From Laggard to Leader: *Why the capabilities that power Australia's Clearing & Settlement services are falling behind global leaders, and how we can get back to the front of the pack*

Final report – September 2023

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Table of contents

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This document is intended for general informational purposes only. The analysis in this report was commissioned by FinClear and prepared by Mandala.

Mandala is a research firm with offices in Melbourne, Canberra and Sydney. Mandala specialises in combining cutting-edge data and advanced analytical techniques to generate new insights and fresh perspectives on the challenges facing businesses and government.

This study examines the opportunity for Australia to return to the global frontier by modernising our financial markets

- This report benchmarks the capabilities and performance of financial markets infrastructure, specifically in Clearing and Settlement services, across leading global markets. Global markets examined in this report include, but are not limited to, the United States (US), Canada, European Union (EU), Hong Kong, Switzerland, Singapore, United Kingdom (UK) and New Zealand.
- This report acknowledges that the Clearing House Electronic Subregister System (CHESS) introduced and maintained by the Australian Securities Exchange (ASX) currently provides internationally competitive service levels. However, the technology which underpins CHESS has become outdated, limiting Australia's ability to continue to improve the efficiency, cost, risk management, and functionality of post-trade processes.
- While global peers are moving to adopt newer technologies, Australia's singular reliance on CHESS means it is currently constrained in its capacity to integrate emerging technologies into post-trade processes, limiting the potential to introduce real-time transaction settlement while allowing for more flexible and scalable infrastructure. This report considers the opportunity for Australia to return to the global frontier by enabling the adoption of more innovative and efficient technologies, including distributed ledger technologies (DLT), in Clearing and Settlement services.

Executive summary

Australia is falling behind global leaders in financial market capabilities, and urgent action is required to claim our position at the front of the pack

In the early 2000s, Australia was at the forefront of global financial markets capabilities. The stock exchange had adopted electronic trade execution, clearing and settlement ahead of many other global markets. Sydney was ranked 7th on the Global Financial Centres Index (GFCI) as of 2007.

However, Australia's financial market infrastructure and related regulatory architecture has failed to keep pace with global changes, specifically as new innovations such as distributed ledger technologies (DLT) emerged. This is starkest in Clearing and Settlement (C&S) where the Clearing House Electronic Subregister System (CHESS) was world leading when introduced in 1994 but its underlying technology is now outdated, limiting Australia's ability to continue to improve the service levels and performance of post-trade services. Sydney is now ranked 13th, behind cities in the US, Europe and Asia, while Melbourne had fallen from 18th in 2007 to 31st in 2022.

In 2015, the Council of Financial Regulators (CFR) recommended reforms to Australia's C&S markets to increase competition aimed at driving innovative improvements in service and cost. However, relatively little has changed since. Over the period 2016-2022, the Australia Securities Exchange (ASX) announced and then failed to implement a DLT-based solution to replace the existing CHESS system, leaving Australia behind global leaders.

There is an urgent need to overcome the challenges posed by the monopoly that ASX currently holds over key aspects of the C&S of listed securities in Australia. In December 2022, Treasury proposed new legislation to address these issues and introduce responsible competition in C&S markets. This aims to boost competition, improve stability, reduce risks and lower costs, in turn fostering innovation and delivering benefits to the broader financial ecosystem.

Modernising Clearing & Settlement services and infrastructure has been beneficial for financial markets overseas

C&S services, currently provided exclusively by the ASX for listed securities, enables the exchange of financial assets between parties. They are critical to the successful operation of Australia's financial markets, minimising counterparty risk, and providing efficiency and stability for participants.

Introducing responsible competition in global C&S markets has led to three key benefits: (1) enhanced innovation; (2) increased efficiency; and (3) lower costs for participants.

Competition has facilitated new technological innovations, such as DLT and atomic settlement, which are changing the way in which C&S services are delivered. For example, DLT and atomic settlement can eliminate the need for settlement, delivering capital efficiency and reducing risks.

Innovation in global markets has also pushed markets to shorter settlement cycles. European markets moved to T+2 settlement cycles in 2014, while other major financial markets are now considering a T+1 cycle.

Globally, C&S fees have fallen from greater competition and innovation, with fee reductions of up to 80 per cent.

Delivering modern, competitive Clearing & Settlement services requires responsible regulatory reform to deliver for investors, consumers and businesses

New technological innovations are requiring regulators to reconsider the traditional definition of C&S. Globally, these new innovations are changing the nature of C&S, the types of assets being cleared, and the market participants. These changes can have positive outcomes for investors, consumers and businesses.

There are three main challenges being addressed through technological advancement and regulatory innovations: (1) lengthy settlement times; (2) manual processes; and (3) bilateral clearing of risky instruments.

However, Australia's regulatory approaches have not been updated to enable use of new technologies to overcome these challenges, and require reform to support a modern C&S market that spurs innovation and delivers broad benefits.

Australia can be a leader in financial market innovation and technology in a way that is both responsible and beneficial

Government and industry must work together to design a modernised regulatory framework that delivers reliable, stable, efficient and secure financial markets.

Adopting a phased, risk-calibrated approach to introduce competition in C&S services will enable all relevant stakeholders to maintain confidence in the reliability, stability and security of Australia's financial markets, while allowing Australia to reclaim its former position at the global frontier of financial markets infrastructure.

There are three key phases to returning Australia to the global frontier of financial markets:

1. Grant regulatory relief for new entrants in C&S markets.
2. Enable interoperability amongst C&S systems.
3. Evolve the market structure to ensure responsible competition in C&S markets.

1 **Australia is falling behind global leaders in financial market capabilities, and urgent action is required to claim our position at the front of the pack**

2 Modernising Clearing & Settlement services and infrastructure has been beneficial for financial markets overseas

3 Delivering modern, competitive Clearing & Settlement services requires responsible regulatory reform to deliver for investors, consumers and businesses

4 Australia can be a leader in financial market innovation and technology in a way that is both responsible and beneficial

Appendix

Australia was at the forefront of financial markets but has failed to keep pace with global developments

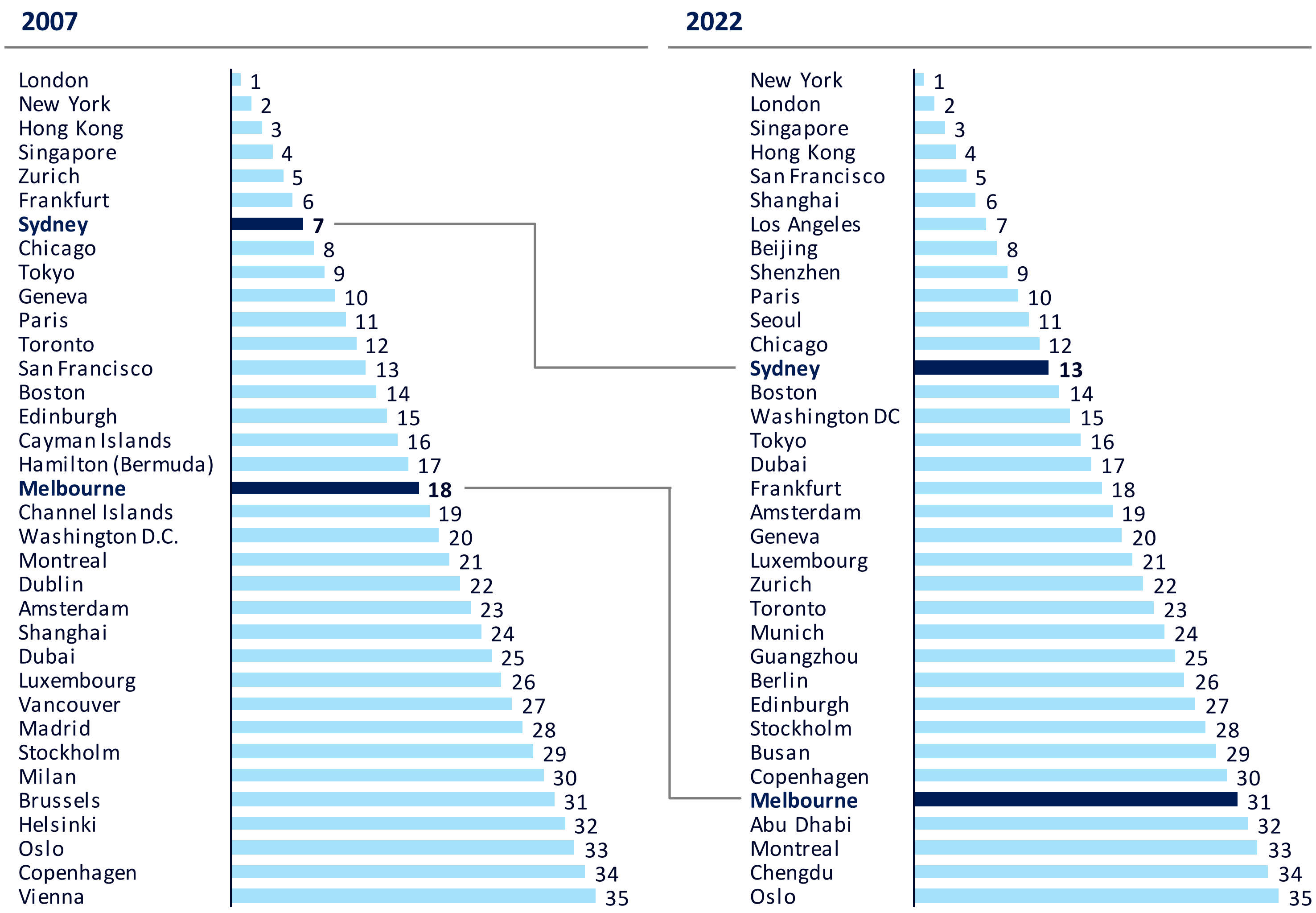
For more than two decades, Australia was at the forefront of global financial markets capabilities. The Australian Securities Exchange (ASX) had adopted electronic trade execution ahead of many other global markets. CHESS was world-leading for much of its existence since it was first introduced during the 1990s.

Australia's leading position was recognised in global rankings of financial centres such as the Global Financial Centres Index (GFCI). The GFCI ranks over 100 financial centres based on factors such as business environment, human capital, infrastructure, financial sector development and reputation. In 2007 the GCFI ranked Sydney 7th in the world.

However, over time, Australia's relative strength as a financial centre overall has declined. By 2022 Sydney's ranking had declined to 13th in the world, while Melbourne had fallen from 18th in 2007 to 31st in 2022.

Exhibit 1: Australia's ranking on the Global Financial Centres Index

Index ranking, 2007 versus 2022



Source: Mike Wardle and Professor Michael Mainelli (2023) *The Global Financial Centres Index 33*; Michael Mainelli and Mark Yeandle (2007) *The Global Financial Centres Index 1*; Global Financial Centres Index 2008 to 2022 (accessed here).

In Clearing & Settlement services Australia was world-leading but is now at risk of falling behind

ASX was one of the first major exchanges in the world to implement a fully electronic clearing and settlement (C&S) system (via introduction of CHESS in the 1990s), delivering reduced cost while increasing efficiency and accuracy. CHESS replaced a system of paper-based share certificates and manual settlement of executed trades.

Leading global markets have since caught up to and begun to move past Australia. This has been particularly evident over the last decade as North American and European markets introduced new automation technology.

More recently, global peers have been moving further ahead of Australia by leveraging distributed ledger technologies (DLT). The use of DLT, particularly tokenised assets and atomic settlement, is now changing the very definition of clearing and settlement.

Capturing the opportunities presented by new C&S capabilities can help to bring Australia back to the global frontier of financial markets capabilities while delivering significant benefits via improvements in efficiency, stability and cost, as well as spurring ongoing innovation in the broader financial markets technology ecosystem.

Exhibit 2: Evolution of the global Clearing and Settlement industry

1973
The Depository Trust Company (DTC) is founded to provide central depository services for securities marking a shift away from physical stock certificates towards electronic book-entry securities

1987
Society for Worldwide Interbank Financial Telecommunication (SWIFT) extends messaging services to the securities market

1994
CHESS is introduced by the Australian Securities Exchange (ASX). CHESS replaces the previous paper-based system of share certificates and enables electronic settlement of trades

2002
Continuous Linked Settlement Bank (CLS Bank) starts operations providing a global multicurrency cash settlement system which helps reduce settlement risk arising in foreign exchange transactions

2011
DTCC launches Global OTC derivatives repository to increase transparency and reduce risk

2015
Launch of TARGET2-Securities (T2S), a single platform on which securities and cash can be transferred between investors across Europe, using harmonised rules and practices

2020
LedgerX is granted regulatory exemption to offer physically settled bitcoin futures without having to register as a derivatives clearing organisation

2021
SIX Digital Exchange (SDX) is launched in 2021 offering tokenised equity and fixed income products

2022
DTCC's project ION processes up to 160,000 transactions per day leveraging DLT

Source: DTCC (2022) *DTCC's project ion platform now live in parallel production environment, processing over 100,000 transactions per day on DLT*; Company websites. SIX (2021) *SIX Launches its SIX Digital Exchange by Successfully Issuing the World's First Digital Bond in a Fully Regulated Environment*; CFTC (2020) *CFTC Approves LedgerX, LLC to Clear Fully-Collateralized Futures and Options on Futures*; European Central Bank (2015) *TARGET2-Securities successfully launched today*; The Global Treasurer (2001) *CLS Bank International Settlement Service to Start in 2002*; Business Wire (2011) *DTCC Launches Global OTC Interest Rate Trade Repository*; Mandala analysis.

There is urgent need for reform in Australia's C&S market to enable responsible competition and innovation

Motivated by the emerging limitations of the existing CHESS system as well as the potential of new technologies, in 2016 the ASX initiated a program aiming to use DLT-based solutions to replace CHESS. Regrettably, the ASX announced the failure of this project in late 2022. This setback has added urgency to the need to reform the C&S market in Australia.

Introducing the right policy settings is critical to facilitate responsible competition and spur innovation to overcome challenges with the monopoly that ASX currently holds over key aspects of the C&S of listed securities in Australia. Recognising this, the Council of Financial Regulators (CFR) made recommendations in 2015 to introduce responsible competition into the C&S market.

Recently, the Commonwealth Treasury proposed new legislation to address these issues and introduce responsible competition into the C&S market. This legislation aims to boost competition, improve stability, reduce risks and lower costs, in turn fostering innovation and delivering benefits to the broader financial ecosystem.

Exhibit 3: Key components to reforming Australia's Clearing and Settlement market and to help to bring Australia back to the global frontier of financial markets capabilities

Introducing responsible competition

- Introducing responsible competition to Australia's C&S markets is a key enabling action to address challenges with the current situation.
- Responsible competition will foster innovation leading to improved services and lower costs to market participants as well as broader economic benefits to Australia.

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Bespoke regulatory approach

- Establishing the right policy setting and regulatory frameworks for Australia's C&S markets will be critical to deliver benefits for investors, consumers and businesses.
- This needs to be carefully crafted considering the nature of technological innovations and Australia's objectives in pursuing reform in this area.

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Agreed roadmap to the global frontier

- Industry and Government need to work closely to identify and align on a clear path to reforming Australia's C&S markets.
- Establishing the right path forward can help to propel Australia back to the global frontier of financial markets, deliver significant benefits, and maintain system stability.

Source: Commonwealth of Australia (2023) *Competition in the provision of clearing and settlement services*; Council of Financial Regulators (2015) *Review of Competition in Clearing Australian Cash Equities*; Council of Financial Regulators (2012) *Competition in Clearing Australian Cash Equities*; Mandala analysis.

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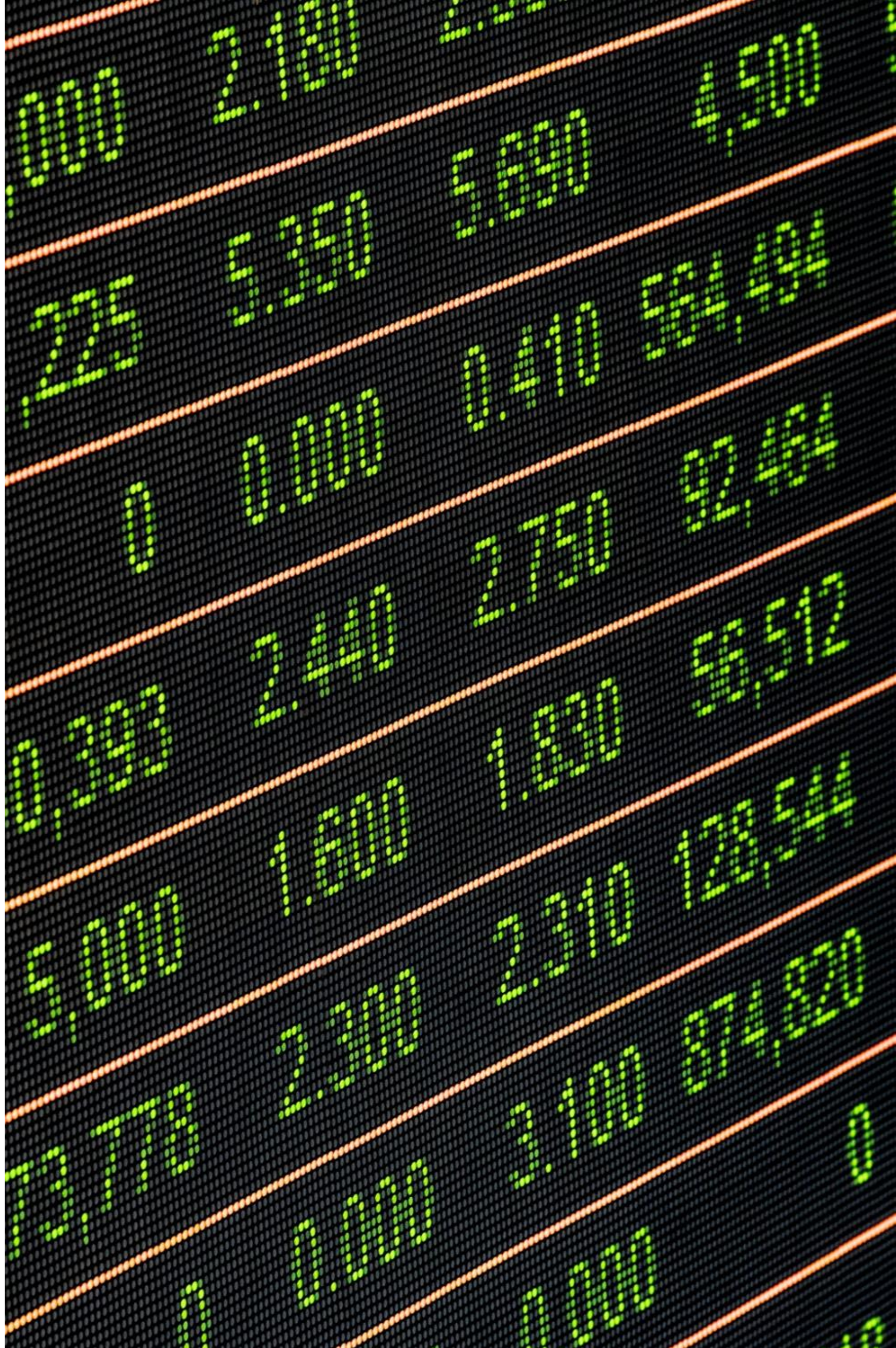
Appendix



C&S services are critical to financial markets and help reduce risk and improve efficiency

Clearing and Settlement (C&S) services enable the process of exchanging financial assets between parties. The Clearing stage typically involves a reconciliation and validation of trades between buyers and sellers in financial markets. Once this is complete, Settlement occurs where the exchange of financial instruments and funds occurs between the parties.

In Australia these services are currently provided by ASX (via its subsidiaries ASX Clear and ASX Settlement) and occur through various steps that rely heavily on CHESS.

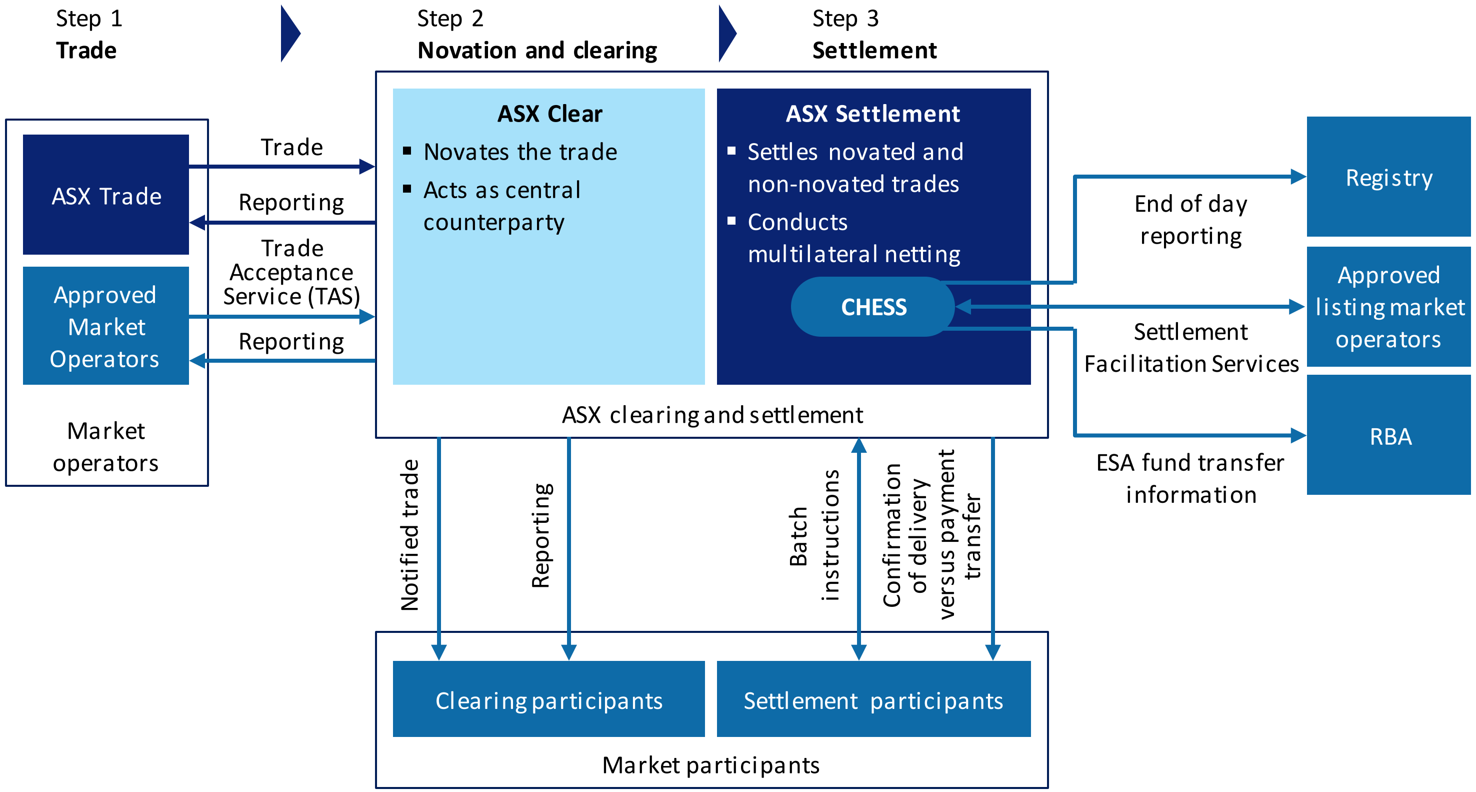
Although largely invisible to most investors, C&S services are critical to the successful operation of Australia's financial markets. C&S services support a robust financial market by minimising counterparty risk, providing transaction efficiency, as well as providing stability and certainty for market participants.

Effective and efficient C&S services deliver benefits to consumers (particularly via their superannuation portfolios), investors and businesses.

Exhibit 4: Clearing and Settlement in Australia takes place over three key phases, involving market operators, market participants, ASX and regulators

Definition

- **Clearing** is the process of validating and finalising trades executed, where a central counterparty acts as an intermediary to mitigate counterparty risk.
- **Settlement** is the transfer of ownership of securities and the exchange of payment between the buyer and seller, which occurs after the clearing process.



Source: ASX (2023) *Cash market clearing: ASX Clear provides an efficient, secure clearing service for shares, warrants and ETFs traded on ASX Trade or through an Approved Market Operator.*

Global experience indicates that competition in C&S can unlock three key benefits

Evidence from leading global financial markets has demonstrated that the introduction of competition in C&S services has enhanced innovation in financial markets technology, improved efficiency and delivered lower costs.

Leading global markets have moved away from a single monopolistic provider, which has facilitated enhanced innovations. Global markets are now experimenting with innovations such as tokenised assets and DLT based solutions. For example, the European Union is encouraging new market entrants to test DLT based solutions by granting regulatory relief.

Competition has also led to increased efficiency as global markets have reduced their settlement cycles. Most leading markets are now operating on a T+2 settlement cycle, with many considering a considering a move T+1, such as the US, Canada and the European Union.

The introduction of competition in C&S services can deliver cost savings to consumers (via their superannuation fund accounts), businesses (via reduced costs of capital) and investors (super funds and other institutional investors). C&S fees in global markets have fallen by 16% to 80% as greater competition and innovation is introduced.

Exhibit 5: Benefits of competition and innovation in leading global Clearing and Settlement markets

A Enhanced innovation	Introduced DLT based settlement processing Showed central bank cash and assets could be tokenised Provided regulatory relief to pilot DLT solutions	Integrated DLT-based systems for settlement of securities Launched a settlement platform based on DAML Using DLT based collateral management, and developing DLT sandboxes
B Increased efficiency[1]	US and CA T+3→ T+2 in 2017; T+2 → T+1 by May 2024 EU T+3 → T+2 in 2024, currently considering a transition to T+1	T+3 → T+2 in 2018 Currently T+2 HK, and T+1 for China UK moved to T+2 in 2014 and currently considering T+1
C Lower costs	Reduced fees for both clearing and settlement in 2023 Reduced prices ~28% since 2011 to 2018 Reduced clearing fees by ~25% in 2022	Settlement fees for futures reduced from $10 to $2 per contract Fixed costs were removed from pricing structure in 2018 Clearing fees reduced from €0.055 to €0.04 in 2022

1 Increased efficiency is based on settlement time cycles.
Note: See Appendix C for more details.
Source: Mandala analysis.

Innovations such as DLT can eliminate the need for settlement to deliver capital efficiency and reduce risks

Global markets have been exploring innovative solutions in clearing and settlement markets, specifically digital ledger technologies (DLT). The US Depository Trust & Clearing Corporation (DTCC) introduced DLT based settlements for a subsection of the market, processing up to 160,000 transactions per day. Canada piloted the tokenisation of central bank cash and assets to allow for instant settlement on DLT. Other markets such as the EU, UK and Singapore are also encouraging players to innovate with DLT by providing regulatory relief to support new offerings.

Currently, Australia has a multi-day clearing and settlement cycle (T+2) which creates risks for a counterparty to an executed trade to default on its settlement obligations. To mitigate this risk, ASX Clear imposes a collateral requirement onto entities responsible for the clearing of market transactions. Collateral requirements are typically higher for companies without a long trading history. For example, an ASX10 'blue chip' company may only face a 2.5% collateral requirement versus up to a 42% collateral requirement for a fast-growing tech company.

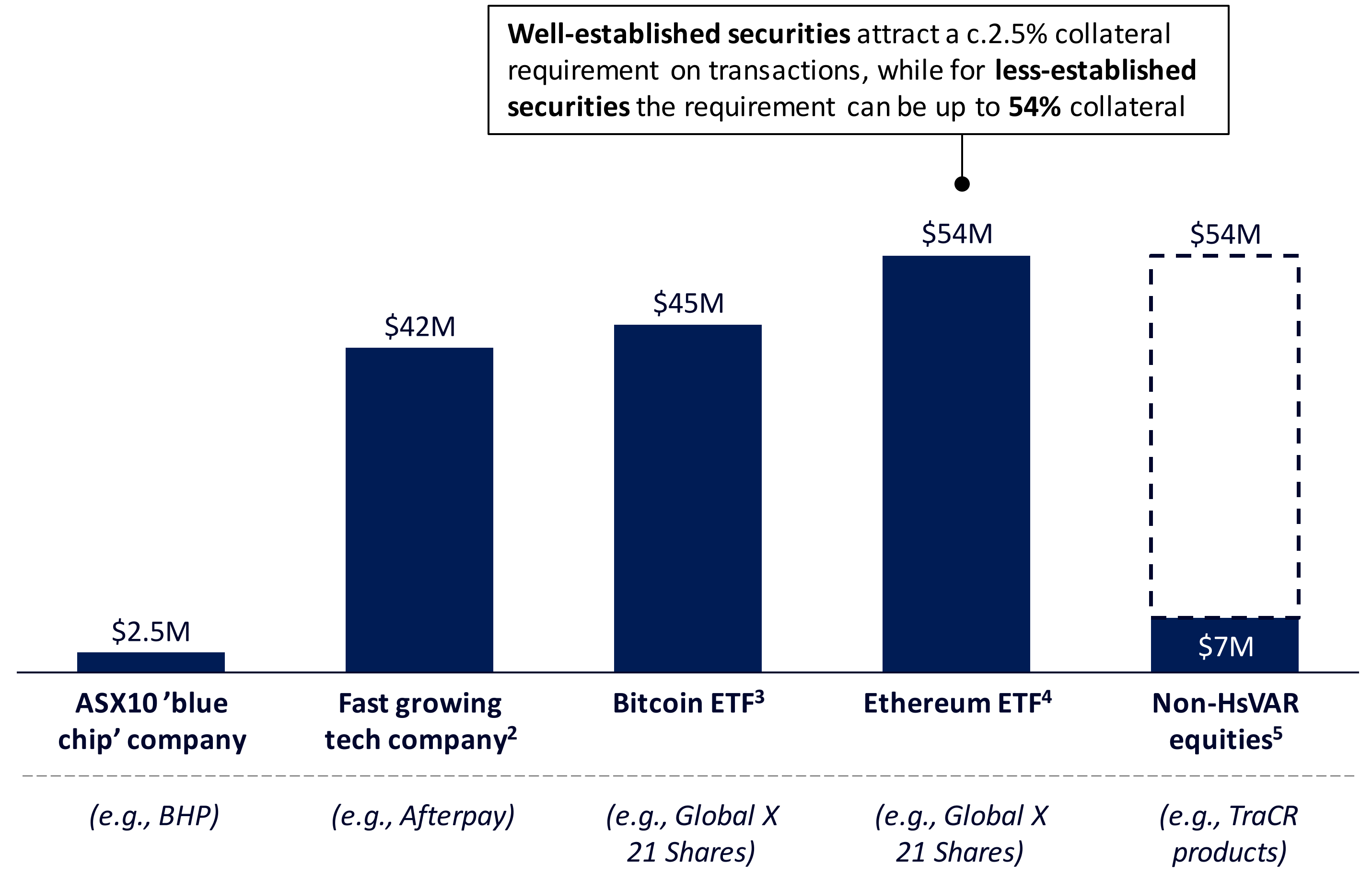
Leveraging DLT, particularly atomic settlement,[1] can eliminate the need for collateral through instantaneous settlements. This eliminates the risk of defaults and reduces the cost of trading less established securities (via reducing the collateral required), increasing investor interest in these companies.

A Enhanced innovation

ILLUSTRATIVE

Exhibit 6: Example of Cash Market Margining (CMM) requirements with ASX Clear

$AU millions (based on net position of $100M), various years



1 See appendix for more details. 2 Capital requirements for Afterpay prior to its acquisition by Block (then known as Square). The current capital requirements for Afterpay are 24% as of November 2021. 3 Capital requirements were 40% in 2022. 4 Capital requirements were 50% in 2023. 5 Lower-end estimates of $7M is based on TraCR products, and upper-end estimates of $54M are based on Cosmos Purpose Ethereum Access ETF (which delisted in November 2022).
Source: FinClear data; Mandala analysis.

Global markets have reduced settlement times over the past decade, with the US leading the move to T+1

Settlement time is the period taken to settle a securities trade after execution. Settlement times ('T+X' where 'X' has typically been several business days) have been reduced as advances in technology and infrastructure have emerged. Shorter settlement cycles have been critical in enabling strong financial markets. Specifically, shorter cycles reduce risk by shortening the time that counterparties to a trade are exposed to credit risk. Shorter settlement times also reduce costs and increase liquidity by reducing the time collateral is required to be posted by clearing participants.

Over the past decade, global markets have shortened settlement times from T+3 to T+2, with some markets now achieving cycles of T+1. The EU, UK and Switzerland started the transition to T+2 in 2014. This was introduced as part of a European harmonisation of post-trade arrangements aimed at improving efficiency and removing barriers between borders. Hong Kong moved to T+2 at the same time. In 2015, China moved to a T+1 settlement cycle for A shares.[1] Australia and New Zealand moved to a T+2 settlement cycle in 2016. By 2017, the US and Canadian markets were on a T+2 cycle, and they are about to transition to T+1 by May 2024. India completed a move to T+1 in February 2023.

As of May 2023, the ASX has now started to consider a move to T+1, however its implementation is yet to be finalised.

B Increased efficiency

NON-EXHAUSTIVE

Exhibit 7: EU, UK, SW and HK led the move to T+2; CN and IN have achieved T+1; US and CAN are targeting T+1 by May 2024

October 2014

The EU, UK and Switzerland moved from T+3 to T+2 as part of a European harmonisation of post-trade aimed at improving efficiency and removing barriers between borders

Hong Kong moved to T+2 due to the global trend to standardise regional and global settlement practices

January 2015

China moved to a T+1 settlement cycle in 2015 for A Shares. This includes a T+0 settlement time for securities, and T+1 settlement time for cash.

March 2016

Australia moved to T+2 settlement for cash equities.

New Zealand moved to a T+2 settlement cycle to align with AU markets.

December 2018

Singapore shortened its settlement cycle from T+3 to T+2 to harmonise with other global markets.

February 2023

India became the first market to move to a complete T+1 settlement cycle after completing a phased approach which began in February 2022

May 2024

The US and Canada moved to T+2 in 2017.

The US and Canada are now moving towards T+1 settlement by May 2024. This was in response to the GameStop incident in 2021 and other collective market activity which brought challenges in the market structure and retail investing to the spotlight.

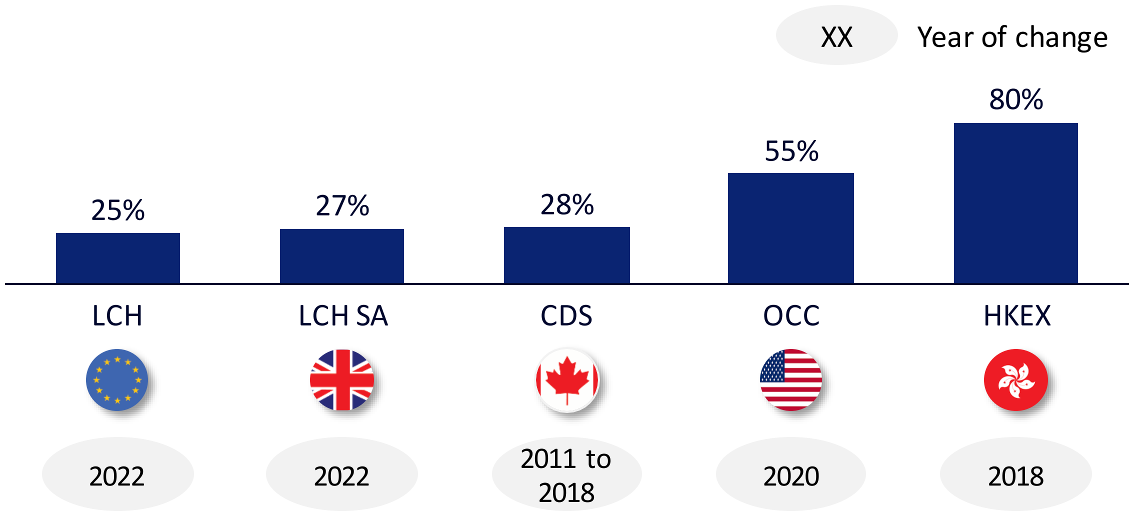
Near-future developments

1 China A-shares are the shares of companies that originated and incorporated in China. These shares are traded on stock exchanges based in China.
Note: See Appendix C for more details.
Source: Mandala analysis.

Competition and innovation has reduced C&S fees in global markets by up to 80%

Exhibit 8: Examples of cost reduction achieved in Clearing and Settlement fees

% of trading fees, various years



The introduction of responsible competition and innovation in major global markets has significantly reduced clearing and settlement fees. Reductions range up to 80 per cent. The Hong Kong Exchange (HKEX) implemented substantial reductions in settlement fees for futures contracts in 2018. Previously set at $10 per contract, these fees were reduced by 80 per cent to $2. Furthermore, the HKEX introduced a tiered trading fee structure to reduce fees significantly.[1]

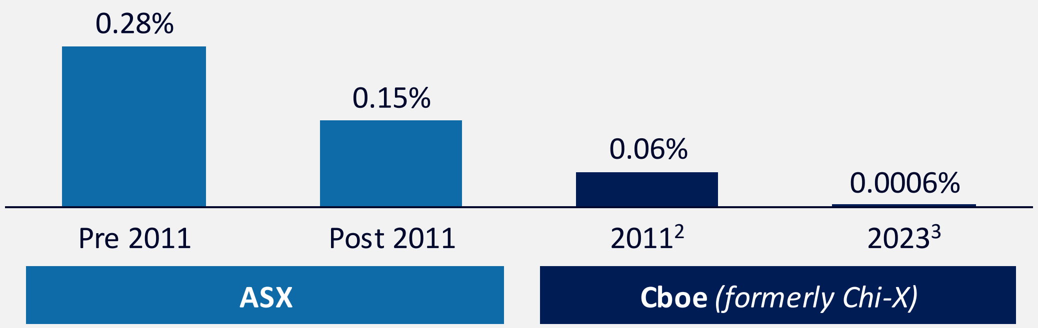
1 HKEX (2018) *HKEX to cut fees and make other changes in its stock futures market in early July.*
Source: DTCC (2020) DTCC identifies seven areas of broker cost savings as a result of greater post-trade automation; Council of Financial Regulators (2012) Competition in Clearing Australian Cash Equities; HKEX (2018) HKEX to cut fees and make other changes in its stock futures market in early July; Mandala analysis.

Competition in trading in Australia has lowered fees, indicating the potential for C&S

Exhibit 9: Australian trading fees in equities trading

% of trading fees, 2011-2023

ASX reduced fees to 0.15% just before Cboe (formerly Chi-X) entered the market. ASX has since maintained the same fee, while Cboe has lowered fees.



Previous research from the CFR suggested trading fees could fall by as much as 30 per cent from increased competition in C&S.[4] Recent estimates from the DTCC also suggested further automation and innovation could reduce post-trading fees by 20 per cent to 25 per cent by eliminating redundancies and manual processes while also mitigating operational risks.

2 Brokers selling were charged 0.06% while those buying were paying 0.12%. 3 Brokers selling are charged 0.0006% while brokers buying are charged 0.0013%. 4 Council of Financial Regulators (2012) *Competition in Clearing Australian Cash Equities*.
Source: ASX (2022) *ASX Equity Derivatives*; The Conversation (2011) *Chi-X launch - what does it mean for the Australian market?*; Interactive Brokers (2023) *Cboe Australia Exchange Fees*; Mandala analysis.

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Appendix

Technological innovation is reimagining how C&S services operate

Technological innovation is reshaping the landscape of C&S services. This transformation has been driven by three key advances in technology: *automation, cloud computing, and digital ledger technologies (DLT)*. While Australia has made strides in adopting automation, it continues to lag global leaders, particularly in adopting DLT-based solutions.

Automation has significantly improved the efficiency of C&S operations. *Straight Through Processing (STP)* has eliminated manual processes by enabling end-to-end electronic transaction processing, saving time and resources. This has been complemented by *Netting*, which reduces costs and risk and improves efficiency by offsetting the value of multiple transactions between counterparties. *ISO 20022* messaging has enabled the standardised exchange of information.

Cloud Computing has further advanced efficiencies in C&S through solutions such as APIs that enable interoperability and information sharing, real-time monitoring and risk management, and data analytics and reporting. These innovations have enabled access to timely information and increased transparency of trade flows.

The C&S markets have been most disrupted by *DLT*-based solutions. Distributed ledgers have provided a decentralised platform for all parties to access and share information, while also enabling instantaneous settlement through innovations such as atomic settlement and tokenised assets.

Exhibit 10: Australia has adopted aspects of automation but trails global leaders on other innovations especially Distributed Ledger Technologies

1. Automation

- **Straight Through Processing (STP)** enables end-to-end transaction processing without manual intervention.
- **Netting** offsets the value of multiple transactions between counterparties.
- **ISO 20022** enables standardised electronic exchange of information between financial institutions, corporations and other users.

Australia | Global peers

2. Cloud Computing

- **APIs** allow different systems to communicate and share information in real-time making.
- **Real-time monitoring and risk management** provides visibility into trade flows, positions, and settlement status.
- **Data analytics and reporting** via scalable and flexible computing resources improve efficiency.

Australia | Global peers

3. Distributed Ledger Technologies

- **Distributed ledgers** streamline C&S by providing a platform for all parties to access and share information.
- **Atomic settlement** enables instantaneous settlement of assets.
- **Tokenised assets** streamline the settlement process by reducing the need for intermediaries such as custodians or clearing houses.

Australia[1] | Global peers

Degree of adoption Low — High

1 As of May 2023, FCX is the only provider of C&S-related services in Australia using DLT based solutions.
Source: Mandala analysis.

These developments have implications for how we think about C&S

Technological advancements and their potential applications in financial markets require regulators to re-evaluate existing regulatory frameworks for C&S markets.

New technology, such as DLT-based solutions, are redefining the end-to-end C&S process. It is enabling the transition from centralised C&S systems dominated by CCPs to decentralised systems that enable instantaneous peer-to-peer settlement. This shift brings significant benefits in the form of reduced cost and risk, and increased liquidity and transparency.

Furthermore, technological innovation is changing the type of assets that are traded on financial markets. Traditional securities, such as stocks and bonds, continue to make up the majority of financial instruments traded, but new digital assets are emerging from new technology, such as tokens, cryptocurrencies, and virtual assets.

New technology offers the potential to open Australia's financial markets to new types of participants. This includes a broader range of retail investors and consumers, as well as new market entrants providing new services (e.g., peer-to-peer payment platform solutions).

Exhibit 11: Clearing and Settlement markets need to be considered in the context of new technologies that are reducing risk and costs and increasing competition and innovation

	From…	To…	Implication
Clearing and settlement process	• Centralised clearing and settlement systems • Traditional intermediaries (e.g., custodians, brokers) • Legacy systems • Lengthy settlement time	• Decentralised clearing and settlement systems • Peer-to-peer settlement mechanisms • DLT-based solutions • Atomic settlement	• Reduced settlement risk • Reduced settlement times • Reduced/eliminated collateral • Reduced reliance on traditional intermediaries • Improved transparency
Type of assets being cleared and settled	• Traditional securities (e.g., stocks, bonds) • Physical assets	• New digital assets (e.g., cryptocurrencies, tokens) • Virtual assets (e.g., digital art)	• Increased innovation due to creation of new asset classes • Increased trading volumes
Type of market participants involved in clearing and settlement	• Primarily institutional investors • Established financial institutions	• Broader range of retail investors and consumers • New entrants and disruptors (e.g., Decentralised finance protocols, peer-to-peer payment platforms)	• Increased competition and innovation • Increased market participation • Increased liquidity

Source: Mandala analysis.

In leading global markets, innovations are being enabled by regulatory reform

Regulatory reforms play a critical role in fostering innovation in and addressing potential challenges posed to C&S markets. This was evident in the adoption of central counterparty clearing houses (CCPs) in leading markets in prior years, as well as recent measures to reduce settlement cycles and provide regulatory relief to players experimenting with new innovations such as DLT based solutions.

CCPs were widely adopted following the 2008 Global Financial Crisis (GFC) and played a critical role in reducing counterparty risk and restoring market confidence. Recently, new technologies have emerged that overcome some of the challenges CCPs impose. A single clearing house is no longer considered essential in a growing number of markets.

Global markets have since focused on shortening settlement cycles for security trades to improve efficiency and reduce risk. Europe and Hong Kong led the movement of shortening settlement times from T+3 to T+2 in 2014, while Australia followed suit in 2016. India moved to a T+1 in February 2023; the US and Canada plan to move to T+1 by May 2024.

Global markets are increasingly providing regulatory relief to encourage market participants to innovate with emerging technologies. For example, the US, EU and Switzerland have leveraged sandboxes to test the use of DLT in C&S.

Exhibit 12: CCP has been adopted in most leading markets while new innovations are driven by settlement time reductions and regulatory relief measures

1. Central Counterparty Clearing houses (CCP)

- CCPs provide a centralised clearing service and became prominent in response to the 2008 financial crisis.
- At the time, CCPs offered cost benefits due to improved economies of scale achieved from then current technology.
- New technologies offer similar benefits of CCPs without the potential disadvantages (e.g., single point of failure).
- Jurisdictions around the world are experimenting with alternatives to CCPs to optimise benefits while maintaining stability and trust.

2. Settlement time reduction

- Shortening of the settlement cycle for securities trades reduces counterparty risk, improves efficiency, and increases liquidity in the financial markets.
- In 2014, Europe led the movement of shortening settlement time from T+3 to T+2; the U.S and Canada followed suit in 2017 and are now considering T+1.
- The change required market participants to adjust their internal systems and processes to accommodate new settlement cycles.

3. Regulatory relief

- Regulatory relief refers to measures taken to reduce the regulatory burden on entities that are introducing novel technologies and approaches to providing C&S services.
- Regulatory sandboxes are a common form of relief that allows innovative products to be tested in a controlled environment free of the usual regulatory requirements.
- Several countries are using regulatory sandboxes; e.g., the US, EU and Switzerland use regulatory sandboxes to test the use of DLT in C&S services.

Source: Mandala analysis.

Clearing and Settlement faces 3 major challenges which are being addressed through technological innovations and regulatory advancements

Technological innovation | Regulatory advancement

Exhibit 13: Challenge	Why is this a challenge?	What is being done to address it?
Lengthy settlement times	▪ **Increased Counterparty Risk**: Longer settlement times increase counterparty risk. During the settlement period, the seller (or the CCP) is exposed to the risk that the buyer may default on the transaction and the buyer (or the CCP) is exposed to the risk that the seller may not honour the transaction. ▪ **Increased Capital Requirements**: Lengthy settlement times require market participants to hold capital for an extended period, resulting in increased capital requirements.. This can be particularly challenging for smaller market participants who may not have sufficient resources ▪ **Increased Liquidity Risk**: Market participants need to make payments and/or provide collateral elsewhere during the settlement period, tying up liquidity that could be used for other purposes.	Technological innovation: ▪ Automation e.g., STP, Netting ▪ Cloud computing e.g., Real-time monitoring and risk management ▪ Blockchain e.g., distributed ledgers, atomic settlement Regulatory advancement: ▪ Settlement time reduction ▪ Regulatory relief
Manual processes	▪ **Increased Operational Risk**: Manual processes are more prone to errors, omissions, and delays. ▪ **Inefficiency**: Manual processes are often time-consuming and labor-intensive. This can lead to longer settlement times, higher costs, and lower throughput for market participants. ▪ **Lack of Scalability**: Manual processes may not be able to scale to accommodate increasing transaction volumes, which can limit the growth potential of market service providers. ▪ **Lack of Transparency**: Manual processes can be opaque, making it difficult for market participants to track the status of their transactions and identify potential issues.	Technological innovation: ▪ Automation e.g., STP, Netting, ISO 20022 ▪ Cloud computing e.g., APIs, Data analytics and reports ▪ Blockchain e.g., distributed ledgers, atomic settlement, tokenised assets Regulatory advancement: ▪ Regulatory relief
Bilateral clearing of risky instruments	▪ **Increased Counterparty Risk**: In the absence of a CCP each party to a transaction becomes directly exposed to the risk of default by the counterparty. Market participants must rely on one another's creditworthiness which can be difficult to assess, particularly in times of market stress. ▪ **Increased Complexity**: Without a CCP, market participants must negotiate and settle each transaction individually, which can result in increased complexity and operational risk. ▪ **Limited Netting**: CCPs allow for netting, which means that market participants can offset their exposures against each other, reducing the overall risk and capital requirements. Without a CCP, netting is limited, which can result in higher capital requirements for market participants.	Technological innovation: ▪ Automation e.g., Netting ▪ Cloud computing e.g., Real-time monitoring and risk management ▪ Blockchain e.g., distributed ledgers, atomic settlement Regulatory advancement: ▪ Central Counterparty Clearing Houses

Source: Mandala analysis.

These developments mean that Australia's regulatory approach is outmoded

Exhibit 14: Challenges posed by current regulatory approach in Australia

Regulatory framework for market operators	▪ **ASIC currently prescribes the use of CHESS** for settlement of equities in Australia under the Corporations Act 2001 and any alternative clearing and settlement system must be approved by ASIC, which **creates a bottleneck for new entrants to the market**. ▪ ASIC's framework requires market operators to maintain centralised control over clearing and settlement, which **conflicts with the decentralised nature of distributed ledger technology**.
Control over assets	▪ DLT solutions are **designed to enable disintermediation and peer-to-peer transactions**, which conflicts with the requirement for licensed financial institutions to maintain control of over client's assets. ▪ The **requirement for licensed financial institutions to maintain control over client's assets can create inefficiencies and delays** in the settlement process, which DLT-based systems are designed to address by enabling real-time settlement without intermediaries.
AML and CTF regulations	▪ The use of DLT-based systems for clearing and settlement may create challenges in meeting AML and CTF regulations related to the recording and reporting of transactions, as **DLT-based systems may not fit within existing regulatory frameworks and require new reporting and compliance mechanisms**.
Limited principles for use of DLT	▪ The lack of a specific regulatory framework **may create uncertainty for financial institutions looking to adopt DLT-based solutions for clearing and settlement purposes**, due to concerns over compliance and legal risks. ▪ The lack of a specific regulatory framework **may limit the ability of DLT-based clearing and settlement systems to integrate with existing financial systems and infrastructure**, which can slow down adoption and reduce the potential benefits of the system. ▪ For instance, **Switzerland enacted the Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology (Swiss DLT bill) in 2021** which enabled the country to close the many gaps in its legal framework and create more legal assurance for crypto assets and custodians. The Swiss DLT bill: o Defines what constitutes an electronic record and introduces a regulatory framework for its proper use o Allows de jure for the creation of DLT based digital assets and describes the requirements to use DLT o Improves conditions for companies using DLT and provides more legal certainty in the event of bankruptcy

Source: ASX (2023) *ASX regulatory framework*; gtlaw.com.au; Alexandra Overgaag (2023) *An overview of the Swiss Distributed Ledger Technology (DLT) Act*; ASX; Mandala analysis.

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Appendix

Enabling competition via a phased approach will deliver lower costs for market participants, increased choice and innovation, and reduced risk of systemic failure

Exhibit 15: Australia can move back to the global frontier of financial markets through a phased approach

A — Grant considered regulatory relief for new entrants

- This can spur greater competition in the market, as new entrants are more easily able to offer innovative new products and services.
- Regulatory relief involves streamlining regulations, reducing capital requirements, and exempting entrants from certain regulatory obligations.

B — Enable interoperability amongst C&S providers

- Interoperability gives market participants choice between different operators thereby promoting competition and innovation.
- Interoperability amongst clearing and settlement systems involves establishing common technical standards and protocols.

C — Evolve market rules to ensure responsible competition

- The objective here is to enable increased competition and innovation while maintaining market stability and confidence.
- This entails creating an environment that allows new participants to enter the market to compete responsibly with established players.

Reforming the regulation of the C&S market via a phased approach will enable the industry to capture the promise of new technologies and service innovations while preserving market stability and confidence

Source: Mandala analysis.

Regulatory relief can enable greater choice and innovation, as well as reduced costs and risks

Granting regulatory relief to new entrants in the C&S market can enable them to trial innovative new products and services, leading to improvements in service levels and the overall performance of Australia's C&S markets.

Regulatory relief can be provided in various forms, including exemptions from regulatory requirements for new market entrants, reduced capital requirements, or a streamlined regulatory processes.

In 2017, the US Commodity Futures Trading Commission (CFTC) granted regulatory relief to LedgerX. This relief enabled Ledger X to offer physically settled bitcoin futures contracts to retail clients without having to register as a derivatives clearing organisation. This facilitated greater choice and innovation in the market, while also reducing the cost of trading and settlement. This also isolated any risk of systemic failure by supporting new asset classes which are not directly linked to traditional financial assets.

***Note:** LedgerX operated successfully for more than six years prior to its acquisition by FTX in late 2021. Since then, it has continued to operate successfully and independently of FTX. LedgerX was acquired by Miami International Holdings in 2023.*

A Roadmap – Regulatory relief

Exhibit 16: Granting regulatory relief to LedgerX by the US Commodity Futures Trading Commission has enabled greater innovation and increased choice in the US markets

July 2017 — LedgerX was granted regulatory exemption to offer physically settled bitcoin futures contracts to retail clients without having to register as a derivatives clearing organisation.[1]

October 2017 — LedgerX launched its physically settled bitcoin futures contracts, becoming the first US-based platform and gaining significant attention from both retail and institutional investors.

June 2019 — LedgerX was approved as a designated contract market by the CFTC allowing it to operate as a regulated exchange.

Today — LedgerX continues to operate as a regulated exchange and clearinghouse for physically settled bitcoin futures and option contracts, with a focus on serving institutional investors.

Granting regulatory exemption to LedgerX had three benefits:

- Increased choice and innovation in the market.
- Reduced cost of trading and settlement as it allowed the use of a wider range of settlement mechanisms.
- Reduced risk of systemic failure by supporting new asset classes not directly linked to traditional financial assets.

Source: Aziz Abdel-Qader (2017) *LedgerX Receives CFTC Mandate as Bitcoin Derivatives Clearing Organization*; CFTC (2019) *CFTC Approves LedgerX LLC as a Designated Contract Market*; Reuters (2023) *FTX gets approval for LedgerX sale, asserts $3.9 billion Genesis claim*; FTX US (2021) *FTX.US Acquires LedgerX*; William Suberg (2019) *Bitcoin First as LedgerX Launches Physically-Settled Futures Product*; Mandala analysis.

Interoperability amongst players enables innovation leading to reduced costs and risk and improved efficiency

Interoperability amongst C&S providers has been a critical enabler of innovation in C&S services in global markets.

Interoperability allows multiple C&S systems to communicate and exchange information with each other, enabling different systems, protocols, and processes to facilitate the transfer, confirmation, and settlement of financial transactions for participants across multiple systems. Establishing common technical standards and protocols such as messaging protocols, APIs, and data formats are some of the key steps to achieving interoperability.

In 2009, European C&S markets established interoperability arrangements to enable increased efficiency for market participants. These arrangements have since been expanded to cover a wide range of products that now includes equities, interest rates and foreign exchange.

The implementation of interoperability arrangements in European markets has resulted in cost savings and improved liquidity via greater competition, and reduced system risk by increasing the resilience of clearing and settlement systems.

B Roadmap – Interoperability

Exhibit 17: European clearing and settlement markets have created interoperability arrangements

2009 – Six x-clear and LCH.Clearnet sign an agreement to allow members access to both clearing houses through a single connection for interest rate swaps (IRS).

2012 – The interoperability arrangement is expanded to cover a wider range of products, including equities, interest rates and foreign exchange.

2018 – Six x-clear and LCH.Clearnet sign an MOU to ensure continued access to each other's services in the event of a no-deal Brexit.

Today – The two clearing houses have been able to continue to clear derivatives contracts with each other without interruption, even after Brexit.

Enabling interoperability between Six x-clear and LCH.Clearnet delivered three main benefits:

- Reduced the need for market participants to hold duplicate margin for their trades, as well as the reducing the resources associated with reconciling trades, leading to an overall reduction in costs.
- Allowed participants to choose based on factors such as pricing, product offerings, and risk management capabilities. This also drove innovation and led to new and improved products and services.
- Reduced the risk of systemic failure by increasing the resilience of clearing houses and reduced the potential for contagion in the event of default.

Source: Six x-clear; LCH; Elliot Holley (2012) *SIX x-clear reaps the rewards of interoperability*; European Systemic Risk Board (2019) *CCP interoperability arrangements*; Globalcustodian (2010) *LCH.Clearnet and SIX x-clear Publish Interoperability Agreement*; thetradenews.com; Mandala analysis.

Evolving market rules requires close collaboration between government and industry

Evolving the rules and structure for Australia's C&S market requires close collaboration between government and the financial and technology sectors to ensure the benefits of increased competition are captured while market and system stability and confidence is maintained.

The Australian Government has taken encouraging steps in this direction, with a proposal that will allow regulators to take on greater responsibilities in approving market players and enabling increased competition.

In Switzerland, regulators have worked closely with industry to implement a new legislation that enabled the use of DLT based solutions. This framework came into force in 2021, after which SIX Digital Exchange (SDX) introduced innovative products for consumers, including but not limited to tokenised equity and fixed income products.

C Roadmap – Responsible competition

Exhibit 18: The passage of the DLT bill in Switzerland required close collaboration between the government and the financial and technology sectors

2017

A working group composed of representatives from government and the financial and technology sectors was tasked with developing a regulatory framework for DLT

2019

A series of public consultations was held on the proposed DLT bill to solicit feedback from the public and from industry groups, with feedback used to improve the bill

2021

New legal framework launched

- In February, ledger-based securities represented on a DLT-based platform became effective
- In August, the remaining provisions (notably regarding DLT trading facilities) took effect

Today

SIX Digital Exchange (SDX; launched 2021) now offers

- Tokenised equity and fixed income products
- New products and services e.g., carbon, art
- Web3-based crypto services

Evolving the market structure for Switzerland had multiple benefits:

- Increased innovation in the market leading to new products and services.
- Increased choice for market participants.
- Reduced costs due to the use of DLT based technologies.
- Reduced settlement risks as SDX leverages atomic settlement.

Source: Alexandra Overgaag (2023) *An overview of the Swiss Distributed Ledger Technology (DLT) Act*; Fintechnews Switzerland (2021) *A Look Into Switzerland's Distributed Ledger Technology Act*; Finance.Swiss (2023) *Transforming the markets with the SIX Digital Exchange SDX*; Antonina Olecka (2022) *Interview with Mathias Studach on SDX's achievements and future plans*; Mandala analysis.

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Appendix

DLT-based collateral management can improve flexibility, efficiency and risk management

Exhibit 19: Dimension	Status quo	DLT-based collateral management
Flexibility	▪ **Limited collateral options**, which can reduce flexibility for participants ▪ **Fixed margin requirements**, which may not reflect market conditions ▪ **Limited access to collateral for smaller participants**, which can reduce market liquidity and increase systemic risk	▪ **More diverse collateral options**, including non-traditional assets, increasing flexibility for participants ▪ **Customised margin requirements**, with smart contracts automatically adjusting requirements based on market conditions ▪ **Increased access to collateral for smaller participants**, improving market liquidity and reducing systemic risk
Efficiency	▪ **Reliant on manual processes and multiple intermediaries**, which can be time-consuming and costly ▪ **Limited real-time updates**, which can lead to delays in settlement times and decreased liquidity ▪ **Increased risk of errors and discrepancies**, which can result in delays and additional costs	▪ **Automated collateral management**, reducing the need for intermediaries and increasing efficiency ▪ **Real-time updates**, enabling faster processing and improved liquidity ▪ **Reduced risk of errors, discrepancies** and the need for manual reconciliation
Risk Management	▪ **Limited visibility into risk exposure**, which can increase the likelihood of defaults and losses	▪ **Improved risk management, with real time updates and immutable audit trails** helping participants better manage their risk exposure

*"The average **operational cost saving potential** of full-scale blockchain adoption across eight of the largest global investment banks could be in the range of **30% or more per institution" –** Accenture and Aon joint study*

Source: Accenture (2017) *Blockchain Technology Could Reduce Investment Banks' Infrastructure Costs by 30 Percent, According to Accenture Report*; Accenture (2017) *Banking on Blockchain: A Value Analysis for Investment Banks*; Oliver Wyman; WEF; Mandala analysis.

ISO 20022 provides a standardised electronic medium for financial messages enabling consistent, accurate communication across systems and organisations

Exhibit 20: ASX currently uses a proprietary messaging standard with plans to upgrade its system to the ISO 20022 global messaging standard

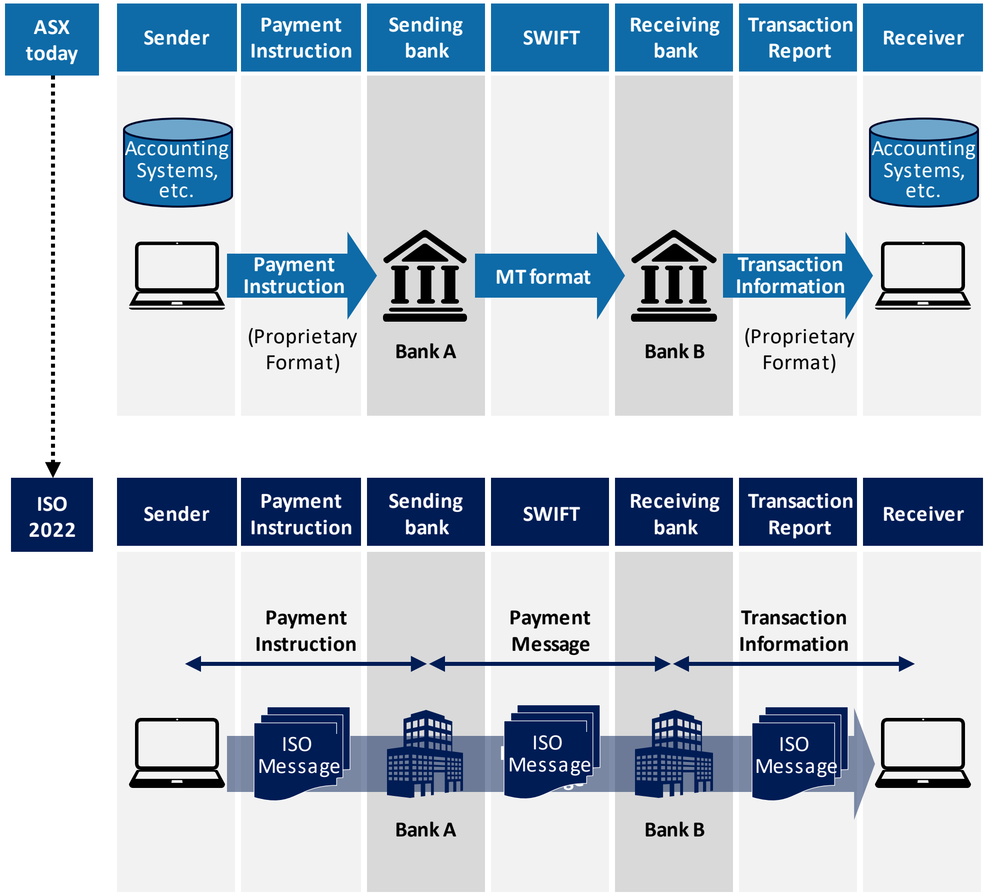
What is it?

ISO 20022 is a messaging standard that enables the electronic exchange of information between financial institutions, corporations and other users. It provides a standardised format for financial messages, ensuring information is communicated accurately and consistently across different systems and organisations

What are the benefits?

- **Enables interoperability** between financial institutions and systems globally, facilitating communication and integration between systems
- **Supports wide range of communication protocols and message formats**, enabling compatibility with current and future messaging technologies
- **Enhances data sharing** through detailed and structured information

How is it done?



Where has it been successfully implemented?

- DTCC leverages ISO 20022 to reduce miscommunications and errors and automate inbound instructions and elections on elective dividends and other events
- Canada's TMX Group applies ISO 20022 to provide browser-based access and straight-through processing within its clearing houses
- SIX utilises ISO 20022 for customer-bank data exchange covering business areas of cash management reporting and payment instruction placement
- Australia's New Payments Platform (NPP) is designed using the ISO 20022 standard as the basis for payment messaging

Source: DTCC (2023) *ISO 20022 Messaging specifications*; Tata (2017) *TCS BaNCS to Power TMX Group, Canada's premier exchange, depository & clearing group, with a new consolidated technology Platform*; SIX (2023) *What Is ISO 20022?*; New Payment Platforms (2023) *The Platform*; MUFG (2023) *ISO 20022 Adoption and Migration for Cross-Border Payments*; SWIFT; EY; Bank of England; ASX; Mandala analysis.

Tokenised assets reduce the need for intermediaries like custodians or clearinghouses potentially reducing costs and increasing efficiency

Exhibit 21: Tokenised assets enables instantaneous settlement using DLT

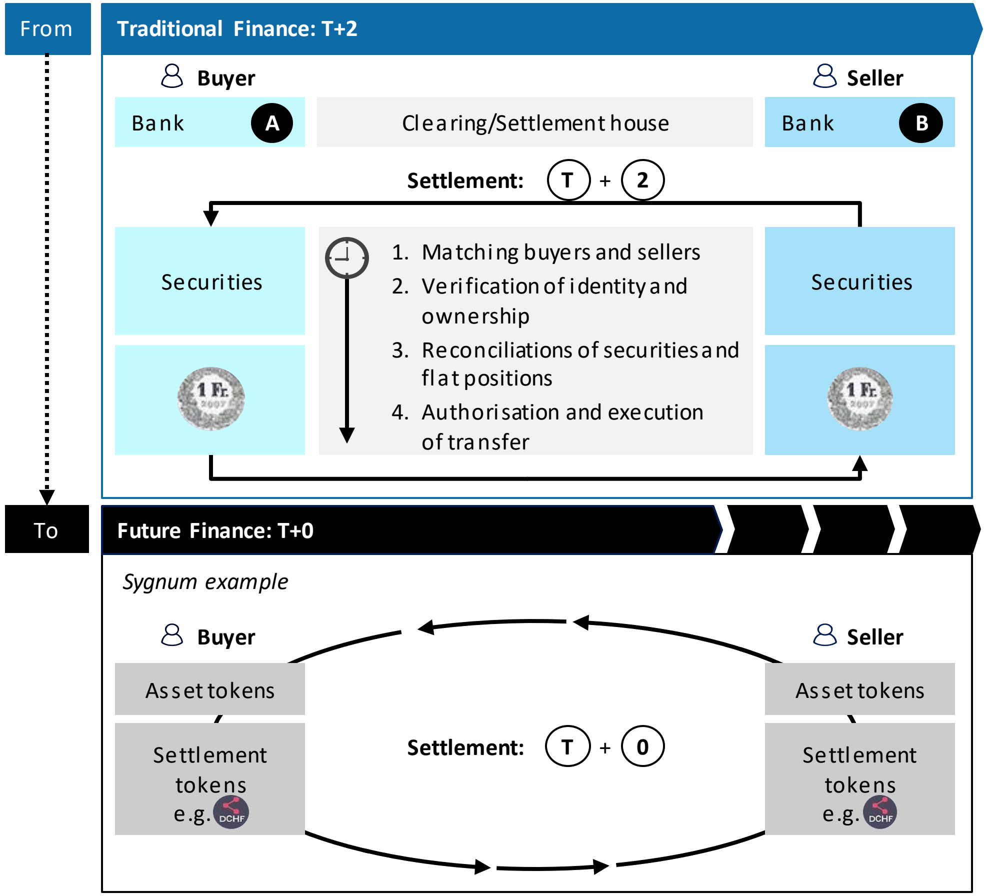
What is it?

Tokenised assets refer to assets converted into digital tokens, which are then recorded on a distributed ledger. These tokens represent ownership of the underlying asset and can be traded and settled in a secure and transparent manner

What are the benefits?

- **Reduced cost and time** by enabling real time settlement and reducing the need for intermediaries
- **Increased transparency and reduced fraud** by providing a secure and transparent record of ownership and transaction history
- **Increased liquidity** by enabling fractional ownership and allowing for the creation of new financial products based on these assets

How is it done?



Where has it been successfully implemented?

- Switzerland's SIX Digital Exchange (SDX) announced in 2022 the **first-ever tokenisation of equity shares in a fully regulated CSD based on DLT** in partnership with F10 and Aequitec[1]
- Canadian Securities Exchange (CSE) has announced a proposed securities clearing and settlement platform which enables companies to issue conventional equity and debt through tokenised securities

1 F10 is a global FinTech and InsurTech Innovation Ecosystem; Aequitec is a digital share register and cap table company.

Source: Gregory Hogan (2018) *Canadian tokenized securities trading platform announced*; SIX (2022) *SIX Digital Exchange successfully tokenizes private shares on its regulated blockchain-based Central Securities Depository in partnership with F10 and Aequitec*; Sygnum (2020) *Settlement tokens and their role in a tokenized ecosystem*; Mandala analysis.

Distributed ledgers streamline the clearing and settlement process, reducing collateral requirements and the need for intermediaries

Exhibit 22: Distributed ledger Technology can provide a decentralised clearing and settlements system

What is it?

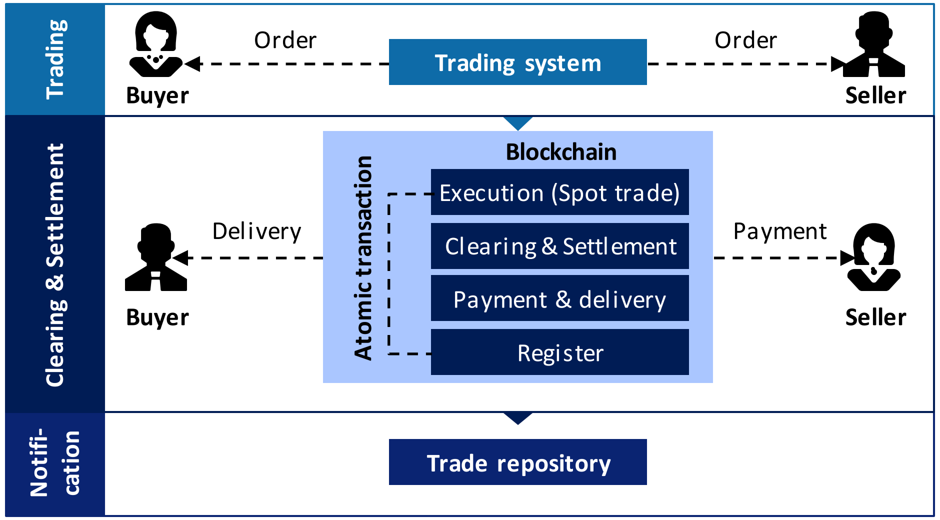
Distributed ledger technology (DLT) is a digital system that allows multiple parties to have simultaneous access to a single, secure, and tamper-proof ledger

- **What are the benefits?**

- **Reduced collateral requirements** DLT and smart contracts could optimise the calculation and posting of margins more efficiently, thereby realising financial cost savings for market participants
- **Reduced time and cost of transactions** as many processes, including KYC/AML procedures, can be automated
- **Reduced intermediaries** as DLT provides the ability to execute trades subject to specific conditions and makes it possible to ensure that both parts of a trade are fulfilled

How is it done?

Trade on a DLT trading facility



- **Trade**: Participants buy and sell orders for a DLT security are matched on the trading system of a DLT Trading Facility
- **C&S**: Spot trade is executed via smart contract on the blockchain. If the conditions are met, the trade is executed and instantly settled, and the new state of the ownership is registered on the blockchain. For fully blockchain-based spot transactions, there will not be a need for central counterparty, in particular due to the instant settlement
- **Notification**: Trade repository, register will keep a record of transactions

Where has it been successfully implemented?

- In September 2020, the Swiss parliament adopted the Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology (DLT bill) which availed a **new license type for DLT Trading Facilities to provide order matching, clearing, settlement and custody services**
- SIX Digital Exchange (SDX) becomes the **world's first fully regulated digital asset exchange and Central Securities Depository (CSD) based on DLT**

- DTCC with developed **Project Ion platform, an alternative settlement platform leveraging distributed ledger technology (DLT)** which is processing 100,000 bilateral equity transactions per day and 160,000 transactions on peak days

Source: Alexandra Overgaag (2023) *An overview of the Swiss Distributed Ledger Technology (DLT) Act*; DTCC (2022) *DTCC's project ion platform now live in parallel production environment, processing over 100,000 transactions per day on DLT*; Swiss Federal Council (2021) *Federal Council brings DLT Act fully into force and issues ordinance*; PwC (2023) *Swiss DLT law: New regulations bring new opportunities*; Randy Priem (2020) *Distributed ledger technology for securities clearing and settlement: benefits, risks, and regulatory implications*; Mandala analysis.

Atomic Settlement mitigates the risk in clearing and settlement by reducing the likelihood of one-party defaulting on their obligations

Exhibit 23: Atomic settlement is underpinned by DLT and enables instantaneous settlement

What is it?

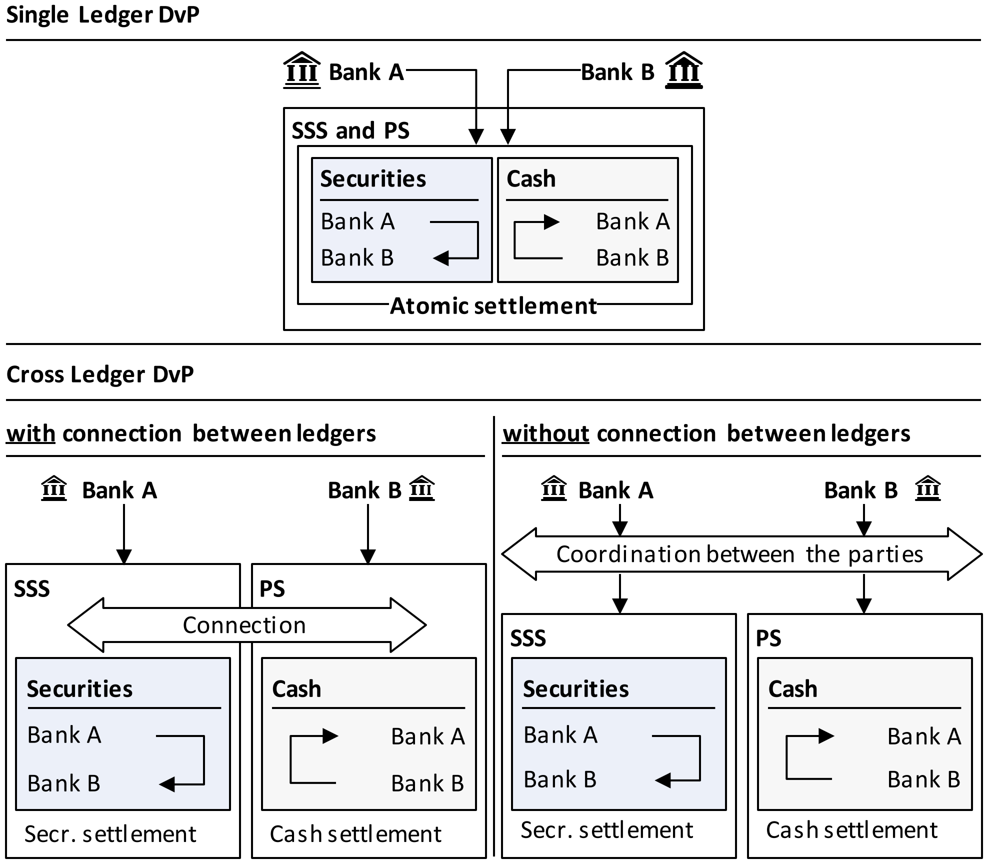
Atomic settlement is the instant exchange of two assets whereby the transfer of one assets occurs if and only if the transfer of the other asset also occurs

What are the benefits?

- **Reduced settlement time** as the Distributed Ledger Technology can process multiple actions simultaneously
- **Reduced counterparty risk** as atomic settlement ensures all transactions are completed simultaneously
- **Simplified reconciliation** as all trades are settled simultaneously, reduces the need for manual reconciliation

How is it done?

SSS: Securities Settlement System; **PS:** Payment System; → : Instruction



Where has it been successfully implemented?

- Project Helvetia, a joint project between the Swiss National Bank (SNB) and the Swiss stock exchange operator SIX, demonstrated the feasibility of atomic settlement
- Project Jasper III, a joint project between Bank of Canada and Payments Canada, was able to facilitate the simultaneous exchange of cash and securities in a single, atomic transaction

Source: Bank of International Settlements (2020) *Project Helvetia: Settling tokenised assets in central bank money*; Dr. Rahul Banerjee (2021) *The Alchemy of Atomic Settlement*; SIX (2022) *BIS, SNB and SIX successfully test integration of wholesale CBDC settlement with commercial banks*; Payments Canada (2018) *Jasper Phase III: A collaborative research initiative between Payments Canada, the Bank of Canada and TMX group*; Mandala analysis.

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Appendix

A: Technological innovations

B: Regulatory innovations

C: International case studies

D: References

CCPs act as intermediary between buyer and seller in a trade, guaranteeing trade completion and reducing counterparty risk; DLT can deliver these and other benefits

Exhibit 24: Central Counterparty Clearing Houses have been widely adopted post the 2008 Global Financial Croses

What is it?

Central Counterparty Clearing Houses (CCPs) act as **guarantor between two parties involved in a trade.** The CCP becomes the buyer to every seller and the seller to every buyer. The CCP **assumes the counterparty risk for both parties** in a transaction, ensuring that the transaction is completed even if one of the parties defaults on their obligation

What are the benefits?

- **Eliminates the risk of one party defaulting** on their obligation
- **Increased transparency** by providing a centralised platform for trade reporting, clearing and settlement
- **Reduced cost** due to improved economies of scale
- **Increased liquidity** in the market

Two main regulations were enacted to increase the resilience of the industry and reduce the risk of systemic failure after the 2008 crisis

Dodd-Frank Wall Street Reform and Consumer Protection Act

- Dodd-Frank Act was **enacted in 2010** in response to the **GFC**. The key provision requires **central clearing for certain types of swaps** instead of bilateral settlements
- Dodd-Frank Act **designated certain CCPs as "systemically important financial market utilities"**, subjecting CCPs to heightened regulatory scrutiny and oversight, including **new requirements for governance, risk management and financial resources** for CCPs

European Market Infrastructure Regulation (EMIR)

- EMIR **came into force in 2012**, designed to **improve the safety and transparency of the over-the-counter derivates market** in the EU
- EMIR's key requirement is **mandatory central clearing of certain types of OTC derivatives** (rather than bilaterally), reducing counterparty risk
- EMIR also requires CCPs to hold sufficient capital and collateral **to cover any losses that may occur in the event of a member's default**, without needing to rely on external sources of funding

However, some jurisdiction are experimenting with **alternatives to the CCP**

- In September 2020, the Swiss parliament adopted the **Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology** (DLT bill) which introduced a new license type for **DLT Trading Facilities to provide order matching, clearing, settlement and custody**

Source: PwC (2023) *Swiss DLT law: New regulations bring new opportunities*; Europa.eu; SIX; Mandala analysis.

Regulatory relief measures are designed to promote innovation, inform the design of a more tailored regulatory environment, and reduce the burden of compliance

NON-EXHAUSTIVE

Exhibit 25: There are various forms of regulatory relief being leveraged by global regulators to experiment with new innovations, including DLT

What is it?

Regulatory relief is a **set of measures put in place by regulatory bodies to provide temporary relief** to market participants from certain regulatory requirements

What are the benefits?

- **Encourages innovation** by reducing barriers to entry and providing a more supportive regulatory environment
- **Assists regulators design tailored regulation** by helping them understand new innovations
- **Reduces time and cost** associated with regulatory compliance

Multiple jurisdictions are providing regulatory relief to encourage innovation in the Clearing and Settlement industry

- The US Commodity Futures Trading Commission (CFTC) has **granted several exemptions and no-action relief letters to distributed ledger-based platforms**. For example, in 2017, the CFTC granted an exemption to LedgerX, a digital currency derivatives platform, allowing it to **operate as a clearinghouse for digital currency options**
- The Swiss DLT bill came into force in 2021 with an aim to **regulate decentralised digital ledger technology,** enabling the country to close many gaps in its legal framework and create more legal assurance for crypto assets and custodians. Notably, the DLT act **defines what constitutes an electronic record and introduces a regulatory framework for its proper use**
- The UK under the Financial Services and Markets Bill (HCB 146) in 2022 gave **HM Treasury (HMT) the ability to establish Financial Market Infrastructure (FMI) regulatory sandboxes** where the HMT can temporary disapply or modify relevant legislation to allow participating FMI's to "test and adapt to new technologies and practices"
- The EU in February 2023 has launched a **regulatory sandbox for innovative use cases involving distributed ledger technologies**. The Sandbox will allow supervisors to enhance their knowledge of cutting-edge technologies involving DLT while giving **exemption to companies from certain MiFID II and Central Securities Depository Regulation (CSDR)**

Source: PwC (2023) *Swiss DLT law: New regulations bring new opportunities*; Shearman & Sterling (2022) *UK Financial Services and Markets Bill 2022*; Thomson Reuters; KPMG; European Commission (2023) *Launch of the European Blockchain Regulatory Sandbox*; Finews; cointelegraph; Mandala analysis.

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A: Technological innovations

B: Regulatory innovations

C: International case studies

D: References

Global experience indicates that competition in C&S can unlock innovation leading to three key benefits (I/II)

Exhibit 26: Benefits of competition and innovation in Clearing and Settlement market

A Enhanced innovation	▪ DTCC introduced DLT based settlement processing up to 160,000 transaction per day ▪ OCC is launching Ovation to use the cloud for clearing	▪ CDS demonstrated for the first time that both central bank cash and assets could be tokenised to complete an instant settlement on DLT	▪ EU's DLT Pilot regime provided a regulation sandbox to allow players and regulators to gain experience with use of DLT	▪ Six Digital Exchange (SDX) announced the first-ever tokenisation of equity shares in a fully regulated CSD based on DLT
B Increased efficiency	▪ Reduced settlement time from T+3 to T+2 in 2017, and set to become T+1 in May 2024		▪ Current settlement is T+2 with discussions ongoing to transition to T+1	▪ Reduced settlement time from T+3 to T+2 in 2014
C Lower costs	▪ DTCC reduced its fees in 2023 from \$0.47 to \$0.46 per million of processed value and from \$2.56 to \$2.16 per million of settling value ▪ OCC reduced clearing fees from \$0.055 per contract to \$0.025 in 2020	▪ CDS has applied a ~28% price reduction from 2011-2018	▪ LCH has reduced fees by ~25% for its Cash Market clearing in 2022	▪ Six x-clear cut its prices by 15-30% in 2011 and offers a 25% discount on any "new business"

Source: Desktop research; Mandala analysis.

Global experience indicates that competition in C&S can unlock innovation leading to three key benefits (II/II)

Exhibit 27: Benefits of competition and innovation in Clearing and Settlement market

	Singapore	Hong Kong	New Zealand	United Kingdom
A Enhanced innovation	▪ MAS provides regulatory relief from a one-stop assistance in regulatory support to regulatory customisation for complex business models ▪ Project Ubin successfully integrated DLT-based systems to enable seamless settlement of securities transaction	▪ HKEX and DTCC have partnered to launch Synapse, a settlement platform based on DAML smart contract technology to reduce settlement times for international investors trading in China through Hong Kong securities market	▪ N/A	▪ LCH SA has integrated DLT-based collateral management for automating collateral workflows to reduce time and less costs for market participants ▪ UK is planning to develop DLT sandboxes to enable CSD functionality using blockchain by adapting CSD regulations for DLT settlement
B Increased efficiency	▪ Reduced settlement time from T+3 to T+2 in 2018	▪ Currently T+2 for Hong Kong and T+1 for mainland China	▪ Reduced settlement time from T+3 to T+2 in 2016	▪ Reduced settlement time from T+3 to T+2 in 2014 and has set up a taskforce to examine the case for transition to T+1 settlement
C Lower costs	▪ Currently 0.0325% of contract value; last changed in 2012 from 0.04%	▪ HKEX reduced settlement fees for futures from $10 to $2 per contract and introduced tiered trading fees in 2018	▪ NZX revised pricing structure removing existing fixed cost fees in 2018	▪ LCH SA reduced clearing fees from €0.055 to €0.04 for average daily volumes below 60,000 trades in 2022

Source: Desktop research; Mandala analysis.

United States is transitioning to T+1 settlement, CS agencies are reducing costs and innovating around DLT, cloud computing and risk management

Exhibit 28: Four major benefits have been realised from competition within and outside of the United States

There are **three major clearing agencies** in the United States:

- **Depository Trust and Clearing Corporation (DTCC)** with subsidiaries NSCC and FICC clears virtually all broker to broker deals while DTC is a central securities depository and securities settlement system
- **Options Clearing Corporation (OCC)** clears and guarantees options and futures contracts
- **CME Group** clears exchange-traded futures and options contracts

Increased efficiency	Trade settlement for all US trades have transitioned from T+3 to T+2 in 2017 and are set to become T+1 by May 2024
Improved stability & reliability	Settlement times being reduced times has brought key benefits such as reduction of outstanding settlements leading to smaller counterparty risk exposure in turn reducing margin requirements
Enhanced innovation	▪ DTCC's Project Ion introduced a distributed ledger technology (DLT) based settlement platform that supports T+0, processing up to 160,000 transaction per day ▪ OCC will be launching a new platform, Ovation by 2025 which is the first SIFMU1 to request regulatory approval for using the cloud for clearing, risk management and data management applications in the US ▪ CME Group will launch the SPAN 2 framework that will allow implementation of granular and dynamic adjustments to margins at a product and portfolio level. Enhanced reporting of margining into different risk factors such as market risk, liquidity, and concertation will be provided
Lower Costs	▪ NSCC has proposed to reduce its fees from $0.47 to $0.46 per million of processed value and $2.56 to $2/16 per million of settling value on its "value into the net" and "value out of the net" fees respectively ▪ OCC has reduced clearing fees from $0.055 per contract to $0.025 in 2020 due to achieved operating leverage by increased trading volumes

1 Systemically important financial market utility.

Source: CPSS-Red Book; DTCC (2022) *DTCC's project ion platform now live in parallel production environment, processing over 100,000 transactions per day on DLT*; Global Investor (2022) *OCC's tech transformation: why it's creating a more robust infrastructure*; Luke Jeffs (2023) *Canada to adopt T+1 settlement with US in May 2024*; OCC (2023) *What is the Renaissance Initiative?*; US SEC (2017) *SEC Adopts T+2 Settlement Cycle for Securities Transactions*; US SEC (2022) *Self-Regulatory Organizations; National Securities Clearing Corporation; Notice of Filing and Immediate Effectiveness of a Proposed Rule Change To Amend Certain Fees*; Mandala analysis.

Canada is moving towards T+1 settlement and exploring distributed ledgers as a way to reach instantaneous settlement

Exhibit 29: Canada's markets are closely intertwined with the US due to similar participants and common securities

There are **two major agencies** for post-trade processing, clearing and securities settlement in Canada both **operated by TMX group**:

- **Clearing and Depository Services incorporated (CDS)** operates CDSX which is Canada's main system for clearing and settlement of eligible Canadian equity, debt and money market transactions
- **Canadian Derivatives Clearing Corporation (CDCC)** issues, clears and guarantees equity, index and interest rate derivates traded on Montreal Exchange

Increased efficiency

- Settlement for all Canadian trades will transition from T+2 to T+1 by 2024 primarily to keep settlement cycle in Canada aligned with the U.S. markets
- Private players (e.g., DTCC) already have the capability to clear and settle on T+0

Improved stability & reliability

- Reduction in settlement times reduces market inefficiencies, mitigates counterparty, market, and liquidity risks and reduces outstanding settlements and replacement cost risks

Enhanced innovation

- TMX Group, the Bank of Canada, Payments Canada and Accenture demonstrated the feasibility of clearing and settlement of securities using distributed ledger technology (DLT), showing for the first time that both central bank cash and assets can be tokenised to complete and instant, end-to-end equity settlement on distributed ledger technology (DLT)

Lower Costs

- CDS has applied 27.6% price reduction from 2011-2018 mainly due to increased economies of scale as CDS' custody volumes for debt and equity have risen by 39% and 47% respectively.

Source: Accenture; CDS; CPSS-Red Book; The Canadian Depository for Securities Limited (2019) *Pricing Study*; Luke Jeffs (2023) *Canada to adopt T+1 settlement with US in May 2024*; Ryan Mapa & Zach Austin (2017) *Canada's Move to a T-2 Settlement Cycle*; Mandala analysis.

The EU is exploring the use of DLT by providing regulatory relief to gain experience which could lead to improved reliability and shortened settlement

Exhibit 30: Benefits in the EU have been driven by technological innovations

There are **eight clearing[1] agencies in the EU** with three leading players:

- **LCH. Clearnet SA:** Clears transactions in France, Belgium, Germany, Spain, Italy, Luxembourg, the Netherlands, Portugal and the UK
- **Cboe Clear Europe (EuroCCP):** Clears transactions in the Netherlands, Germany, Sweden, the UK, Norway and Hungary
- **EUREX Clearing AG:** Clears transactions in Germany

There are 30 CSD with major players grouped into two large ICSDs **Euroclear group and Clearstream group**

Increased efficiency

- Current settlement cycle for most transactions in equities and fixed income markets is two business days (T+2) with discussions ongoing whether to transition to T+1

Improved stability & reliability

- The EU's DLT Pilot Regime provides a regulation sandbox to allow post settlement players as well as regulators gain experience with the use of DLT with aims at creating a harmonised legal framework for market infrastructures and improved stability and shorter settlement times

Enhanced innovation

- LCH implemented Millennium Clearing & Risk system configured to clear and risk manage 20 million trades per day at a rate of 1600 trades per second reducing end of day processing time significantly
- EUREX Clearing has rolled out ESG Clearing Compass to support reconcile client's ESG strategy, improve monitoring and reporting facilities

Lower Costs

- LCH has reduced fees by ~25% for its Cash Market clearing in 2022

1 EUREX Clearing AG (Germany), Hellenic Exchanges holdings SA (Greece), BME Clearing (Spain), LCH. Clearnet SA (France), CC&G (Italy), European Central Counterparty N.V. (The Netherlands), CCP (Austria); OMICLEAR – C.C., S.A. (Portugal).

Source: CPSS-Red Book; Arthur Van Den Bossche (2023) *EU launches its DLT Pilot Regime*; Morten Linnemann Bech, Jenny Hancock, Tara Rice and Amber Wadsworth (2020) *On the future of securities settlement*; Mandala analysis.

Competition in Switzerland's clearing industry due to interoperability has led to price reduction and increased innovation

Exhibit 31: Interoperability has been a key driver of the benefits realised in Switzerland

There are **three recognised clearing agencies in Switzerland**:

- **SIX x-clear:** Clears shares, ETF, ETP and CHF bonds
- **LCH. Ltd** Clear Shares, ETF and ETPs
- **Cboe Clear Europe:** Clear Shares, ETF and ETPs

There are **interoperability arrangements between these agencies for Cash equities and ETFs**

Increased efficiency

- Settlement time has changed from T+3 to T+2 in 2014

Improved stability & reliability

- Implementation of Straight-through processing has reduced manual errors, streamlined workflows, improved data quality and enhanced system security

Enhanced innovation

- Swiss Exchange employed full automation via Straight-through processing (STP) of all steps involved from entering an order on the Swiss Stock Exchange through into the settlement infrastructure through the relevant central counterparty (CCP) i.e., either of Six x-clear, LCH and Cboe Clear Europe
- Six x-clear successfully explored the use of DLT[1] as a feasible way of integrating tokenised assets and central bank money

Lower Costs

- Six x-clear has cut its prices and introduced a new volume-based tariff structure in 2011 with reduction of 15% on average and 30% for its largest clients to encourage clients to consolidate their clearing volumes with SIX x-clear and also offers a 25% discount on any "new business" resulting from trading flows migrated to SIX x-clear

1 Project Helvetia is a collaborative experiment between the BISIH Swiss Centre, SIX and the SNB, to explore the settlement of tokenised assets in central bank money

Source: CPSS-Red Book; SIX (2022) *Price list of SIX x-clear AG*; SIX (2022) *SIX Digital Exchange successfully tokenizes private shares on its regulated blockchain-based Central Securities Depository in partnership with F10 and Aequitec*; LCH (2022) *Fees: The cost to clear at EquityClear SA*; Adrian Whelan (2022) *The Great T+1 Settlement Debate Comes to Europe*; Mandala analysis.

Singapore provides regulatory relief for DLT innovation and has leveraged DLT-based systems to enable seamless settlement of securities transaction

Exhibit 32: Singapore is experimenting with DLT technologies by providing regulatory reliefs

There are 4 approved clearing and settlement houses in Singapore

- **Central Depository (PTE) Limited** provides clearing and settlement services of securities and derivatives
- **Singapore Exchange Derivatives Clearing Limited** clears financial and commodity derivatives traded on the Singapore Exchange (SGX)
- **ICE Clear Singapore PTE LTD** clears financial and commodity derivatives traded in Asia Pacific
- **Asia Pacific Clear PTE LTD**: Clears futures and options contracts

Increased efficiency

- Singapore shortened its clearing and settlement cycle to T+2 in December 2018 to align processes with global standards

Improved stability & reliability

- Singapore's regulatory relief measures provide a safe environment for testing new innovations in the industry while helping regulators better understand and manage risks associated with the new technologies and business models

Enhanced innovation

- Monetary Authority of Singapore (MAS) provides regulatory relief from a one-stop assistance in regulatory support to regulatory customisation for complex business models
- Project Ubin successfully integrated DLT-based systems to enable seamless settlement of securities transaction

Lower Costs

- SGX-ST revised clearing fees from 0.04% to 0.0325% of contract value in 2014

Source: Allen & Gledhill (2014) *Clearing and settlement fees for SGX-ST to be revised from 1 June 2014*; Monetary Authority of Singapore (2023) *Overview of Regulatory Sandbox*; Monetary Authority of Singapore (2023) *Project Ubin: Central Bank Digital Money using Distributed Ledger Technology*; RBC Investor and Treasury Services (2023) *Market Profiles: Singapore*; Mandala analysis.

Hong Kong's HKEX has managed to reduce settlement times by leveraging smart contract technologies

Exhibit 33: Smart contract technologies is a key driver of the benefits experienced in Hong Kong

There are 3 approved clearing and settlement houses in Hong Kong

- **Hong Kong Securities Clearing Company Limited (HKSCC)** provides clearing services to transactions in securities
- **HKFE Clearing Corporation Limited (HKCC)** provides clearing services for derivatives traded in Hong Kong Futures Exchange Limited
- **SEHK Options Clearing House Limited (SEOCH)** provides clearing services for derivatives traded in The Stock Exchange of Hong Kong Limited

Increased efficiency

- Hong Kong moved to T+2 in 2014 and moved to T+1 with mainland China in 2017

Improved stability & reliability

- Reduction of settlement time and application of smart contract technologies has reduced counterparty risk and improved market efficiency

Enhanced innovation

- HKEX and DTCC have partnered to launch Synapse, a settlement platform based on DAML smart contract technology to reduce settlement times for international investors trading in China through Hong Kong securities market

Lower Costs

- HKEX reduced settlement fees for futures from $10 to $2 per contract and introduced tiered trading fees in 2018

HKEX (2022) *Synapse*; HKEX (2018) *HKEX to Cut Fees and Make Other Changes in its Stock Futures Market in Early July*; HKEX (2011) *Settlement - Securities*; RBC Investor and Treasury Services (2023) *Market Profiles: Hong Kong*; Mandala analysis.

United Kingdom is planning to provide sandboxes to gain benefits of DLT; LCH has integrated DLT-based collateral management reducing time and cost

Exhibit 34: United Kingdom is experimenting with DLT technologies by providing regulatory reliefs

There are 5 recognised clearing houses in the UK

- **LCH SA** clears securities and derivatives of the London Stock Exchange
- **CME Clearing Europe Limited** clears derivatives in various exchanges[1]
- **ICE Clear Europe Limited** clears derivatives in energy, agriculture & commodities
- **LME Clear Limited** clears futures and options contracts for LME's metals markets
- **Euroclear UK & international:** Provides settlement services for equities, bonds and money market instruments

Increased efficiency

- Reduced settlement time from T+3 to T+2 in 2014 and has set up a taskforce to examine the case for transition to T+1 settlement

Improved stability & reliability

- UK's plan of developing regulatory sandboxes to enable CSD functionality would allow players and regulators gain experience and provide an enabling regulatory environment for leveraging DLT based technologies within clearing and settlement

Enhanced innovation

- LCH SA has integrated DLT-based collateral management for automating collateral workflows to reduce time and costs for market participants
- UK is planning to develop DLT sandboxes to enable CSD functionality using blockchain by adapting CSD regulations for DLT settlement

Lower Costs

- LCH SA reduced clearing fees from €0.055 to €0.04 for average daily volumes below 60,000 trades in 2022

1. London Metal Exchange (LME), Intercontinental Exchange (ICE), NYSE Euronext London Market

Source: Debevoise & Plimpton (2014) *London Stock Exchange introduces T+2 standard settlement period*; LCH (2022) *Fees: The cost to clear at EquityClear SA*; Ledger Insights (2022) *LSE's clearinghouse LCH SA integrates Baton's DLT collateral system*; Ledger Insights (2022) *UK plans DLT sandbox for Financial Market Infrastructures by 2023*; RBC Investor and Treasury Services (2020) *Market Profiles: United Kingdom*; UK Government (2022) *Policy Paper: Accelerated Settlement Taskforce*; Mandala analysis.

1 Australia is falling behind global leaders in financial market capabilities, and urgent action is required to claim our position at the front of the pack

2 Modernising Clearing & Settlement services and infrastructure has been beneficial for financial markets overseas

3 Delivering modern, competitive Clearing & Settlement services requires responsible regulatory reform to deliver for investors, consumers and businesses

4 Australia can be a leader in financial market innovation and technology in a way that is both responsible and beneficial

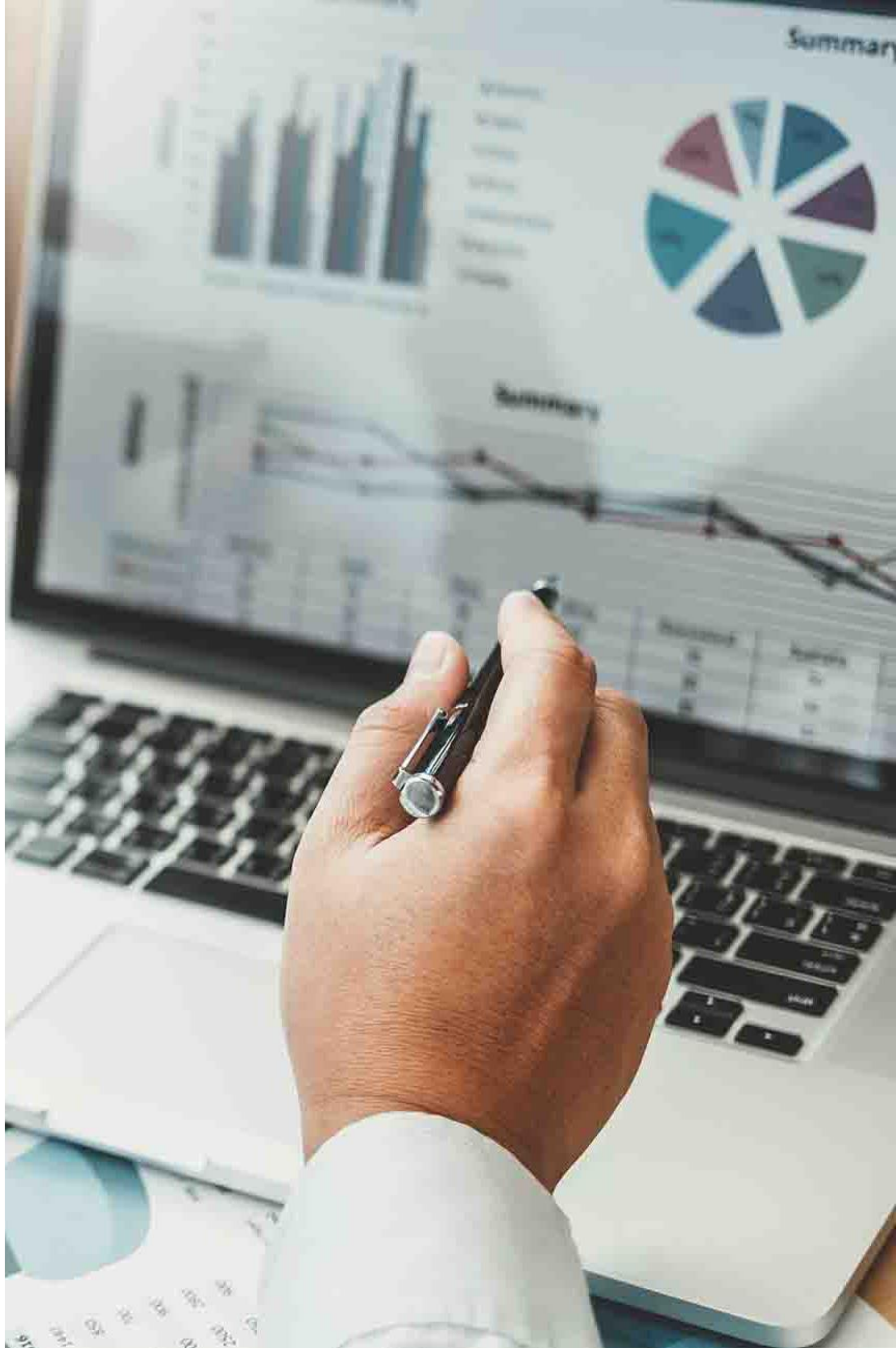
Appendix

A: Technological innovations

B: Regulatory innovations

C: International case studies

D: References



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