 Participant Default Rules and Procedures

Prompted in part by the May 2015 default of BBY Limited (an ASX Clear, ASX Settlement and Austraclear participant), in 2015/16 the Bank conducted a detailed assessment of the ASX CS facilities' default management arrangements against the relevant requirements in the FSS. While the Bank assessed that all the CS facilities observed the Standard on default management rules and procedures, the Bank made a number of recommendations in the September 2016 Assessment outlining some additional steps the ASX CS facilities should take to fully meet expectations, as well as recommendations for continuous improvement. Many of the Bank's recommendations were aligned with ASX's existing plans to implement further refinements to the CCPs' and SSFs' DMRFs.

Consistent with the recommendations, ASX has made significant progress in enhancing the DMRFs over the Assessment period.

- *Enhancements to documentation.* ASX has significantly enhanced and added to the documentation supporting the SSF's DMRF. These enhancements include additional detail, as well as new documents setting out the specific procedures to be followed in the event of default of a clearing participant, an Austraclear participant, ASX Settlement participant, participating bank, or payment provider. In addition, ASX Clear documentation has been updated to include guidelines around the close-out treatment of specific cover positions in a default situation.⁹
- *Enhancements to disclosure and client education.* ASX has enhanced the disclosures available to participants on key aspects of the facilities' DMRFs. This includes the publication of new guidance notes on the ASX Clear (Futures) and Austraclear and updates to the existing guidance notes for ASX Clear and ASX Settlement.¹⁰ Separately, ASX intends to improve awareness of its DMRFs among clients of participants and other stakeholders. This includes the development of a new fact sheet targeted at insolvency practitioners and the inclusion of materials on the facilities' DMRFs in its investor education roadshow.
- *Enhancing portability of ETOs.* While the ability of a client to transfer or port its positions following the default of a participant is, to an extent, outside of ASX's control, ASX is intending to make certain operational changes to make such a transfer more efficient.
- *Engagement with default brokers.* ASX has engaged more deeply with one of its default brokers on the close-out process. Through this process the default broker provided feedback on expected close-out timeframes and prices, and hedging strategies. The engagement also identified operational changes to more efficiently place orders with the default broker.
- *Testing its recovery arrangements.* In May, ASX ran an internal fire drill that tested its recovery arrangements. This fire drill illustrated the trade-off between different recovery tools and the implications for non-defaulting participants of delaying replenishment of mutualised default resources.

9 ASX Clear participants are able to lodge stocks as 'specific cover' collateral for call options written on that stock. All other collateral (including cash and eligible securities) posted by the participant to cover its margin requirement is treated as 'general cover'.

10 The update to the ASX Clear note included a new section on the impact of the 'back-out algorithm', which is a tool used by ASX Clear to remove a defaulted participant's cash market obligations.

- *Review of resolution regimes applicable to participants.* During the Assessment period, ASX updated its analysis of the impact of resolution regimes applicable to participants and provided the analysis to the Bank.
- *Taking appropriate account of stability interests in other jurisdictions.* ASX has given some initial consideration of its arrangements to consider stability interests in New Zealand and plans to engage with the Reserve Bank of New Zealand on this during 2017/18.

Separately, ASX has amended the membership of its Default Management Group (DMG).¹¹ Prior to the changes, all OTC derivatives participants were required to be members. Under the changes, members will not have an obligation to participate, so long as the DMG had six members. If the number of members dropped below six, ASX would have the power to co-opt members. The changes are intended to enable OTC derivative participants to better manage their commitment to assist with default management processes at multiple CCPs, while ensuring that ASX has access to the expertise and execution capability to hedge and auction default portfolios.

While ASX has made significant progress in addressing the Bank's recommendations, work to enhance the DMRFs will continue in future assessment periods.

- *Enhancements to testing.* ASX has commenced plans to enhance its default management fire drills. These plans include the introduction of new SSF-specific fire drills, the first of which will be in the second half of 2017, and an increase to the complexity and scope of the CCP fire drills. ASX also intends to consider engaging more widely with stakeholders following future fire drills, including with the CCPs' Risk Consultative Committees (RCCs).¹² The Bank will monitor these developments as part of its ongoing supervision of ASX.
- *Additional default broker.* During the Assessment period, one of ASX Clear's two default brokers resigned. ASX is currently in the process of securing an additional default broker and reviewing its default broker arrangements. In the meantime ASX has contingency arrangements should its one default broker not be able to facilitate the close-out of a defaulting participant's positions.

Recommendation. In order to continue observing CCP Standard 12, ASX Clear should implement its plans to secure an additional default broker.

2.4 Operations and Technology

2.4.1 Operational issues

ASX Trade disruption

On 19 September 2016, there was a major disruption to the operation of ASX's equity trading system, which prevented trades from being executed for most of that day. The incident involved a combination of technological problems and operational errors. While the Bank does not have a direct role in the regulation of trading facilities, ASX's operational risk management controls and

¹¹ The primary role of the DMG, which is comprised of trading and risk experts from ASX's OTC clearing participants, is to advise the Default Management Committee (DMC) on aspects of the management of an OTC participant default specified in the Operating Rules.

¹² Each CCP has an RCC comprised of participants that provide feedback to the ASX Clear and ASX Clear (Futures) Boards on risk management matters.

frameworks are broadly similar across its trading and CS facilities. Consequently, issues in operational risk management of the trading system may have implications for the CS facilities. In addition, following the incident, participants asked for additional clarification around the point of novation in ASX Clear of trades matched in ASX Trade.

The Australian Securities and Investments Commission (ASIC) led the regulatory investigation of the incident and in December 2016 published a report setting out recommendations for ASX.¹³ In May, ASX published an update on progress it had made in response to the recommendations, much of which was in the area of operational risk management. ASX stated that it had:

- reviewed and strengthened its business continuity management and IT disaster recovery processes and documentation, as well as the scope and timing of current disaster recovery testing
- completed a review of technology status monitoring across all of its core platforms and introduced a number of enhancements, including new tools to improve ASX's ability to identify and resolve issues at the commencement of an incident and during recovery
- reviewed its arrangements for mitigating manual operator errors, specifically the 'four eyes' principle.¹⁴

On ASIC's recommendation, ASX also has consulted on its approach to determining settlement prices – the prices it would use to calculate margin – during an ASX Trade disruption (see Section 3.7). ASX also intends to provide further guidance to participants on the point of novation in ASX Clear of a trade matched in ASX Trade and on its ability to cancel trades.

Austraclear incident

On 15 February, there was a material Austraclear operational incident following a power outage, during which all services were unavailable for around half an hour in the evening. While ASX has back-up battery-based power and diesel generators at both of its operating sites, a malfunctioning switch meant that the site's power demand was not able to be routed to the diesel generators. A consequence of the power outage was that it made a component of the CHES system inoperable at the back-up site. A contributing factor was the age of the component. As a result, for a period of a few weeks following the incident, ASX's ability to recover from an operational disruption to its CHES operations was limited.

In response to this incident, ASX has advised ASIC and the Bank that it has completed a number of remedial actions, including replacing the faulty CHES component. ASX has also:

- engaged a third party to review its power supply arrangements at its second site
- conducted further testing on back-up power supply arrangements
- undertaken further analysis of hardware age and support across all ASX infrastructure; a key outcome of the review was ensuring the system infrastructure assets register identifies all infrastructure supporting key systems and their end-of-life date.

13 The report also included a detailed timeline of the incident. It is available here: <<http://download.asic.gov.au/media/4122347/rep509-published-21-december-2016.pdf>>.

14 These statements are available in an update ASX published on the actions and progress in addressing the ASIC recommendations in relation to the outage, available here: <<http://www.asx.com.au/communications/notices/2017/asx-trade-outage-update.pdf>>.

Operational risk review

Following the two significant operational disruptions discussed above, and in light of other incidents during 2016/17 across both its trading and CS facilities, ASX, at the instigation of the Bank and ASIC, has commissioned an external assessment of its operational risk management arrangements. The review will consider ASX's current technology governance, operational risk practices and control mechanisms. It will include a detailed review of ASX's documentation, supplemented by interviews with staff from each function and business line. The review will also benchmark ASX's practices against international best practice in this area. The Bank and ASIC will review the results of the report in 2017/18 and ASX's response to any recommendations made in the review.

2.4.2 Engagement on cyber resilience

A key regulatory priority over the Assessment period was in the area of cyber resilience. To this end, the Bank, in cooperation with ASIC, conducted a detailed assessment of the CS facilities' governance arrangements relevant to cyber resilience against the Governance chapter in the CPMI-IOSCO Cyber Guidance. This assessment did not identify any significant issues.¹⁵ ASX is conducting a self-assessment against the remaining chapters of the guidance, which will draw in part from an external review against industry standards, both of which the Bank intends to review during the next assessment period.

Consistent with the Cyber Guidance, ASX has also developed a concrete plan to improve its capabilities to recover from a cyber attack, which builds on ASX's cyber security plan and strategy.

As part of this plan, ASX will:

- identify potential paths or means that might be used to launch a cyber attack on the CS facilities
- identify the consequences for the CS facilities' critical operations that may arise from successful cyber attack
- assess the CS facilities' ability to detect, respond and recover from possible cyber attack
- based on the findings of the previous points, and taking into account the costs and benefits of potential enhancements, identify and implement enhancements to the CS facilities' existing systems and processes that would provide a material net benefit to the CS facilities' capability to target a two-hour recovery time objective.

The Bank will monitor ASX's implementation of these plans.

Finally, ASX has reviewed the case for developing participant requirements in the area of cyber resilience, in consultation with a range of participants, industry vendors and industry bodies. While ASX will not develop detailed requirements due to concerns about the duplication of regulatory obligations, it will update guidance notes supporting the CS facilities' admission requirements to underscore the importance of cyber risk and observance of international best practice.

2.4.3 CHESS replacement

During the Assessment period, ASX continued its development work on its project to replace the CHESS clearing and settlement system. This is an important element of ensuring that ASX's core

¹⁵ Due to the sensitivities around cyber-related information, the results of this assessment are not disclosed in this report.

infrastructure for the cash equities market meets international best practice, and that its performance, resilience, security and functionality continue to meet the needs of its users. ASX is working with a vendor, Digital Asset Holdings, to develop a potential CHES replacement based on a permissioned, private DLT system. Working with Digital Asset Holdings, ASX has continued to enhance a DLT prototype developed over 2016/17. ASX intends to make a final decision on whether to proceed with a DLT solution or use an alternative technology to replace CHES towards the end of 2017. The Bank will continue to monitor the development of a new clearing and settlement system for cash securities transactions. This will include: how the new system aligns with the requirements in the FSS; the clarity, effectiveness and documentation of the default management processes; contingency plans regarding the replacement of CHES should the decision be taken not to proceed with a DLT solution. As part of the Bank's and ASIC's engagement with ASX on the external review of the facilities' operational risk management arrangements, the Bank will also monitor ongoing maintenance and smooth functioning of the existing CHES system in the transition to its replacement system.

The CFR, of which the Bank is a member, will also be monitoring ASX's conduct in the development of the new clearing and settlement system with regard to the CFR's *Regulatory Expectations for Conduct in Operating Cash Equity Clearing and Settlement Services in Australia* (Regulatory Expectations).¹⁶ The Regulatory Expectations, which were published in October 2016, set out the regulators' expectations for ASX's conduct in operating its cash equity CS facilities as a monopoly provider, until such time as a committed competitor emerges.

2.5 New Products and Services

ASX expanded and enhanced its OTC derivatives service during the Assessment period. This includes:

- *Expansion of product scope.* In October, ASX introduced two new OTC interest rate derivative (IRD) products, bank bill swap rate (BBSW) vs Australian overnight index average (AONIA) basis swaps and 'asset swaps'. ASX also increased the maturity of some of its existing OTC IRD products.
- *Expansion of operating hours.* In February, ASX extended the operating hours for the OTC service, allowing participants to submit trade registrations during the London trading hours (overnight in Australia). This did not require significant operational change, since ASX Clear (Futures) already clears contracts traded on the ASX 24 Night Session.
- *Client clearing operational processes.* In June, ASX amended its operating rules to facilitate a process through which client OTC derivatives transactions are submitted for clearing. The new process is aimed at aligning ASX's arrangements with international practice and overseas regulation.

ASX launched, or further developed, several other new products and services during the 2016/17 Assessment period.

- *Securities lending in ASX Collateral.* ASX Collateral is a service that allows its customers to automate the optimisation and allocation of collateral securities held within Austraclear. In January, ASX expanded the service to provide a tri-party securities lending service for fixed income securities. The service allows participants to effect securities lending transactions for

¹⁶ Available at: <<https://www.cfr.gov.au/publications/cfr-publications/2016/regulatory-expectations-policy-statement/pdf/policy-statement.pdf>>.

which the securities lent and collateral are held within the Austraclear system on a delivery-versus-delivery (DvD) basis, thereby eliminating the principal risk that exists in the settlement of such transactions outside of ASX Collateral.

- *Renminbi (RMB) securities.* In September, ASX introduced the capability to issue, settle and hold RMB-denominated securities in Austraclear. The RMB payments leg arising from settlement of these products is facilitated by Austraclear's existing Foreign Currency Settlement Service, which facilitates the settlement of RMB payments.
- *Expansion of mFund product scope.* In February, ASX expanded the scope of managed fund products that can be settled through its mFund service to all unlisted registered managed investment schemes, subject to certain liquidity and disclosure requirements. This change was made in response to requests by issuers of managed funds, brokers and investors. Previously, the scope of the mFund service was limited to simple managed funds.
- *Weekly and serial options.* ASX expanded its listing of ETOs in October to include new weekly and serial option contracts. Similar to monthly or quarterly options contracts, weekly options offer the Standard & Poor's (S&P)/ASX 200 index or selected stock as the underlying asset, but with weekly expiries up to the first month. Serial options are equity index options that expire on a monthly basis. ASX expanded its listing of serial options to offer monthly expiries to the first six months, from the first three months previously.

3. Special Topic on CCP Margin Arrangements

An effective margining system is a critical component of a CCP's financial risk management framework. Margin held by a CCP is the first layer of financial protection against losses incurred due to a participant default, and is a 'defaulter-pays' (i.e. non-mutualised) resource. Because the amount of margin collected from a participant scales with the level of risk associated with the participant's portfolio, margin may also assist in incentivising participants to manage and contain the risk they bring to the CCP.

The amount of margin collected for a particular portfolio is sensitive to the model, parameters and assumptions chosen by a CCP in designing its margin system. The design of this system also determines the frequency with which a CCP will call its participants for margin, and the responsiveness of margin requirements to changes in market conditions. Margin represents the majority of collateral held by the ASX CCPs: during the Assessment period the CCPs collectively held around \$6 billion in margin, relative to a total of \$900 million in pooled financial resources.

The FSS contain a number of requirements in relation to a CCP's margin arrangements within CCP Standard 6. This section provides an overview of the ASX CCPs' margin arrangements and the results of the Bank's detailed assessment against CCP Standard 6. Consistent with the Bank's usual practice, the Bank has assigned ratings for each sub-standard within CCP Standard 6, as part of the detailed assessment. The section focuses on eight key requirements:

- *Initial margin.* Initial margin, which aims to cover potential future changes in the value of each participant's position, should meet an established single-tailed confidence level of at least 99 per cent with respect to the estimated distribution of future exposure (CCP Standard 6.3).
- *MPOR.* The initial margin model should use a conservative estimate of the time horizons for the effective hedging or close-out of the products cleared by the CCP (including in stressed market conditions) (CCP Standard 6.3).
- *Portfolio margining and offsets.* A CCP may allow offsets or reductions in margin across products that it clears if the risks of the products are significantly and reliably correlated (CCP Standard 6.5).
- *Procyclicality.* A CCP's margin system should, to the extent practicable and prudent, limit the need for destabilising procyclical changes (CCP Standard 6.3).
- *Variation margin.* A CCP should mark participant positions to market and collect variation margin at least daily to limit the build-up of current exposures (CCP Standard 6.4).
- *Intraday margin.* A CCP should have the authority and operational capacity to make intraday margin calls and payments, both scheduled and unscheduled, to participants (CCP Standard 6.4).

- *Pricing.* A CCP should have reliable sources of timely price data, as well as procedures and sound valuation models for addressing circumstances in which pricing data are not readily available or reliable (CCP Standard 6.2).
- *Review and validation.* A CCP should analyse and monitor its margin model performance and overall margin coverage through backtesting and sensitivity analysis, as well as regularly review and validate its margin system (CCP Standards 6.6 and 6.7).

3.1 Initial Margin Models

CCP Standard 6.3 states that CCPs should use margin models that generate margin requirements sufficient to cover their potential future exposure to participants and appropriately account for relevant risk factors of the products cleared.

For any margin model, a CCP must set three key parameters:

- *Confidence interval.* The target level of coverage of initial margin over potential future exposures. The FSS require that a CCP target initial margin to meet a single-tailed confidence level of at least 99 per cent of the estimated distribution of future exposures.¹⁷
- *Look-back period.* The sample of historical data used to estimate the model.
- *MPOR.* Also known as the close-out period, this is the projected length of time between (i) the receipt of the last margin payment from a defaulting participant, and (ii) when all of that participant's positions have been closed out. That is, it is the period in which the CCP is exposed to potential losses on a defaulting participant's portfolio.¹⁸

ASX's margin arrangements include a suite of initial margin models. Table 6 summarises the margin model used for each product class, including the key parameters. Notably, while ASX's policy is that margin coverage should achieve at least the regulatory minimum, in practice, ASX targets a confidence interval of 99.7 per cent in each margin model. ASX has indicated that this added degree of conservatism provides it comfort that it will not breach the regulatory minimum.

17 As discussed in the introduction to Appendix C, the Bank applies a supplementary interpretation of the CCP Standards to any domestically licensed derivatives CCP that provides services to participants that are either established in the EU or subject to EU bank capital regulations. As part of this interpretation, such CCPs would typically be expected to apply a higher confidence interval, of at least 99.5 per cent, in relation to less liquid products such as OTC derivatives.

18 As part of the Bank's supplementary interpretation of the CCP Standards, any domestically licensed derivatives CCP that provides services to participants that are either established in the EU or subject to EU bank capital regulations would typically be expected to use a close-out assumption of at least five days for less liquid products, such as OTC derivatives, and the higher of a one- or two-day close-out period for more liquid exchange-traded products.

Table 5: ASX CCP Initial Margin Models

Product	CCP	Model	Look-back period	Close-out period	Total margin requirement ^(a)
Exchange-traded derivatives	Both	CME SPAN	60 or 252 days ^(b)	1 or 2 days ^(b)	\$5 450m
OTC IRDs	ASX Clear (Futures)	Filtered historical simulation value at risk	June 2008 onwards	5 days	\$276m
Cash market products	ASX Clear	Historical simulation value at risk (for All Ordinaries index equities with at least two years of price history)	2 years	1 day	\$75m
		Flat rates (for all other products)	N/A	1 day	\$95m

(a) Daily average total over 2016/17.

(b) ASX uses the highest of one- or two-day price/implied volatility movements across both the 60- or 252-day periods.

Sources: ASX; RBA

ASX's key margin models are described further in Sections 3.1.1 to 3.1.3. In addition to the amounts calculated by its margin models, ASX also levies margin 'add-ons' to account for certain risks which are not taken into account by its models. These add-ons are described in Section 3.1.4.

3.1.1 Exchange-traded derivatives

The ASX CCPs calculate initial margin for exchange-traded derivatives using CME SPAN.¹⁹ In the CME SPAN model, margin requirements are first calculated for groups of similar products, and are then aggregated to generate an overall requirement for a participant's portfolio. For example, at ASX Clear (Futures), all futures and options based on 90-day bank bills, at all expiries, are within a single group. Margin requirements for a product group are based on an estimate of the largest potential one- or two-day loss in value for that group, up to a given confidence level. This loss is modelled using hypothetical market shocks, based on various combinations of price and volatility changes (discussed below). In aggregating margin requirements within and across product groups, the CME SPAN model also applies a series of adjustments to account for correlations between products and certain specific risks (see Section 3.3).

To generate the hypothetical market shocks applied to product groups, ASX first calculates the 'price scanning range' (PSR) and 'volatility scanning range' (VSR) for the product group. These parameters reflect the maximum expected price and implied volatility movements for the contracts within the group. To calculate the PSR and VSR, ASX considers the higher of one- and two-day movements in price or implied volatility, using the higher of a 60- or 252-day look-back period. The parameters are set to cover a confidence interval of 99.7 per cent.²⁰

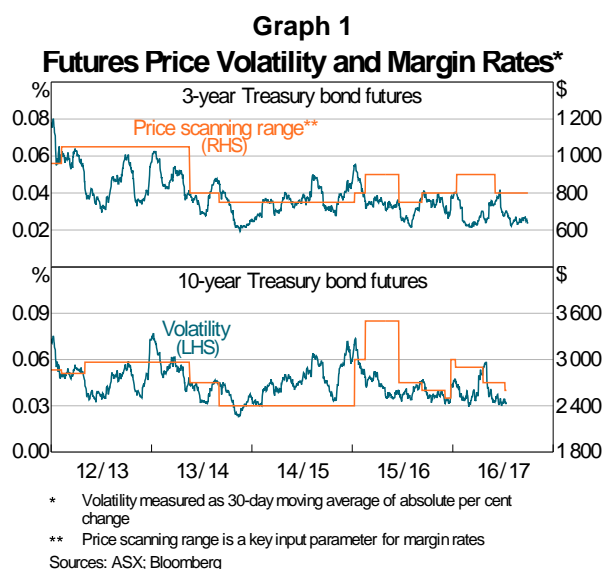
Once ASX has calculated the PSR and VSR, a set of 16 hypothetical scenarios are created using alternative combinations of price and volatility changes based on the PSR and the VSR, and the participants' portfolios are valued under each scenario.²¹ The base margin requirement for the portfolio is set at the highest estimated loss across all scenarios.

19 Although ETOs and low-exercise-price options are margined using CME SPAN, the cash securities transactions generated by their exercise are margined with other cash market products (discussed in Section 3.1.3).

20 For example, if ASX sets the PSR for a particular contract at \$1000, ASX's expectation is that the likelihood of a one- or two-day price move in the contract exceeding \$1000 is around 0.03 per cent.

21 For example, one scenario has a price increase of two-thirds of the PSR, and volatility fall by the whole VSR.

Although ASX typically sets CME SPAN parameters in accordance with the calculation described above, it may also make discretionary adjustments to parameters such as the PSR or VSR based on a forward-looking assessment of future market conditions. For example, at the end of June 2016, ASX increased margin rates applicable to the 3- and 10-year Treasury bond futures contracts in response to heightened market volatility following the UK referendum on EU membership (Graph 1). These increases were pared back towards the end of 2016. ASX reviews CME SPAN model parameters on a three-monthly cycle for all products except equity derivatives, for which the PSR and VSR are reviewed on a monthly cycle. ASX may also adjust parameters at other times on an ad hoc basis.



3.1.2 OTC interest rate derivatives

ASX Clear (Futures) uses a filtered historical simulation value at risk (FHSVaR) model to calculate margin requirements for OTC derivatives, using a sample period starting from June 2008. Value at risk (VaR) models calculate the expected loss on a portfolio by considering the (actual or simulated) distribution of changes in the entire portfolio's value over an assumed close-out period. The margin requirement is set at the expected loss of the portfolio implied by that distribution, at a given level of confidence. For example, the VaR margin requirement on a portfolio consisting of a single contract could be set using the third-worst price movement out of a sample of 1000 historical observations, corresponding to a 99.7 per cent confidence interval.

To generate margin requirements for portfolios consisting of multiple positions, the value of the portfolio at different points in history may need to be 'simulated' from historical price data of the constituent contracts. In the case of an OTC derivatives portfolio, the distribution of changes in the value of a participant's portfolio is simulated by revaluing a participant's portfolio under different historical interest rate scenarios. This simulation generates a history of the value of a participant's portfolio since June 2008, as well a set of five-day changes in the portfolio's value. ASX Clear (Futures) sets the base margin requirement by considering the expected loss on the portfolio based on this distribution at a 99.7 per cent confidence level.

This margin requirement is then *filtered*, or scaled, to reflect the level of current market volatility. For instance, if current volatility is high relative to previous periods, margin requirements may be scaled up. This recognises that the future distribution of changes in a portfolio's value may be different to the historical distribution of changes, particularly in volatile periods. ASX also applies a floor to its

volatility scaling factor, which limits the extent to which margin requirements are reduced in low volatility conditions, helping to limit procyclicality (see Section 3.4).

3.1.3 Cash market products

ASX Clear uses two models to margin cash market products: a historical simulation value at risk (HSVaR) model, which is used for securities in the ASX 500 All Ordinaries index with more than two years of continuous price data (around 80 per cent of the securities in the index); and flat rates, which are used for all remaining cash market products. Collectively, these models are referred to as ASX's CMM model.

HSVaR

ASX Clear splits HSVaR-margined securities into two groups – ASX 200 securities, and other ASX 500 All Ordinaries securities – and calculates initial margin independently for each group. The HSVaR calculation for each group is similar to the FHSVaR calculation for OTC derivatives described above, although there is no filtering in the CMM model. ASX targets 99.7 per cent coverage using a two year look-back period, but approximates this coverage by using a 99 per cent confidence interval and then scaling up the resulting margin requirement by a 'portfolio add-on factor' (currently 30 per cent). ASX has indicated that it has chosen this process as it produces more stable margin requirements, given the small number of price observations beyond the 99th percentile in the two years of data. ASX's backtesting results have consistently verified that the CMM model has achieved at least 99.7 per cent coverage over the past few years.

Flat rates

For securities that are less liquid or that have less than two years of price history, ASX Clear applies a flat margin rate to each security in a participant's portfolio to calculate initial margin. Flat rates are based on available price information, targeting a 99.7 per cent confidence interval over a one-day close-out period. However, this coverage target is approximated using different confidence intervals and close-out periods according to liquidity and available price information (see Appendix C.1, CCP Standard 6.3). ASX assigns individual flat rates for securities in the All Ordinaries index with less than two years of price history. Other securities are grouped with broadly similar products, with all securities in a group assigned the same flat rate, and the margin requirement for that group calculated by applying the relevant flat rate to a participant's net settlement obligation for the group. The participant's overall margin requirement for these securities is the sum of these individual flat rate requirements; ASX does not allow offsets between different flat rate groups.

3.1.4 Initial margin add-ons

CCP Standard 6.1 requires that margin levels are commensurate with the risks and particular attributes of each product, portfolio and market that a CCP serves. To better account for these idiosyncrasies, ASX applies margin add-ons to address a number of product- and portfolio-specific risks that are not captured in its initial margin models.

- *OTC derivative liquidity risk.* To account for additional costs that might arise from the close-out of a large and/or illiquid OTC derivative portfolio, ASX applies a liquidity multiplier to the initial margin requirement calculated using the FHSVaR model. ASX surveys its OTC clearing participants on an annual basis to estimate the average liquidation costs associated with portfolios of a given size. The OTC derivative liquidity add-ons, which increase with a

participant's initial margin, currently range from 5 per cent for OTC initial margin requirements above \$50 million, to 33 per cent for initial margin above \$500 million.

- *Exchange-traded derivatives spread risk.* During the Assessment period, ASX introduced add-ons to key CME SPAN parameters to address the risk that bid/offer spreads widen when ASX is closing out a defaulting participant's portfolio.²² The spread risk add-ons are applied to electricity and agriculture futures and less actively traded ETOs. The add-ons are not applied to ETOs on SPI futures or to ETOs on the 20 most actively traded stocks, as ASX has indicated the spread risk on these products is not significant. To calibrate the spread risk add-ons for each product, ASX uses a 99.7 per cent confidence interval over a 12-month sample of bid/offer spreads, using the most conservative 12-month sample from the last five years.

In addition to these add-on arrangements already in place, ASX intends to enhance its management of liquidity risk at both CCPs by introducing automatic risk-based add-ons. Currently, ASX has the discretion to call additional initial margin (AIM) if risks from illiquid or highly concentrated portfolios exceed one or more pre-specified triggers. Under the new approach, which will be implemented in December, add-ons will reflect the magnitude of the risks, and trigger automatic calls for AIM.²³

ASX's proposed liquidity risk add-on is intended to account for the additional costs associated with closing out a large and/or illiquid portfolio, including the risk that these portfolios may take longer to close out than assumed in ASX's MPORs (see Section 3.2). This approach allows ASX to specifically target the portfolios for which this risk arises, rather than increasing the initial margin requirement for all portfolios. These add-ons will be applied automatically if a participant holds more than a certain per cent of the average daily trading volume in a particular futures contract, or more than a certain per cent of open interest for a particular options contract. The add-ons will increase proportionally with the size of the participant's exposure. ASX is also intending to apply liquidity add-ons to cash equities products.

Recommendation. ASX Clear and ASX Clear (Futures) should complete the implementation of add-ons to manage liquidity risk for cash equities and products margined using the CME SPAN model.

3.2 Margin Period of Risk

CCP Standard 6.3 requires CCPs to conservatively estimate the time it might take to close out or effectively hedge a defaulting participant's positions, including in stressed market conditions. The guidance to the FSS notes that a CCP should justify its close-out periods for each product type, taking into account: historical price and liquidity data; the concentration of participant positions; reasonably foreseeable events following the default of a participant; and the impact of a participant's default on market conditions. This recognises that the MPOR assumption should be supported by a high degree of analytical rigour, given the importance of this parameter in CCPs' margin models.

²² CME SPAN parameters are typically calculated using mid prices.

²³ Other AIM calls are subject to minimum call amounts of \$1 million for cash market products and \$2 million for other products.

ASX has set its MPORs at one day for cash market products, two days for exchange-traded derivatives, and five days for OTC IRDs. The range of MPORs primarily reflects ASX's assessment of structural market liquidity across these products.

ASX is in the process of developing and documenting the analytical basis of its MPORs for all classes of products it clears. ASX's analysis will consider a range of factors, including: historical turnover, liquidity and price data; concentration of participant portfolios; and likely market conditions in default scenarios. ASX will also introduce backtests which vary the assumed timing of a participant's default relative to the last margin payment, in order to assess the impact of this assumption on margin coverage.

ASX expects its final analysis to be completed for all products in the next nine months, and has already conducted preliminary analysis on some products. This preliminary analysis has included an initial assessment of the impact of the one-day MPOR assumption on margin coverage in the CMM model; this analysis has indicated that initial margin coverage has exceeded 99.7 per cent for both one-day and two-day price moves for the past few years, and exceeded 99.7 per cent for three-day price moves over the past year. The Bank expects that ASX will conduct a full analysis of the adequacy of MPOR assumptions for all products, including those subject to the CMM model.

Recommendation. ASX Clear and ASX Clear (Futures) should conduct and document analysis of the margin period of risk assumptions used in their initial margin models for all products, and review these assumptions in light of this analysis.

3.3 Portfolio Margining

CCP Standard 6.5 states that a CCP may allow offsets or reductions in margin across products that it clears if the risk of one product is significantly and reliably correlated with the risk of the other product. All of ASX's margin models permit some form of offset, except for the flat rates applied to cash market products.²⁴

ASX's VaR-based models for cash market products and OTC derivatives calculate margin using the historical distribution of the portfolio's value over the sample period. As a result, offsets based on historically observed price correlations between products are implicitly recognised in the margin calculation. ASX Clear (Futures) also allows an OTC participant to select a set of interest rate futures in its house account to be margined (using FHSVAr) within the portfolio of the participant's cleared OTC derivatives. Offsets for these futures, including against OTC derivatives, are similarly implicitly recognised within the FHSVAr model. The use of an extended look-back period helps to validate the reliability of the historical correlations underlying calculations in ASX's FHSVAr model for OTC derivatives.

The CME SPAN model, which ASX uses for exchange-traded derivatives, allows for margin offsets between related contracts via inter-commodity spread concessions (ICCs). These offsets recognise

²⁴ Further detail on portfolio margining is available in Appendix C.1, CCP Standard 6.5.

correlations observed across related contracts and are only applied where measures of correlation exceed certain predefined thresholds.²⁵ ASX applies two different types of ICCs:

- Hedging offsets are provided where a participant has offsetting positions in contracts with robust positive correlations (where losses from one contract are likely to be offset by gains in the other contract).
- Stability offsets, which are only recognised at ASX Clear, are provided where a participant has long/long or short/short positions in two contracts, in recognition of the risk-reducing benefits provided by portfolio diversification.²⁶

During the Assessment period, ASX introduced enhancements to its sensitivity analysis framework (see Section 3.8); the revised framework includes tests of the robustness of the offsets in ASX's margin models to changes in correlations, including the impact of a complete erosion of correlations underlying its ICC offsets. The Bank will monitor the results of this analysis over the next assessment period.

3.4 Procyclicality

Procyclicality in margining refers to changes in margin that are positively correlated with market fluctuations. Margin will often increase in periods of heightened volatility. Such increases may be automatic – as volatile price observations are incorporated into the model's look-back period, or due to the effect of 'filtering' in an FHSVaR model (see Section 3.1.2) – or they may be discretionary, based on the CCP's assessment of expected future volatility (see Section 3.1.1). These increases may be appropriate and necessary to ensure the CCP maintains sufficient margin coverage. However, rapid increases in margin rates during a period of heightened volatility may exacerbate financial stress (for example, by increasing liquidity strain on clearing participants). CCP Standard 6.3 requires that CCPs limit the need for destabilising procyclical changes in margin requirements, to the extent practicable and prudent.

To manage procyclicality, ASX's CME SPAN and FHSVaR models incorporate parameter floors to prevent margin requirements from falling too low when volatility is low; this helps to reduce the variability in margin requirements between low and high volatility periods. For the CME SPAN model, these floors are applied to the PSR or VSR on a discretionary basis, and are set based on a range of quantitative and qualitative information. For the FHSVaR model, a floor is applied to the factor used to 'filter' historical interest rate changes. This factor scales margin requirements higher or lower in response to the current level of volatility, ensuring margin requirements are responsive to current market conditions. For the past few years, ASX has maintained this floor at or above 100 per cent. This means that, while margin requirements may be scaled up in high volatility periods, they are not scaled down in low volatility periods. This reduces the potential for variability in margin requirements if a low volatility period is followed by a high volatility period.

25 Additional details on how ICCs are applied in margin calculations are available in Box A of the Bank's 2011/12 ASX Assessment, available at <https://www.rba.gov.au/payments-and-infrastructure/financial-market-infrastructure/clearing-and-settlement-facilities/assessments/2011-2012/pdf/report-2011-2012.pdf>.

26 ASX applies caps to these offsets: hedging offsets are capped at 40 per cent at ASX Clear and 80 per cent at ASX Clear (Futures) (except for a small number of look-alike contracts with almost 100 per cent correlation); and stability offsets are capped at 20 per cent.

For the FHSVaR model, ASX also mitigates procyclicality by using an extended look-back period that begins in June 2008. This look-back period incorporates several periods of market stress, including the 2008 financial crisis. All else being equal, including periods of market stress in a model's look-back period will increase base margin requirements and reduce the likelihood that margin requirements need to be increased in high volatility periods, or the magnitude of any increase that is required.²⁷

In light of evolving regulatory expectations in this area, over 2017/18 ASX intends to review the effectiveness of its arrangements to limit the need for destabilising procyclical changes in its margin requirements. This review will cover all of ASX's margin models. The Bank will monitor this work as it progresses as part of its broader review of the CCPs' arrangements against the recently published CPMI-IOSCO Resilience Guidance.

3.5 Variation Margin

CCP Standard 6.4 requires CCPs to mark participant positions to market and collect variation margin at least daily, to limit the build-up of current exposures. ASX's approach to cover current exposures varies by CCP and by product:

- For exchange-traded derivatives and OTC derivatives cleared by ASX Clear (Futures) and low-exercise-price options (LEPOs) at ASX Clear, variation margin is collected at least daily. Variation margin is collected from participants with a mark-to-market loss and passed on to participants with a mark-to-market gain.
- For ETOs for which a participant has a net short position, ASX Clear calculates and collects 'premium margin' daily from participants. This is conceptually similar to variation margin and is based on daily mark-to-market changes in the value of the net position. Premium margin collected is held by ASX. Premium margin is not levied on net long ETO positions (i.e. where the potential exposure on the position cannot fall below zero).
- For equity trades in the constituents of the All Ordinaries index, ASX collects 'mark-to-market margin', which is conceptually similar to variation margin collected on other exchange-traded products. However, rather than being passed through directly, mark-to-market gains are offset against the participant's posted initial margin (with the offset capped at the level of initial margin).

ASX does not collect variation, premium or mark-to-market margin on cash equity trades outside the All Ordinaries Index or on other cash market products (such as warrants); these products are subject to initial margin only. On these products, ASX Clear is exposed to up to two days of potential initial margin erosion between the point at which initial margin is called and the point the trade is settled. This effectively increases the margin period of risk on these trades by two days, as a participant may default immediately prior to the point of settlement. Although these products make up a small share of total risk exposure at ASX Clear (around 15 per cent of average initial margin over 2016/17), ASX will nevertheless assess the appropriateness of its MPORs for these products as part of the comprehensive MPOR analysis it will conduct over 2017/18 (see Section 3.2). This analysis will include consideration of whether MPORs appropriately account for the potential accumulation of exposures.

27 A caveat to this is that extreme observations may become 'diluted' by less extreme observations in a long look-back period. This can be avoided by appending one or more periods of stress onto a rolling look-back period of fixed length. For example, a CCP may use the most recent five years of data plus the 2008/09 financial crisis as its look-back period.

The Bank will review this analysis during the next assessment period. In the interim, ASX Clear has reviewed backtesting results for the CMM model to confirm that the model achieved margin coverage above 99.7 per cent over one-, two-, and three-day close-out periods over the past year.

3.6 Intraday Margin

CCP Standard 6.4 also requires that CCPs have the authority and operational capacity to make intraday margin calls and payments, both scheduled and unscheduled, to participants. Both ASX CCPs conduct a scheduled end-of-day margin run, which is calculated at 4.30 pm and settled the next morning at 11.00 am. Between each end-of-day run, the CCPs' exposures to their participants may increase due to changes in the composition and/or the value of participants' cleared portfolios. ASX Clear and ASX Clear (Futures) have different processes for managing this intraday exposure, which reflect differences in the materiality of intraday changes in exposures and the operating hours of the two CCPs.²⁸

3.6.1 ASX Clear

ASX Clear does not conduct scheduled daily intraday margin runs, but an intraday run may be triggered on an ad hoc basis by large price moves.²⁹ In the event that an intraday margin run is triggered, a margin call is only made if the call exceeds a minimum margin erosion threshold of 25 per cent (i.e. the account's margin balance has eroded by 25 per cent of its initial margin) and the call is greater than \$100 000.³⁰ During the Assessment period, ASX shortened the settlement deadline for ASX Clear intraday margin calls from two hours to one hour.

3.6.2 ASX Clear (Futures)

ASX Clear (Futures) offers clearing services on a 24/6 basis and so it faces intraday risk overnight as well as during the day.

Day Session (8.30 am to 4.30 pm)

ASX Clear (Futures) currently conducts two scheduled intraday margin runs during its Day Session, at 11.10 am and 1.30 pm.³¹ ASX Clear (Futures) is also able to conduct ad hoc intraday margin runs during the Day Session, and will do so in response to large price movements in key contracts. Intraday margin calls must be met by participants within one hour of notification. ASX Clear (Futures) also recalculates margin on OTC derivatives hourly, and may call for additional margin during the Day Session if a participant's margin requirement exceeds their excess collateral lodged with ASX Clear (Futures).

From the end of September, ASX Clear (Futures) plans to eliminate minimum margin erosion thresholds that had previously applied to intraday margin calls and discontinue its practice of returning excess intraday margin as part of the 1.30 pm call. ASX Clear (Futures) also plans to

28 Further detail on both CCPs' intraday risk management practices is available in Appendix C.1, CCP Standard 6.4.

29 A movement in the S&P/ASX 200 above 1 per cent, or a movement in an individual stock price above 15 per cent would trigger a review by ASX of the materiality of the exposures in relevant contracts. Where open interest and exposures are material, an intraday margin run will be performed.

30 For both CCPs, the minimum payment or margin erosion thresholds do not apply to the end-of-day margin run.

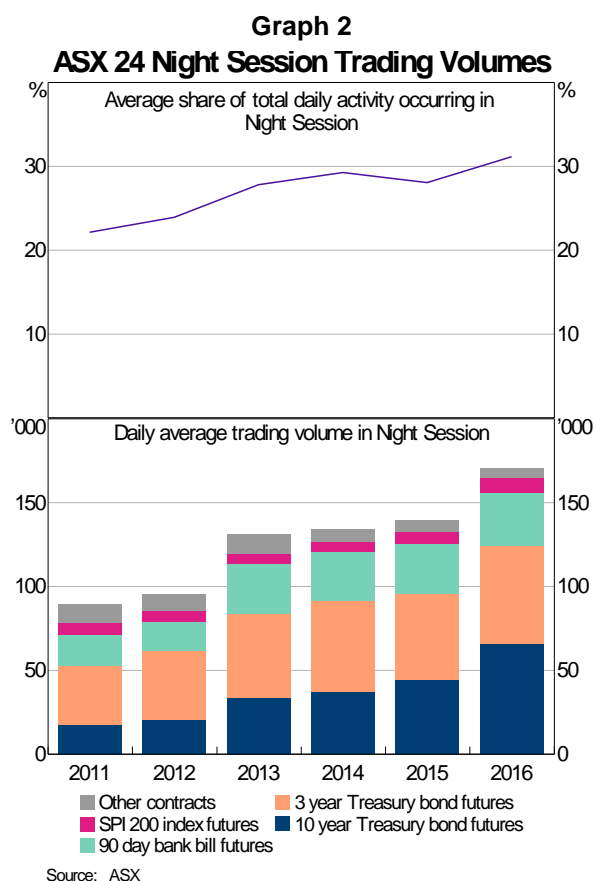
31 ASX Clear (Futures) also calculates intraday margin obligations at 8.05am but does not currently call for intraday margin based on these calculations.

eliminate risk-based erosion thresholds, replacing them with a flat \$1 million minimum call amount.³² These changes are designed to ensure that a greater proportion of intraday exposures are collateralised in the lead-up to the Night Session.

Night Session (5.10 pm to 7.00 am)

ASX Clear (Futures) runs hourly margin calculations during the Night Session; however, participants are unable to make AUD margin payments overnight as the Australian payments system is closed. As a result, any margin erosion following the final intraday margin run at 1.30 pm can currently only be covered by a margin call the following morning.

ASX has recently commenced work on developing and implementing additional arrangements to manage potential exposures during the Night Session. These additional arrangements have been prompted in part by steady growth in activity in the Night Session. Between 2011 and 2016 the proportion of trading volume executed in the Night Session increased by 9 percentage points to represent around one third of transactions executed at ASX Trade 24 (Graph 2). The additional arrangements have also been motivated by the potential for events outside the Australian trading day to have a large impact on the Australian market. ASX Clear (Futures)' long-term plan to manage its overnight risks is to implement real-time margining capabilities on a 24/6 basis, including scheduled overnight margin runs. Overnight margin calls would reduce the size and duration of ASX's overnight exposures and provide ASX with greater flexibility to respond to changes in exposures during the Night Session. ASX expects to implement this proposal by mid-2020.



In the interim, to address uncovered overnight margin exposures ASX is in the process of implementing a number of short-term enhancements to its intraday and overnight risk management arrangements. By the end of September, ASX Clear (Futures) plans to introduce an additional intraday margin run at 8.05 am. This change will reduce the duration of overnight margin exposures by around two hours.

32 Margin erosion thresholds at ASX Clear (Futures) had previously varied depending on the participant's internal credit rating and the product class of the portfolio; the highest thresholds applied to client accounts of A- and B-rated exchange-traded derivatives participants and were set at the lower of \$35 million or 25 per cent, meaning that significant margin erosion was required before a call would be made.

ASX Clear (Futures) has also recently put in place a requirement for certain participants to lodge an AIM 'buffer' to cover a portion of potential margin erosion during the Night Session. The requirement was effective from July 2017 and applies to participants with overnight activity over 2016/17 above certain thresholds. To determine the amount of AIM each participant was required to post, ASX reviewed the participant's daily overnight margin erosion over the previous 18 months and set the requirement based on the average monthly 80th percentile of that participant's peak overnight exposures. Ten participants, representing 97 per cent of overnight activity and over 90 per cent of total initial margin at ASX Clear (Futures), are currently subject to this requirement.³³

ASX is planning to implement a daily overnight USD margin call on the participants who meet the minimum overnight activity thresholds described above. Once this is implemented, ASX will remove the AIM buffer requirement (although participants may choose to post excess margin overnight in order to reduce the operational burden associated with regular overnight margin calls). ASX expects to implement the daily overnight margin call in September 2017.

Recommendation. By the end of 2017, ASX Clear (Futures) should implement its plans to introduce a scheduled intraday margin call during ASX 24's Night Session to improve its management of intraday exposures created during this session.

By 30 June 2020, ASX Clear (Futures) should put in place arrangements to be able to monitor and manage intraday exposures created during ASX 24's Night Session on a near real-time basis, or take other steps to ensure comprehensive management of intraday exposures created during ASX 24's Night Session.

3.7 Pricing

Price data are a key input into a CCP's margin models – correct prices are needed to ensure that margins are set at the right level. CCP Standard 6.2 requires that CCPs have timely sources of price data and have in place procedures and valuation models for situations when price data are not available or are unreliable. The guidance to CCP Standard 6 further requires that CCPs continually evaluate the accuracy and reliability of price data and that pricing models are independently validated at least annually under a variety of market scenarios.

The ASX CCPs source price data for cash market products and exchange-traded derivatives from the ASX Trade and ASX Trade 24 markets. OTC IRDs are priced using third-party data sources. Some settlement prices, including for electricity and other commodity derivatives, are also sourced from third parties.³⁴ ASX maintains separate models to calculate prices for ETOs and OTC IRDs, which are independently validated as part of ASX's regular model validation process (see Section 3.8).

ASX runs a set of checks and validations for its price data each day to ensure they are correct. These include comparing daily price movements against predefined tolerance levels and independent third-party data where possible. ASX also checks price data for consistency across products. Potentially

³³ ASX plans to apply this requirement to an additional participant in the near future.

³⁴ Settlement prices are used to determine settlement obligations for derivatives contracts and margin obligations for all products. For securities products, the settlement price will typically be the same as the market price (i.e. the last traded price executed on the ASX market). In the case of derivatives, the settlement price may be derived from one or more inputs (for example, the settlement price for an exchange-traded option is derived from the settlement price of a security).

erroneous prices are investigated and, if the prices are deemed to be incorrect, the ASX CCPs have the authority to amend them.

ASX has procedures and contingencies in place for situations in which prices are not available or are deemed to be unreliable (e.g. in a market outage). For OTC IRDs, ASX has multiple third-party data sources which it can use, and may contact brokers for information if other sources are unavailable. For exchange-traded products, the ASX CCPs would rely on the last traded price unless there is evidence of material market movements from related products. For instance, ASX may model the price of exchange-traded derivatives using the price of the underlying asset, if available. For the constituent equities of the S&P/ASX 200 index, ASX may use price movements in the SPI futures contract as a proxy.

Following the ASX Trade outage in September 2016 and in response to a recommendation from ASIC, ASX reviewed its process for setting the prices used for margining purposes (i.e. settlement prices) in the event of a market disruption (see Section 2.4.1). As a result of this review, ASX has published a consultation paper to seek feedback from its stakeholders on its processes for determining settlement prices in ASX Clear during a market outage. Separately, ASX will also consult with the Risk Consultative Committee for ASX Clear (Futures) on its methodologies for determining settlement prices for ASX 24 products if the market is unavailable. The Bank will monitor the ASX CCPs' consultation with their participants on the determination of settlement prices during an outage of ASX Trade and ASX 24.

3.8 Review and Validation

CCP Standard 6.6 requires CCPs to analyse and monitor model performance and overall margin coverage through backtesting and sensitivity analysis. Backtesting is a comparison of actual model performance against predicted model outcomes. ASX conducts backtesting at the portfolio level for each of its margin models. It also tests key model parameters, including the PSR and VSR in CME SPAN, and flat rates for cash market products. ASX conducts backtesting daily and reports the results showing the coverage rate for each model over the previous month, quarter and year to relevant staff in the Risk division, along with the results of sensitivity analysis. Backtesting results are also disclosed to participants and the Bank on a monthly basis. ASX is also planning to implement enhancements to its backtesting approach by the end of 2017. This will include new backtests incorporating changes to the assumed timing of default and enhanced statistical tests of backtesting results. Recent results indicate that ASX's margin models have achieved coverage above 99.7 per cent over the past year (Table 7). See Appendix C.1, CCP Standard 6.6 for a comprehensive overview of ASX's backtesting methodology.

Table 6: ASX Margin Model Backtesting Results for 2016/17

Facility	Margin Model	Target Coverage (per cent)	Actual Coverage (per cent)
ASX Clear	CMM	99.7	99.91
ASX Clear	CME SPAN	99.7	99.96
ASX Clear (Futures)	CME SPAN	99.7	100
ASX Clear (Futures)	OTC IRD FHSVAr	99.7	100

During the Assessment period, ASX refined and documented its approach to sensitivity analysis. ASX's refined approach assesses the sensitivity of margin requirements to changes in all key margin

parameters, including the MPOR, look-back period and confidence interval. ASX also intends to conduct 'reverse sensitivity analysis' on CME SPAN margin models to determine the degree to which key CME SPAN parameters need to be varied in order to breach target initial margin coverage. ASX will perform its new sensitivity analysis on the CME SPAN and OTC FHSVaR models on a monthly basis from September 2017, with the analysis extending to the CMM model from the end of December 2017. The Bank will monitor the refinement of this framework and the results of this analysis over the coming assessment period. This will be done as part of the Bank's broader review of the ASX CCPs' alignment with the new CCP Resilience Guidance (see Section 2.2).

The CCPs' margin methodologies are also subject to comprehensive validation and ongoing review under ASX's Model Validation Standard (see Appendix C.1, CCP Standard 4.5). Clearing Risk Quantification and Development (CRQD) is responsible for conducting the regular reviews of models, while Internal Audit coordinates the independent validation process with CRQD input. The results of these reviews and independent validations are reported to the CRQD and the CCPs' Boards. ASX made changes to its model validation framework during the Assessment period, including changes to the frequency of independent validations for some margin models (see Section 2.1.4).

3.9 Conclusions and Recommendations

ASX has well-established margining arrangements, which it has continued to enhance over recent years. The Bank's assessment is that ASX Clear 'observes' all of the sub-standards in CCP Standard 6: Margin. ASX Clear (Futures) 'observes' all of the sub-standards under CCP Standard 6 except sub-standard 6.4, which it 'broadly observes'. In the case of sub-standard 6.4, the Bank assesses that the lack of operational capacity to make scheduled or unscheduled margin calls and payments during ASX 24's Night Session is an issue of concern that should be addressed by ASX Clear (Futures) in a defined timeline. ASX has already made progress to address this issue, in particular through the introduction of the requirement for certain participants to lodge AIM to cover a portion of potential intraday exposures during the Night Session. ASX also has planned both short-term and long-term enhancements to ASX Clear (Futures)' risk management arrangements to more comprehensively manage these exposures, which it plans to complete by September 2017 and mid-2020, respectively. The Bank recommends that ASX implement these plans or take other steps to ensure comprehensive management of intraday exposures created during ASX 24's Night Session.

Apart from the recommendation on intraday risk, the Bank has made two recommendations outlining steps required for the CCPs to continue to observe the requirements in the margin Standard. These recommendations are consistent with plans ASX has already initiated and relate to:

- the management of liquidity risk in the CCPs' margin models for exchange-traded derivatives (CCP Standard 6.1)
- the analytical basis for the CCPs' MPOR assumptions (CCP Standard 6.3).

ASX also has other work underway to enhance its margining arrangements:

- engagement with participants on prices used during a market outage
- a review of the effectiveness of its margin arrangements to limit destabilising procyclical changes
- implementation of a new sensitivity analysis framework.

The Bank will monitor ASX's implementation of these enhancements in coming assessment periods and report on ASX's progress in future assessment reports.

Abbreviations

ADI	authorised deposit-taking institution	DvP	delivery-versus-payment
AFR	Available Financial Resources	EPSC	Enterprise Portfolio Steering Committee
AIM	additional initial margin	ERM	Enterprise Risk Management
ALMO	Approved Listing Market Operator	ERMC	Enterprise Risk Management Committee
ALR	Additional Liquidity Requirement	ESA	Exchange Settlement Account
AMO	Approved Market Operator	ESAS	Exchange Settlement Account System
AONIA	Australian overnight index average	ESMA	European Securities and Markets Authority
APRA	Australian Prudential Regulation Authority	ETO	exchange-traded option
AusPayNet	Australian Payments Network	FHSVaR	filtered historical simulation value at risk
ASIC	Australian Securities and Investments Commission	FMI	financial market infrastructure
ASXCC	ASX Clearing Corporation	FSB	Financial Stability Board
BBSW	bank bill swap rate	FSS	Financial Stability Standard(s)
BCL	Banque Centrale du Luxembourg	HLE	High-level Expectation
CALCO	Capital and Liquidity Committee	HSVaR	Historical Simulation of Value at Risk
CBPL	capital-based position limit	ICC	Inter-commodity spread concession
CCMS	centralised collateral management service	ICR	Internal Credit Rating
CCO	Chief Compliance Officer	IOSCO	International Organization of Securities Commissions
CCP	central counterparty	IRD	interest rate derivative
CDI	CHESS Depository Interest	LEPO	low-exercise-price options
CEO	Chief Executive Officer	MoU	memorandum of understanding
CFO	Chief Financial Officer	MPOR	margin period of risk
CFTC	US Commodity Futures Trading Commission	NSX	National Stock Exchange of Australia
CFR	Council of Financial Regulators	NTA	net tangible assets
CHESS	Clearing House Electronic Sub-register System	OLR	Ordinary Liquidity Requirement
CIO	Chief Information Officer	OTA	offsetting transaction arrangement
CLR	Core Liquidity Requirement	OTC	over-the-counter
CMaX	Collateral Management Exchange	PBoC	People's Bank of China
CME SPAN	Chicago Mercantile Exchange Standard Portfolio Analysis of Risk	PFMI	<i>Principles for Financial Market Infrastructures</i>
CMM	Cash Market Margining	PIRC	Participant Incident Response Committee
COO	Chief Operating Officer	RBNZ	Reserve Bank of New Zealand

CRA	Counterparty Risk Assessment	PSNA	<i>Payment Systems and Netting Act 1998</i>
CRO	Chief Risk Officer	PSR	price scanning range
CRPM	Clearing Risk Policy and Management	RCC	Risk Consultative Committee
CPMI	Committee on Payments and Market Infrastructures	RITS	Reserve Bank Information and Transfer System
CRQD	Clearing Risk Quantification and Development	RMB	Renminbi
CS	clearing and settlement	RQWG	Risk Quantification Working Group
CSORC	Clearing and Settlement Operations, Risk and Compliance Committee	RST	reverse stress testing
DBOR	Daily Beneficial Ownership Report	RTGS	real-time gross settlement
DCO	Derivatives Clearing Organization	S&P	Standard & Poor's
DCS	Derivatives Clearing System	SOF	Swift Oversight Forum
DLR	Default Liquidity Requirement	SRPC	Settlement Risk Policy Committee
DLT	Distributed Ledger Technology	SSF	securities settlement facility
DMC	Default Management Committee	SSX	Sydney Stock Exchange Limited
DMG	Default Management Group	STEL	stress test exposure limit
DMRF	Default Management and Recovery Framework	SWIFT	Society for Worldwide Interbank Financial Telecommunication
DMRSG	Default Management and Recovery Steering Group	TAS	Trade Acceptance Service
DPS	Derivatives Pricing System	VaR	value at risk
DvD	delivery-versus-delivery	VSR	volatility scanning range

Appendix A: Continuous Improvements

Table 7: Summary of Progress against 2015/16 Recommendations to Support Continuous Improvement

Recommendation	Standard	Facility	Actions
Documentation. ASX Clear and ASX Clear (Futures) are encouraged to continue enhancing the documentation of the key elements of their financial risk management frameworks, including clear articulation to participants and regulators (and where appropriate the public) of the analytical basis and rationale for the choice and calibration of key margin and stress test model parameters and assumptions.	CCP Standard 2	Both CCPs	<i>Ongoing. The Bank will continue to review in light of the CCP Resilience Guidance.</i> The CCPs have improved the quality of their documentation.
CCP guidance on resilience and recovery. ASX Clear and ASX Clear (Futures) are encouraged to review the following aspects of their risk management arrangements in light of forthcoming CPMI-IOSCO guidance on resilience and recovery of CCPs:	CCP Standards 2, 4, 5 and 7	Both CCPs	<i>Ongoing. The Bank will assess ASX against the CCP Resilience Guidance during the next assessment period.</i> ASX reviewed its risk management arrangements against the draft guidance to identify potential areas for improvement. For more information see Section 2.2.
Recovery planning. The CS facilities are encouraged to continue to refine the documentation of their recovery plans, including considering further elaborating: stress scenarios; communications procedures; the methodology for determining critical services; how structural weaknesses are identified and addressed; and links to other FMIs.	CCP Standard 3, SSF Standard 3	Both CCPs	<i>Fully addressed.</i> The CCPs have updated and refined the documentation supporting their recovery plan to further elaborate on the methodology for determining critical services and links to other FMIs. For more information see Section 2.2.
Credit stress testing. ASX Clear (Futures) is encouraged to review the assumptions it makes regarding the value of its prefunded financial resources in extreme but plausible market conditions, in light of any changes to its collateral haircuts.	CCP Standard 4	ASX Clear (Futures)	<i>Ongoing. The Bank will consider this in light of the CCP Resilience Guidance.</i> Over 2016/17 ASX developed quarterly reporting of the impact of the worst stress over the last 20 years on the value of non-cash and FX margin collateral. For more information see Section 2.1.6.
Liquidity, concentration and spread risks. ASX Clear and ASX Clear (Futures) are encouraged to complete their review of spread, concentration and liquidity add-ons for their margin and credit stress testing models and incorporate these add-ons as appropriate.	CCP Standards 4 and 6	Both CCPs	<i>Partly addressed. In light of the margin special topic, the Bank has increased the priority of this issue and made a specific recommendation.</i> The CCPs have implemented spread add-ons in their CME SPAN margin parameters. The CCPs continue to refine the design of add-ons to account for liquidity risk. For more information see Section 3.1.4.

<p>Risk management system enhancements. ASX Clear and ASX Clear (Futures) are encouraged to continue to progress planned enhancements to their risk management systems, including to deliver the capability to calculate on a near real-time basis:</p> <ul style="list-style-type: none"> • credit stress test exposures • liquidity stress test exposures • margin requirements, using a range of models and parameters. 	<p>CCP Standards 4, 6 and 7</p>	<p>Both CCPs</p>	<p><i>Not addressed. The Bank will consider this in reviewing the five-year plan ASX will develop in 2017/18.</i></p> <p>During the Assessment period, ASX modified and reprioritised certain aspects of its technology transformation program. Rather than developing a new risk management system for the CCPs, ASX will instead be making incremental enhancements to the CCPs' existing risk management systems as part of a five-year plan to be developed over 2017/18. For more information see Section 2.1.7.</p>
<p>Liquidity risk management. ASX Clear and ASX Clear (Futures) are encouraged to regularly test their procedures for accessing their liquid resources, including the on-market liquidation or repo of non-cash collateral and collateral investments, drawdown of ASX Clear's committed liquidity facilities and potential repo of eligible securities at the Bank.</p>	<p>CCP Standard 7</p>	<p>Both CCPs</p>	<p><i>Fully addressed.</i></p> <p>ASX has recently implemented processes to periodically test its procedures for accessing its liquid resources. ASX will now confirm that it has tested its operational capability to conduct transactions to liquidate or repo the full range of assets held by ASXCC on a six-monthly basis. ASX will also regularly review the terms of its commercial bank committed liquidity facility to ensure ongoing compliance with those terms. For more information see Section 2.1.2.</p>
<p>CCP default management. ASX Clear is encouraged to implement its plans for enhancing the effectiveness of its default management arrangements, including improvements to portability and the close-out process for ETOs, and finalise its policy on dealing with 'specific cover' exposures.</p> <p>ASX Clear and ASX Clear (Futures) are encouraged to continue examining ways in which their new risk management system could be used to facilitate, and mitigate risks arising in, the default management process. The CCPs are encouraged to continue developing the system functionality over time, integrating learnings from fire drills and other enhancements identified by the Default Management Steering Group. In the meantime, the CCPs are encouraged to continue to explore options to improve the effectiveness of the default management process within their existing systems.</p> <p>ASX Clear and ASX Clear (Futures) are encouraged to carry out plans to sign on an additional default broker for the markets that they clear for (i.e. ASX and Chi-X markets for ASX Clear, and ASX 24 for ASX Clear (Futures)).</p> <p>ASX Clear and ASX Clear (Futures) are encouraged to carry out their plans to enhance participant and client education and communication regarding the CCPs' default management arrangements. As part of this, the CCPs are encouraged to complete their planned updates of existing participant disclosures on the key aspects of their default management arrangements. For ASX Clear, this should include the development of an ASX Clear Client Fact Sheet. Any disclosures should be easily accessible, preferably in a centralised location.</p>	<p>CCP Standard 12</p>	<p>Both CCPs</p>	<p><i>Partly addressed. The Bank will follow up in the next assessment period.</i></p> <p>Consistent with the recommendations, the CCPs have made significant progress in enhancing their DMRFs over the Assessment period by:</p> <ul style="list-style-type: none"> • finalising ASX Clear's position on specific cover exposures • progressing negotiations with an additional default broker for ASX Clear (Futures) • publishing an ASX Clear client fact sheet • developing information on the impact of a participant default on ETO investors for periodic roadshows. <p>ASX also intends to implement plans to improve the operational efficiency of the transfer or porting of client ETO positions.</p> <p>As mentioned above, rather than developing a new risk management system for the CCPs, ASX will instead be making incremental enhancements to the CCPs' existing risk management systems as part of a five-year plan to be developed over 2017/18.</p> <p>During the Assessment period, one of ASX Clear's two default brokers resigned. Having only one default broker is not consistent with ASX Clear's Default Management Standard, therefore the Bank has made a specific recommendation that this be addressed.</p> <p>For more information see Section 2.3.</p>

<p>Timeliness and reliability of insurance payments. The CS facilities are encouraged to review their assumptions in respect of the reliability and timeliness of payments under their insurance policies in calculating their general business risk capital.</p>	<p>CCP Standard 14 and SSF Standard 12</p>	<p>All facilities</p>	<p><i>Fully addressed.</i> ASX has reviewed its assumptions on the reliability and timeliness of insurance payments, concluding that they remain appropriate.</p>
<p>Commercial settlement banks. ASX Clear (Futures) is encouraged to review its risk management arrangements applicable to commercial settlement banks, and consider establishing a formal framework for the management of these risks.</p>	<p>CCP Standard 9</p>	<p>ASX Clear (Futures)</p>	<p><i>Ongoing. The Bank will monitor this as part of its ongoing supervision.</i> ASX plans to develop a formal framework for the management of risks arising from its use of commercial settlement banks.</p>
<p>Replacement of cash equities clearing and settlement system. ASX Settlement is encouraged to continue to invest in the ongoing maintenance and smooth functioning of the CHES system in the transition to its replacement system, ensuring that it continues to meet the needs of users and that it continues to support stability in the financial system. ASX is also encouraged to invest in appropriate contingency arrangements, to ensure the timely implementation of an alternative CHES replacement system should the decision be taken not to proceed with the DLT solution.</p>	<p>SSF Standard 14</p>	<p>ASX Settlement</p>	<p><i>Ongoing. The Bank will review this in the context of both the external review of operational risk management and the CHES replacement project.</i> The CHES system met its operational targets during the Assessment period. CHES is also within scope of the external review of their operational risk management arrangements that ASX has initiated. The Bank has had discussions with ASX on its contingency plans should the decision be taken not to proceed with a DLT solution to replace CHES. The Bank intends to continue to engage with ASX on this issue in 2017/18. For more information see Section 2.4.3.</p>
<p>Participant core capital requirements. ASX Clear is encouraged to complete enhancements to participant minimum core capital requirements.</p>	<p>CCP Standard 17</p>	<p>ASX Clear</p>	<p><i>Ongoing. Expected to be fully addressed in the next assessment period.</i> ASX Clear released a response to feedback on its proposed changes to minimum capital requirements. ASX Clear has modified the proposal and intends to implement the new requirements in 2017/18. For more information see Section 2.1.5.</p>
<p>Concentration in tiered participation. ASX Clear and ASX Clear (Futures) are encouraged to review their approach to monitoring concentration risks in tiered participation, including triggers for further investigation and actions, and processes for ongoing review of concentration risk.</p>	<p>CCP Standard 18</p>	<p>Both CCPs</p>	<p><i>Ongoing. The Bank will consider this as part of its ongoing supervision.</i></p>

Appendix B: Background Information

B.1 ASX Group Structure

There are two types of CS facilities operated by the ASX Group:

- **CCPs.** A CCP acts as the buyer to every seller, and the seller to every buyer in a market. It does so by 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 risk management as well as greater opportunities for netting of obligations. At the same time, however, they result in a significant concentration of risk in the CCP. This risk can crystallise if a participant defaults on its obligations to the CCP, since the CCP must continue to meet its obligations to all of the non-defaulting participants. The ASX CCPs manage this risk in a number of ways, including through participation requirements, margin collection, the maintenance of pooled resources and loss allocation arrangements (see Appendix B.3).
- **SSFs.** An SSF provides for the final settlement of securities transactions. Settlement involves transfer of the title to the security, as well as the transfer of cash. These functions are linked via appropriate delivery-versus-payment (DvP) arrangements incorporated within the settlement process.

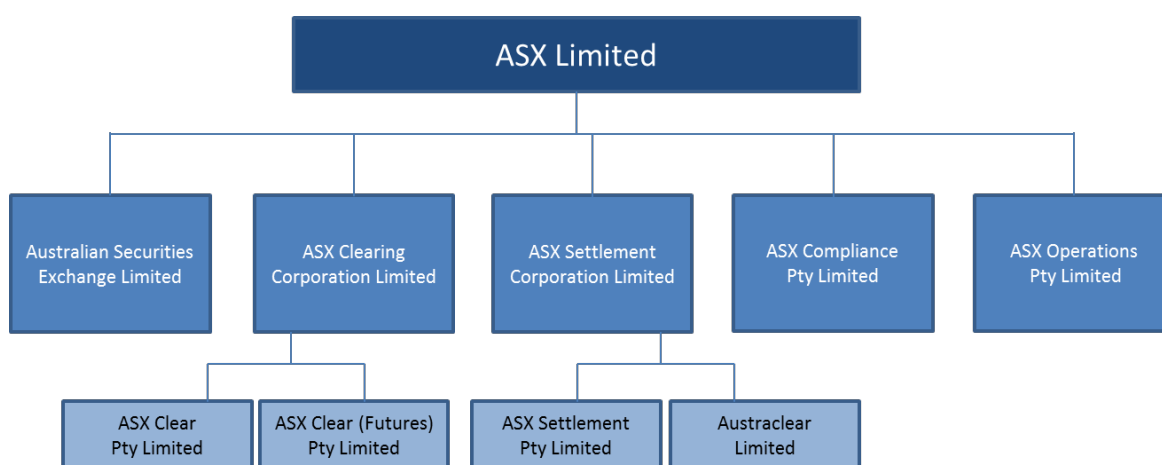
The ASX Group operates two CCPs and two SSFs:

- **ASX Clear** provides CCP services for ASX-quoted cash equities, debt products and warrants traded on the ASX and Chi-X Australia Pty Ltd (Chi-X) markets, equity-related derivatives traded on the ASX market and Chi-X-quoted warrants traded on Chi-X.
- **ASX Clear (Futures)** provides CCP services for futures and options on interest rate, equity, energy and commodity products traded on the ASX 24 market, as well as AUD-denominated OTC IRD.
- **ASX Settlement** provides SSF services for ASX-listed cash equities, debt products and warrants traded on the ASX and Chi-X markets. Under the Settlement Facilitation Service, ASX Settlement also provides settlement services for transactions in non-ASX-listed securities undertaken on trading platforms operated by Approved Listing Market Operators (ALMOs); these include the National Stock Exchange of Australia (NSX), IR Plus Securities Exchange Ltd (IR Plus) and the Sydney Stock Exchange Limited (SSX).
- **Austraclear** provides settlement and depository services for debt securities, including government bonds. It also provides settlement services for derivatives traded on the ASX 24 market and for margin payments in ASX Clear and ASX Clear (Futures).

Each of the ASX facilities holds a CS facility licence, and each CCP and SSF is required under the Corporations Act to comply with the relevant FSS determined by the Bank (i.e. the CCP Standards and SSF Standards, respectively) and to do all other things necessary to reduce systemic risk (see Appendix B.2).

ASX Limited is the ultimate parent company of the four CS facilities (Figure 1: ASX Group Structure) and is listed on the ASX market. The ASX Limited Board is responsible for overseeing the processes for identifying significant risks to ASX and ensuring that appropriate policies, as well as adequate control, monitoring and reporting mechanisms, are in place. In addition, ASX Limited’s Board assigns certain responsibilities to subsidiaries within the group, including the boards of the four CS facilities (the CS Boards). The CS Boards are responsible for managing the particular clearing and settlement risks faced by each respective CS facility, including through compliance with the FSS. The CS Boards are subject to common governance arrangements with high-level objectives set out in the CS Boards’ Charter. There are five directors that serve on all four CS Boards; one additional director serves on both the ASX Clear and ASX Settlement Boards and three additional directors serve on both the ASX Clear (Futures) and Austraclear Boards.

Figure 1: ASX Group Structure



In the ASX corporate structure, the two CCPs – ASX Clear and ASX Clear (Futures) – are subsidiaries of ASXCC. ASXCC is the holding company for, and manages the financial resources of, the two CCPs. It invests these resources according to a treasury investment policy and investment mandate approved by the CS Boards. The two SSFs – ASX Settlement and Austraclear – are subsidiaries of ASX Settlement Corporation Limited. ASXCC and ASX Settlement Corporation Limited are in turn subsidiaries of the ASX Group’s parent entity, ASX Limited. ASX Limited is the licensed operator of the ASX market, which provides a trading platform for ASX-quoted securities and equity derivatives. Another subsidiary, Australian Securities Exchange Limited, is the licensed operator of the ASX 24 market, an exchange for futures products.

In delivering their services, the CS facilities rely on group-wide operational and compliance resources that reside in ASX Operations Pty Limited (ASX Operations) and ASX Compliance Pty Limited (ASX Compliance), which are a wholly owned subsidiary of ASX Limited.

- ASX Operations provides most operational resources required by the CS facilities, including resources to enable ASX Compliance Pty Limited (ASX Compliance) to perform its services.
- ASX Compliance provides compliance services to the licensed entities of the ASX Group, including monitoring and enforcing participants’ compliance with the Operating Rules of the CS facilities.

ASX has adopted a group-wide organisational structure to manage the business operations of its various entities, including the CS facilities. Its business units are organised into nine main groups:

- Office of the Chief Executive Officer (CEO)
- Risk
- Operations
- Technology
- Business Development
- ASX Compliance
- Office of General Counsel and Company Secretariat, Regulatory Policy and Regulatory Assurance
- Finance
- Human Resources.

The CRO, who heads the Risk group, is responsible for providing executive oversight of ASX's Clearing Risk Policy Framework, which documents the formal structure for the development, governance and review of policy and standards for the CCPs. Similarly, the Chief Operating Officer (COO), who heads the Operations group, is responsible for providing executive oversight of ASX's Settlement Risk Policy Framework, which sets out a similar structure for the SSFs. The Risk and Operations groups contain a number of departments that play key roles in the management of risks faced by the CS facilities:

- CRQD is responsible for the development of clearing risk management systems, and maintaining and validating CCP risk and pricing models.
- Clearing Risk Policy and Management (CRPM) develops, maintains and implements CCP policies and standards, and maintains effective procedures for carrying out those policies and standards.
- Post Trade and Issuer Services Operations develops, maintains and implements SSF policies and standards, and maintains effective procedures for carrying out those policies and standards.
- Enterprise Risk is responsible for enterprise-wide risk management, including general business risk.
- Internal Audit conducts risk-based reviews of internal controls and procedures across ASX. Internal Audit reports to the Audit and Risk Committee and the Managing Director and CEO for audit purposes and to the CRO for administrative purposes only.

ASX's Clearing Risk Policy Framework also sets out roles for a number of internal forums that bring together decision-makers and experts from departments across the group:

- CALCO advises on changes to clearing risk policies and standards related to capital, liquidity and balance sheet management.
- Clearing and Settlement Operations, Risk and Compliance Committee (CSORC) shares information on material changes to clearing and settlement policy with significant compliance and/or operational implications.
- Risk Quantification Working Group (RQWG) is responsible for quantitative risk management matters, including the review and application of quantitative risk policies and the Model Validation Framework, including oversight of model governance and the outcomes and recommendations of regular reviews of margining and stress test outcomes and recommendations.

- Default Management and Recovery Steering Group (DMRSG) provides oversight of the CCP's DMRF.

The CSORC also has a role in ASX's Settlement Risk Policy Framework. This Framework sets out roles for two additional internal committees:

- Settlement Risk Policy Committee (SRPC) – reviews policies and standards prior to submission to the CS Boards.
- Participant Incident Response Committee (PIRC) – responsible for monitoring and managing material participant incidents, including any non-compliance with participant obligations, settlement default, operational failure or an event which might result in the participant becoming an externally administered body corporate or an insolvent under administration, and, in the case of a clearing participant, escalating potential default events to the Default Management Committee (DMC).

Information on the executive management of ASX is available on its website.³⁵ ASX made a number of changes to its executive management during the Assessment period:

- In August 2016, a new Managing Director and CEO, Dominic Stevens, was appointed.
- ASX's former CRO, Alan Bardwell, resigned on 10 February. The new CRO, Hamish Treleaven, joined ASX on 1 March.
- ASX's former Chief Information Officer (CIO), Tim Thurman, resigned on 24 March. The new CIO, Dan Chesterman, joined ASX on 4 September.
- ASX's Group General Counsel & Company Secretary and Group Executive Corporate Affairs, Amanda Harkness, resigned in July 2017.
- A new position of Chief Strategy Officer was created in March. This role reports directly to the CEO and is responsible for coordinating ASX's strategies and ensuring consistent delivery of the strategies across business functions. Blair Beaton was appointed to the role on 1 March.

B.2 Regulatory Environment

The Corporations Act establishes conditions for the licensing and operation of CS facilities in Australia and gives ASIC and the Bank powers and responsibilities relating to these facilities. These powers are exercised under the governance of ASIC's Commission and the Bank's Payments System Board, respectively. The regulators' respective roles are defined in the Corporations Act.

- The Bank is responsible for determining standards (the FSS) for the purposes of ensuring that CS facility licensees conduct their affairs in a way that causes or promotes overall stability in the Australian financial system, and for assessing how well a licensee is complying with its obligation under the Corporations Act, to the extent that it is reasonably practicable to do so, to comply with these standards and do all other things necessary to reduce systemic risk.
- ASIC is responsible for assessing the extent to which CS facility licensees comply with all other obligations of a CS facility licensee arising under the Corporations Act, including notably the

³⁵ Available at <<http://www.asx.com.au/about/executive-team.htm>>.

obligation, to the extent that it is reasonably practicable, to do all things necessary to ensure that the CS facility's services are provided in a fair and effective way.

The Bank has determined two sets of FSS relevant to its oversight of CS facilities: the CCP Standards and SSF Standards.

As licensees, the ASX CS facilities are required to provide the Bank with timely information on any material developments relevant to the services provided under its CS facility licence and its compliance with the FSS. The Bank also gathers information on the facilities through an open and ongoing dialogue with ASX staff, including through scheduled periodic meetings and ad hoc targeted meetings on specific topics.³⁶ Based on the information gathered, the Bank undertakes annual assessments of the ASX CS facilities.³⁷

The ASX CCPs are recognised by the European Securities and Markets Authority (ESMA) as 'third-country CCPs'. This allows the ASX CCPs to continue to provide clearing services to participants established in the European Union. ASX Clear (Futures) was also granted an exemption from registration as a Derivatives Clearing Organization (DCO) in the US. This exemption allows ASX Clear (Futures) to provide clearing services to US banks with respect to 'proprietary' swaps. The Bank and ASIC have established a memorandum of understanding (MoU) with each of ESMA and US Commodity and Futures Trading Commission (CFTC) which, among other things, supports cross-border cooperation and information sharing. The Bank has also issued a Supplementary interpretation of CCP Standards to facilitate the ASX CCPs recognition in the EU (see Appendix C).

The Bank also has an MoU with the Reserve Bank of New Zealand (RBNZ) which establishes cooperation arrangements relevant to ASX Clear (Futures)' existing activities in NZD-denominated products. RBNZ has also stated that ASX Clear (Futures) may be of systemic importance in New Zealand and may therefore be designated for oversight as an offshore FMI under the RBNZ's proposed new oversight regime for FMIs.³⁸

B.3 Risk Management in the ASX Central Counterparties

CCPs are exposed to both credit and liquidity risks, primarily following the default of one or more participants. Credit risk is the risk that one or more counterparties will not fulfil their obligations to the CCP, resulting in a financial loss, while liquidity risk arises where the CCP is unable to meet its payments obligations at the time that they are due, even if it has the ability to do so in the future. ASX Clear and ASX Clear (Futures) manage the risks arising from a potential default in a number of ways, including through participation requirements, margin collection, the maintenance of prefunded pooled financial resources, recovery tools, and risk monitoring and compliance activities.

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

37 The Bank's intention to carry out annual assessments of the ASX CS facilities is set out in the *Frequency and Scope of Regulatory Assessments of Licensed Clearing and Settlement Facilities*, available at: <<https://www.rba.gov.au/payments-and-infrastructure/payments-system-regulation/frequency-of-assessments.html>>.

38 For more information, see 'An Enhanced Oversight Framework for Financial Market Infrastructures', available at <<http://www.rbnz.govt.nz/-/media/ReserveBank/Files/regulation-and-supervision/financial-market-infrastructure-oversight/regulatory%20developments/FMIs-Cabinet-paper.pdf?la=en>>.

Participation requirements

Participants in each CCP must meet minimum capital requirements. While capital is only a proxy for the overall financial standing of a participant, minimum capital requirements offer comfort that a participant has adequate resources to withstand an unexpected shock, for example, arising from operational or risk-control failings.

- ASX Clear requires direct participants that clear cash equities or derivatives to maintain at least \$5 million in capital. ‘General participants’, which are able to clear on behalf of third-party participants, are subject to tiered capital requirements. A general participant must maintain \$5 million in capital to support its own clearing activity and \$5 million to support each third-party clearing relationship, up to a maximum of \$20 million.
- ASX Clear (Futures) requires participants that clear futures only to hold at least \$5 million in NTA. Participants using the OTC derivatives clearing service must meet a higher minimum NTA (or Tier 1 Capital) requirement of \$50 million.

The CCPs also impose CBPLs on participants’ activity. Specifically, the ratio of initial margin requirements to liquid capital, NTA or Tier 1 Capital for participants is subject to an upper limit of three for both CCPs.³⁹ As discussed in Section 2.1.5, under certain conditions, banks and subsidiaries of banks or bank holding companies are not subject to a ratio-based capital position limit. Rather, these institutions’ initial margin liabilities are subject to a fixed \$1.5 billion aggregate limit.

During the Assessment period, ASX Clear introduced new requirements in respect of participants’ liquidity risk management frameworks (see Section 2.1.5).

Prefunded financial resources

The CCPs cover their credit and liquidity exposures to their participants by collecting margin and maintaining a fixed quantity of prefunded pooled resources. The CCPs collect several types of margin.

- *Variation margin.* Variation (or ‘mark-to-market’) margin is collected at least daily from participants with mark-to-market losses and, in the case of futures and OTC derivatives, paid out to the participants with mark-to-market gains.
- *Initial margin.* Both CCPs routinely collect initial margin from participants to mitigate credit risk arising from potential changes in the market value of a defaulting participant’s open positions between the last settlement of variation margin and the close-out of these positions by the CCP. The CCPs use statistical models to calculate initial margin, which vary by product type (see Section 3.1). To validate the adequacy of their initial margin models, the CCPs perform regular backtesting and sensitivity analysis (see Section 3.8).
- *AIM.* The CCPs may also make calls for AIM when exceptionally large or concentrated exposures are identified, including through stress tests, or when predefined position limits are exceeded.

In addition to end-of-day margin calls, the CCPs call margin on an intraday basis when exposures due to changes in market value and the opening of new positions exceed predefined limits (see Section 3.6). Intraday margin calls for both CCPs would equal the total shortfall in initial margin, variation margin and AIM if triggered.

³⁹ Prior to May 2017, this ratio was two for ASX Clear (Futures).

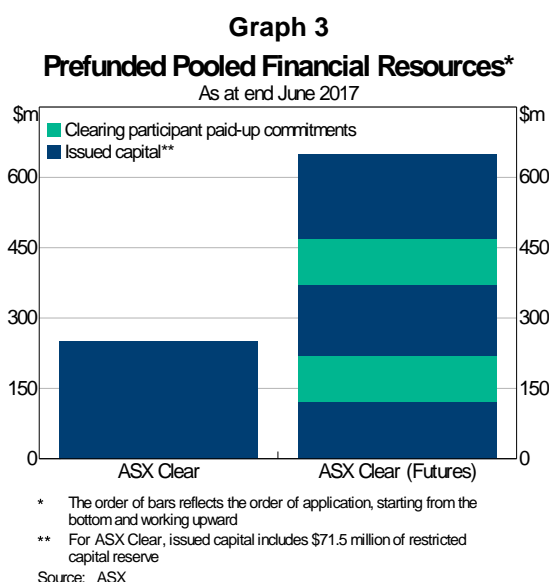
ASX requires that variation margin is posted in cash, while initial margin may also be posted in the form of cash or securities that ASX would be able to rapidly and reliably liquidate in the event of the participant’s default. Specifically, ASX Clear accepts certain equity securities and exchange-traded funds as collateral, while ASX Clear (Futures) accepts certain Australian and US government bonds, as well as foreign currency denominated in EUR, GBP, JPY, NZD or USD. ASX applies haircuts to non-cash and foreign currency collateral to cover market risk on the liquidation of those assets.

An average of 47 per cent of margin requirements in ASX Clear and 96 per cent of AUD-denominated margin requirements in ASX Clear (Futures) were met in cash during the Assessment period. In ASX Clear, equity securities comprise the remaining collateral. In ASX Clear (Futures), approximately 11 per cent was held in foreign currency on average in 2016/17, while 4 per cent was Australian government bonds. Some clients of participants in ASX Clear commonly post non-cash collateral in excess of margin requirements for equity derivatives. In 2016/17, on average, 82 per cent of the value of non-cash collateral posted against derivatives positions in ASX Clear was in excess of margin obligations.

The margin and other collateral posted by a participant would be drawn on first in the event of that participant’s default.⁴⁰ Should this prove insufficient to meet the CCP’s obligations, the CCP may draw on a fixed quantity of prefunded pooled financial resources (referred to as the CCP’s ‘default fund’).

- ASX Clear’s default fund was \$250 million over the Assessment period (Graph 3). This comprised \$178.5 million of own equity and \$71.5 million paid into a restricted capital reserve from the National Guarantee Fund in 2005.
- ASX Clear (Futures)’ default fund was \$650 million over the Assessment period. This included \$450 million of own equity and \$200 million of contributions from participants.

There were no changes to either CCP’s default fund over 2016/17.

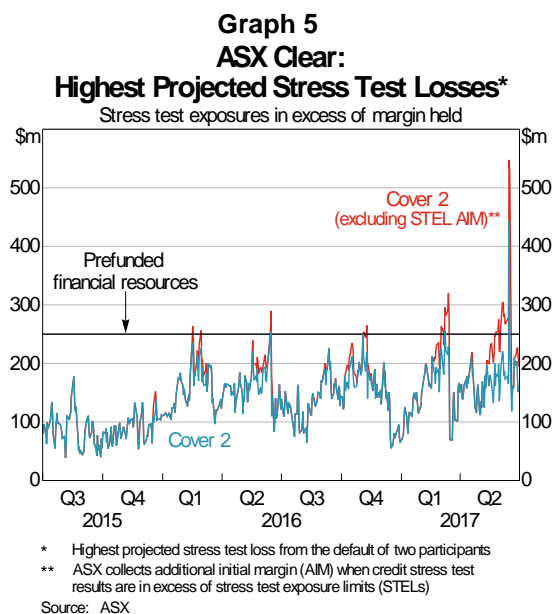


40 For ASX Clear (Futures) the other collateral would include the defaulted participant’s contributions to the CCP’s prefunded pooled financial resources.

Credit stress tests

In order to assess the adequacy of its financial resources to cover its current and potential future credit exposures, the CCPs perform daily credit stress tests.⁴¹ These tests compare each CCP's available prefunded resources against the largest potential loss in the event of the joint default of two participants and their affiliates under a range of extreme but plausible scenarios (Cover 2 requirement). The requirement for the ASX CCPs to have sufficient prefunded resources to meet Cover 2 reflects the Bank's supplementary interpretation of the FSS, under which both CCPs are deemed to be systemically important in multiple jurisdictions (see Appendix C.1, CCP Standard 4.4).

While ASX Clear (Futures) met the Cover 2 requirement throughout 2016/17 (Graph 4), ASX Clear's Cover 2 requirement exceeded its prefunded financial resources on three days in 2016/17 (Graph 5). These shortfalls were covered by AIM the following day. Since the shortfalls were isolated to an individual participant and were covered by AIM collected the following day, ASX did not consider that an increase in the default fund was necessary.



The ASX CCPs automatically call AIM when credit stress test results are in excess of stress test exposure limits (STELs). The STELs are based on ASX's Internal Credit Ratings (ICRs) of participants, with the highest STEL set at half of the total default fund of the relevant CCP. When a participant's credit stress test results exceed its STEL, ASX calls for AIM to cover the difference, with payment due before midday the following day. Not all of these STEL AIM calls are related to shortfalls in the Cover 2 requirement. During the Assessment period ASX Clear made STEL AIM calls on 93 days against three participants in total, with the largest totalling \$269.4 million. ASX Clear (Futures) made STEL AIM calls on 50 days against five participants in total, with the largest call totalling \$119.8 million.

Liquidity risk management

Credit exposures faced by the CCPs from a participant default would also create liquidity exposures. The CCPs may also face default liquidity exposures in excess of their credit exposures. These

41 For more detail on the CCPs' credit stress test framework see Chapter 5 in the *2014/15 Assessment of ASX CS Facilities*.

additional exposures may be particularly large for ASX Clear, given that it novates equity trades with delivery obligations. For example, if a participant with net equity delivery obligations were to default, ASX Clear's liquidity exposure would include the cost of purchasing the securities to meet the delivery obligations of the defaulted participant. By contrast, the CCP's credit exposure would be limited to the change in price in the securities between the defaulting participant's last variation margin payment and the time the CCP executes an offsetting securities trade. ASX Clear also faces liquidity exposures from its acceptance of equity collateral against derivative positions. Specifically, if ASX Clear were to liquidate its equity collateral, it would likely have to wait two days to receive the proceeds of the sale.

The ASX CCPs perform daily liquidity stress tests to assess the adequacy of the CCPs' prefunded financial resources to cover the largest potential liquidity exposure arising from the joint default of two participants and their affiliates under a range of extreme but plausible scenarios (Cover 2 liquidity target). The CCPs' liquidity stress test framework is based on the price movements from their credit stress test scenarios.⁴² As a consequence of having a cash market liquidity 'buffer' (see Section 2.1.2), ASX Clear implicitly has a liquidity threshold for its derivatives-market exposures. During the Assessment period, derivatives-market liquidity exposures exceeded its threshold on 14 days. In all cases, however, the exposures were offset by AIM already held or offsetting exposures in the cash market. While cash market liquidity exposures regularly exceeded the buffer over 2016/17, ASX Clear could have relied on offsetting transaction arrangements (which are essentially liquidity commitments from its participants) to settle any exposures above the buffer (see Appendix C.1, CCP Standard 7.3). ASX Clear (Futures)' liquidity exposures, net of intraday margin held, were less than its prefunded liquid resources during the Assessment period.

If a liquidity stress test breach occurs at either CCP, it is reported to the CRO and CFO. ASX would also review the circumstances and nature of the breach, the size of the breach and possible mitigants. Breaches are also reported on a quarterly basis to CALCO. In addition, if there were three breaches in a quarter, this would require an emergency meeting of CALCO, which would decide on the response. Potential responses to a breach could be to increase the CCPs' prefunded resources, or establish or increase the size of committed liquidity facilities.

Both ASX Clear and ASX Clear (Futures) also face liquidity risk from the reinvestment of pooled prefunded resources and the portion of margin posted by participants in the form of cash. These assets are reinvested and held by ASXCC, the holding company for the two CCPs, according to a defined treasury investment policy and investment mandate. Liquidity risk arises since ASXCC would have to convert its assets into cash to meet any obligations arising from a participant default or for day-to-day liquidity requirements, such as the return of cash margin to participants. To mitigate investment liquidity risk, ASXCC's treasury investment policy requires that a minimum portion of ASXCC's investments must be in liquid assets to meet its minimum liquidity requirements (see Appendix C.1, CCP Standard 7.3).

Recovery tools

In a highly unlikely scenario that involves more than two large participant defaults or market conditions that are beyond 'extreme but plausible', it is possible that prefunded or other liquid financial resources could be insufficient to fully absorb default-related losses or meet payment

42 ASX Clear incorporated amendments to these scenarios to reflect liquidity-specific risks in the cash equities and derivatives market (see Appendix C.1, CCP Standard 7.8). By contrast, ASX Clear (Futures) does not recognise distinct liquidity risks since it has judged that the magnitude of these risks is not material.

obligations. In such circumstances, the CCP may be left with an uncovered credit loss or liquidity shortfall. Each CCP's approach for allocating an uncovered credit loss or liquidity shortfall following a participant default relies on a number of tools:

- *Recovery Assessments.* The power to call for additional cash contributions from participants to meet uncovered losses and fund payment obligations, in proportion to each participant's exposures at the CCP prior to the default. Recovery Assessments are capped at \$300 million in ASX Clear and \$600 million in ASX Clear (Futures) (or \$200 million for a single default).
- *Variation margin gains haircutting.* A tool, available to ASX Clear (Futures) only, allowing the CCP to reduce (haircut) outgoing variation margin payments to participants in order to allocate losses or a liquidity shortfall arising from a defaulting participant's portfolio. There is no cap on the use of this tool.
- *Settlement payment haircutting.* A reserve power that could be used in the context of complete termination to allocate losses or a liquidity shortfall if the above tools were insufficient. Complete termination would involve tearing up all open contracts at the CCP and settling them at their current market value. Any residual losses or liquidity obligations of the CCP could be allocated by haircutting settlement payments to participants. Use of this tool would have a highly disruptive effect on the markets served by the CCP, so would be considered only as a last resort.

In addition, ASX Clear can address a liquidity shortfall relating to the settlement of securities transactions via the use of OTAs with participants due to receive funds in the settlement batch. Both CCPs also have the power to restore a matched book via partial or complete termination of contracts at their current market value if normal close-out processes cannot be carried out.

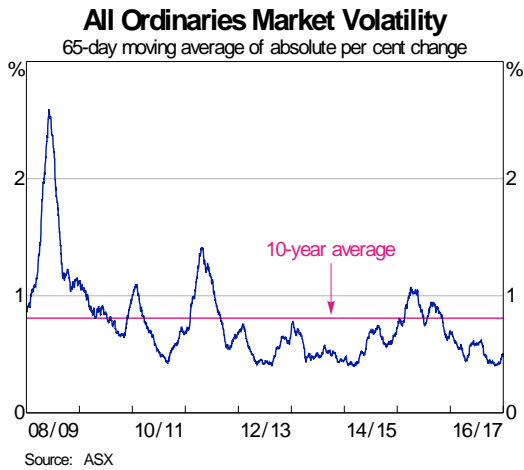
ASX has established a staged process for replenishment of the CCPs' default funds in the event that these were exhausted or partially drawn down following a participant default. At the end of a 22-business-day 'cooling-off period' following the management of a default, ASX Clear and ASX Clear (Futures)' default funds would be fully replenished up to \$150 million and \$400 million, respectively (see Appendix C.1, CCP Standard 4.8).

B.4 Activity and Participation

Central counterparties

Market conditions were generally benign during the Assessment period, with the average volatility in products cleared by ASX CCPs remaining below their 10-year averages. Average volatility in equity prices (as measured by the 65-day moving average of daily absolute percentage changes in the S&P ASX All Ordinaries Index) fell by around 35 basis points to 0.5 per cent (Graph 6). Similarly, volatility in the prices of ASX 24 interest rate futures decreased despite a small uptick in volatility around the time of the US election in November (Graph 7).

Graph 6

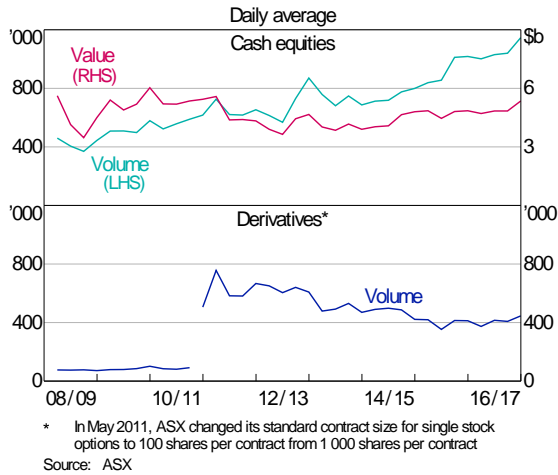


Graph 7

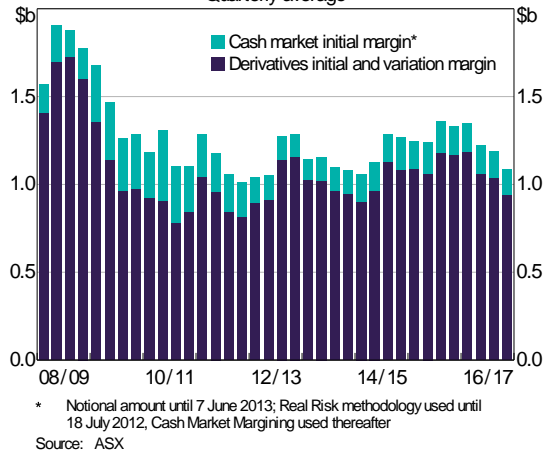


Trading activity in ETOs was relatively flat; this follows a number of years of contraction in activity (Graph 8). The volume on the cash equities market increased, as did the average daily trading value, which grew by 4 per cent.⁴³ Exposures in ASX Clear fell over 2016/17. As measured by initial margin, ASX Clear’s exposures in ETOs fell by 6 per cent on average to around \$1.1 billion over 2016/17 compared with 2015/16, while exposures to cash equities trades fell by 8 per cent to \$155 million (Graph 9). ASX Clear’s exposures to the cash equities market are much lower than for ETOs primarily because of the short duration of cash security trades at two days.

Graph 8
ASX Market Trades



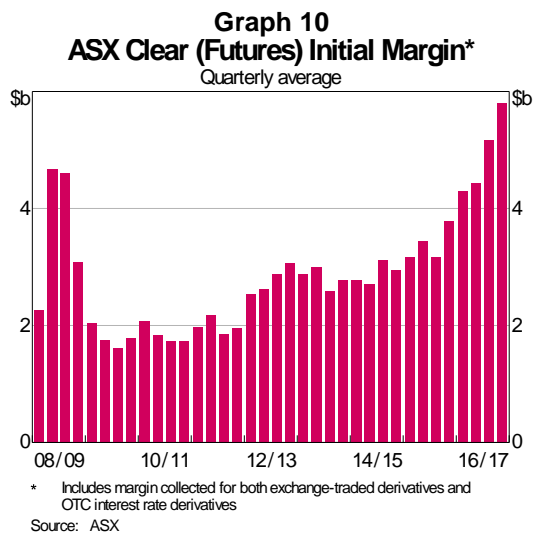
Graph 9
ASX Clear Margin



Exposures at ASX Clear (Futures) grew strongly by 45 per cent to \$4.9 billion on average as measured by margin held (Graph 10). These exposures primarily arise from the four major contracts cleared – the SPI 200 equity index future, the 3-year and 10-year Treasury bond futures and 90-day bank bill swap future – which accounted for around 95 per cent of total transactions cleared at ASX Clear (Futures) in 2016/17. Growth in ASX Clear (Futures)’ exposures was initially driven by higher margin rates set in response to the UK referendum on EU membership in June 2016 (see Section 3.1.1). While margin rates were reduced towards the end of 2016, strong growth in transaction volume in the 10-

43 Exposures to cash equity transactions in ASX Clear are correlated more with value traded than volume.

year Treasury bond futures of 16 per cent, more than offset the impact on exposures of the decrease in rates (Graph 11).



In 2016/17, the average daily value of debt securities settled in Austraclear increased by 6 per cent, to \$46 billion. This includes the value of securities settled under repurchase agreements (other than intraday repurchase agreements with the Bank).

B.5 Operational Performance

ASX manages its operational risks in the context of its group-wide Enterprise Risk Management Framework, applying consistent operational risk controls across all of its CS facilities. Key operational objectives are minimum availability of 99.8 per cent (99.9 per cent for Austraclear) and peak capacity utilisation of 50 per cent. These objectives were met during the Assessment period (Table 9). System availability was equal to or above 99.9 per cent for all systems, while peak usage was below the target of 50 per cent for all systems.

Table 8: ASX CS Facility System Availability and Usage Statistics for 2016/17

Facility	Core system	Availability (per cent)	Peak usage (per cent)	Average usage (per cent)
ASX Clear	Derivatives Clearing System	100	22	9
ASX Clear / ASX Settlement	CHESS	100	30	21
ASX Clear (Futures)	Genium	100	22	9
ASX Clear (Futures)	Calypso	100	50	39
Austraclear	EXIGO	99.98	45	24

Section 2.4.1 discusses a significant operational disruption in Austraclear. There were also two minor incidents that occurred in June – one affecting Genium and one affecting CHESS – but neither of these incidents had an impact on system availability.

Appendix C: Detailed Assessment against the Financial Stability Standards

Introduction

This Appendix sets out the Reserve Bank's assessment of how well ASX Clear and ASX Clear (Futures) have complied with the CCP Standards, and how well ASX Settlement and Austraclear have complied with the SSF Standards during the year to 30 June 2017.⁴⁴ In setting out its assessment, the Bank has applied the rating system used in CPMI and IOSCO's *Principles for Financial Market Infrastructures: Disclosure Framework and Assessment Methodology*.⁴⁵ Under this framework, the Bank has assessed each of the ASX CS facilities' observance of the requirements of each of the applicable FSS as being:

- *Observed* – Any identified gaps and shortcomings are not issues of concern and are minor, manageable and of a nature that the facility could consider taking them up in the normal course of its business.
- *Broadly observed* – The assessment has identified one or more issues of concern that the facility should address and follow up on in a defined timeline.
- *Partly observed* – The assessment has identified one or more issues of concern that could become serious if not addressed promptly. The facility should accord a high priority to addressing these issues.
- *Not observed* – The assessment has identified one or more serious issues of concern that warrant immediate action. Therefore, the facility should accord the highest priority to addressing these issues.
- *Not applicable* – The standard does not apply to the type of facility being assessed because of the particular legal, institutional, structural or other characteristics of the facility.

Section 821A(aa) of the Corporations Act requires that a CS facility licensee, to the extent reasonably practicable to do so, comply with the FSS and do all other things necessary to reduce systemic risk. In assessing how well a CS facility complies with a CCP or SSF standard, the Bank has assessed how well the facility complies with the headline standard and each of the 'sub-standards' listed under the headline standard. A single overall rating is applied to each CCP or SSF Standard, reflecting this assessment.

Where a facility has been assessed to *broadly observe* a CCP or SSF Standard, the Bank will have sought evidence that a plan is in place to address the identified issue of concern within a clear, defined and reasonable time frame, and that it would not be reasonably practicable for the facility to

44 The full text of the detailed assessments of each of these CS facilities is available at <<https://www.rba.gov.au/payments-and-infrastructure/financial-market-infrastructure/clearing-and-settlement-facilities/assessments/2016-2017/index.html>>.

45 Available at <<http://www.bis.org/cpmi/publ/d106.htm>>.

take such actions immediately in order to fully observe the standard. This Appendix includes recommendations that identify the steps required by ASX to address the relevant issues of concern and fully observe the applicable CCP or SSF Standard.

The Bank's ratings of each of the CS facilities against relevant FSS are supplemented by detailed information under each sub-standard that is relevant to the Bank's assessment. The Bank gathered this information through its regular liaison with ASX staff, the supply of regular data and reports by ASX, and a series of specific information requests and meetings with ASX during and immediately following the Assessment period to gather information relevant to assessing compliance with the FSS. Arrangements for regular liaison and the supply of data and reports by ASX are described in further detail under the detailed assessments of CCP Standard 21 and SSF Standard 19.

Supplementary interpretation of CCP Standards

In assessing how well ASX Clear and ASX Clear (Futures) have observed certain sub-standards of the CCP Standards, the Bank has applied the supplementary interpretation of these sub-standards issued by way of an exchange of letters with ASX in October 2014.⁴⁶ This supplementary interpretation supersedes the Bank's previous supplementary interpretation of the CCP Standards issued in August 2013. The supplementary interpretation of the CCP Standards applies to any domestically licensed derivatives CCP that provides services to participants that are either established in the EU or subject to EU bank capital regulations, and affects CCP Standards 2.6, 4.2, 4.4, 6.3, 7.3, 13.2, 13.3, 15.4 and 21.

⁴⁶ This letter is available at <<https://www.rba.gov.au/payments-and-infrastructure/financial-market-infrastructure/clearing-and-settlement-facilities/pdf/supplementary-guidance-domestic-derivatives-ccps.pdf>>.