



BANK OF CANADA
BANQUE DU CANADA

Bank of Canada Oversight Activities for Financial Market Infrastructures 2020 Annual Report

June 2021

Executive summary

Financial market infrastructures (FMIs) are critical to the financial system. They support economic activity by providing a platform to transfer funds and settle transactions. At the same time, FMIs are also a potential source of risk to economic activity and the resilience of the financial system because they facilitate large amounts of transactions. The Bank of Canada (the Bank) designates FMIs operating in Canada that have the potential to pose systemic or payments system risk and oversees them to ensure that the risks are adequately controlled. This oversight contributes to the Bank's broader mandate of promoting the stability and efficiency of the Canadian financial system.

The *Bank of Canada Oversight Activities for Financial Market Infrastructures 2020 Annual Report* describes how the Bank fulfills its mandate for oversight of designated FMIs. The report highlights key issues on safety and soundness of these systems. It also specifies the key risk management enhancements the Bank expects FMI operators to pursue. This report also discusses initiatives undertaken by the Bank in relation to FMI risk management.

Despite heightened market volatility and uncertainties at the initial stages of COVID-19 in 2020, designated FMIs overseen by the Bank demonstrated resilience throughout the year, and they significantly improved their risk management practices to address the Bank's oversight expectations.

Table of contents

The Bank’s approach to oversight of financial market infrastructures.....	5
Regulatory framework	5
The Bank’s FMI oversight framework	7
Special risk considerations in 2020	8
Resilience of designated FMIs to the COVID-19 pandemic.....	8
Values, volumes and volatility.....	8
Maintaining business continuity	9
Oversight priorities for Payments Canada systems	10
Key priorities addressed.....	10
Credit risk management.....	10
Default management	10
ACSS refresh	10
Ongoing priorities.....	11
Modernization.....	11
Newly identified priorities.....	12
Cyber risk management	12
Improvements to contingency	12
Liquidity risk management.....	12
Oversight priorities for TMX systems.....	13
Key priorities addressed.....	13
Liquidity risk management.....	13
Default management	13
Ongoing priorities.....	14
Modernization.....	14
Cyber risk management	14
Business risk	14
Newly identified priorities.....	15
Liquidity risk management.....	15
Access and tiered participation.....	16
Bank of Canada activities	17

Designating <i>Interac</i> e-Transfer®	17
Increasing FMI resolution preparedness.....	17
Strengthening cyber resiliency.....	18
Contributing to international efforts	18
Researching and monitoring trends in the FMI landscape	20
Appendix 1 Annual summary figures of designated FMIs.....	21
Appendix 2 Glossary of terms.....	25
Appendix 3 Abbreviations	28

The Bank's approach to oversight of financial market infrastructures

Financial market infrastructures (FMIs) play an important role in the sound functioning of the financial system. The services they provide are critical for individuals and firms to safely and efficiently purchase goods and services, invest in financial assets and manage financial risks. Given their central role, FMIs require strong risk management practices and must be resilient to shocks.

Regulatory framework

The Bank's powers to oversee FMIs stem from the *Payment Clearing and Settlement Act* (PCSA), which provides the Governor of the Bank of Canada with the authority to designate an FMI if he or she deems it to have the potential to pose systemic risk or payments system risk in Canada.¹ The PCSA further stipulates that the Bank is responsible for oversight of these designated FMIs. In this role, the Bank coordinates with other federal and provincial authorities that also have oversight responsibilities for any given designated FMI.² Formal agreements between the Bank and relevant authorities exist to guide this collaboration.

The Bank also designates and oversees foreign-domiciled FMIs that have the potential to pose systemic risk to the Canadian financial system. For the foreign-domiciled FMIs that are presently designated, the Bank relies on co-operative arrangements in the form of oversight colleges or committees that are led by authorities in the jurisdiction where the foreign FMI is domiciled.

The Bank must ensure that FMIs adequately control their risks because their operations are essential to the Canadian financial system. To achieve this, the Bank assesses designated FMIs against its *Risk Management Standards for Designated FMIs* and *Criteria and Risk Management Standards for Prominent Payment Systems*. These standards were established by the Bank based on the *Principles for Financial Market Infrastructures (PFMI)*, which were developed by the Committee on Payments and Market Infrastructures (CPMI) together with the International Organization of Securities Commissions (IOSCO).³

¹ The federal Minister of Finance must agree that designation is in the public interest. See the glossary in Appendix 2 for a full definition of systemic risk and payments system risk.

² The Canadian Depository for Securities (operator of CDSX) and the Canadian Derivatives Clearing Corporation (operator of the Canadian Derivatives Clearing Service) are recognized and regulated by the Autorité des marchés financiers, the British Columbia Securities Commission and the Ontario Securities Commission. The Minister of Finance shares the responsibility to oversee Payments Canada (operator of the Large Value Transfer System and the Automated Clearing Settlement System).

³ The PFMI establish minimum expectations for risk management of systemically important FMIs to preserve and strengthen financial stability. See [CPMI-IOSCO's web page](#) for more information on the PFMI and CPMI-IOSCO.

The designated FMIs are listed in **Table 1**.

Table 1: Financial market infrastructures designated for Bank of Canada oversight*	
Domestic designated FMIs	
CDCS	The Canadian Derivatives Clearing Service (CDCS) is a central counterparty operated by the Canadian Derivatives Clearing Corporation (CDCC). It clears transactions in all derivatives trades on the Montréal Exchange and certain fixed-income securities, repurchase agreements and over-the-counter (OTC) equity derivatives. CDCC is a wholly owned subsidiary of the Montréal Exchange, which in turn is a wholly owned subsidiary of TMX Group.
CDSX	CDSX is a system operated by the Canadian Depository for Securities Limited (CDS). It consists of a securities settlement system, a central securities depository for equities and fixed-income securities, and a central counterparty service for eligible Canadian exchange-traded and OTC equities. CDS is a wholly owned subsidiary of TMX Group.
LVTS	The Large Value Transfer System is an electronic funds-transfer system operated by Payments Canada. It settles large-value and time-critical payments.
ACSS	The Automated Clearing Settlement System, operated by Payments Canada, is a retail payment system. It clears cheques and electronic items, such as pre-authorized debits, direct deposits and Interac debit payments.
<i>Interac e-Transfer®</i>	<i>Interac e-Transfer®</i> is a person-to-person, electronic payment system for making remote payments. The system is widely used among Canadians and is owned and operated by Interac Corp.
Foreign-domiciled designated FMIs	
CLS Bank	CLS Bank is a special-purpose bank offering the settlement of foreign exchange transactions, including those involving the Canadian dollar.
SwapClear	SwapClear is a clearing system operated by LCH Limited. It centrally clears interest rate swaps and other OTC interest rate derivatives denominated in multiple currencies, including the Canadian dollar.

* Except for the ACSS and *Interac e-Transfer®*, all FMIs listed in this table are subject to the Bank's risk management standards for systemically important FMIs. The ACSS and *Interac e-Transfer®* are subject to the standards for prominent payment systems.

The Bank's FMI oversight framework

The Bank regularly monitors and assesses designated FMIs against its standards to ensure that they are adequately controlling their risks. Central to this process are annual core assurance reviews that focus on FMIs' controls and risk management practices in specific areas.

Findings identified in core assurance reviews are presented to the Bank's Oversight Risk Advisory Committee (ORAC), which is comprised of Deputy Governors as well as senior Bank staff with expertise in FMIs, risk management and financial stability. ORAC may decide to request that FMIs address certain findings as priorities. These priorities are generally expected to be addressed within the following 12 months, though some are multi-year initiatives (e.g., modernization programs). Under this approach, each of the Bank's risk management standards is assessed in depth over a three-year cycle. The prioritization of any mitigating measure requested from an FMI is based on the enhancements that are most relevant to the safety and soundness of the FMI and the broader financial system.

The year 2020 marked the second full year of the Bank's focused, in-depth oversight framework centred around core assurance reviews.

Special risk considerations in 2020

Resilience of designated FMIs to the COVID-19 pandemic

Despite unprecedented challenges brought about by the COVID-19 pandemic, designated FMIs overseen by the Bank demonstrated resilience in their operations throughout 2020.

Values, volumes and volatility

Designated FMIs operated by Payments Canada

Due to the Bank's large-scale liquidity injections and the government's response to the pandemic, ⁴ record-high values were processed through the Large Value Transfer System (LVTS) in 2020. These totalled \$101 trillion for the year—a much greater amount than the previous record of \$48 trillion in 2019. Payment volumes remained relatively stable with an annual total of about 11 million transactions. As suggested by the Bank's analysis in [Chaudhry, A., A. Kosse and K. Sondergard \(2021\)](#), the abundance of liquidity prompted participating financial institutions to send LVTS payments earlier in the day, and the payment system experienced very little stress. ⁵

As a retail payment system, the Automated Clearing Settlement System (ACSS) saw a sharp decline in volumes during the second quarter of 2020 when COVID-19 lockdown measures were introduced. The declines were more pronounced for non-government cheques and cash withdrawals because consumers were less able or willing to engage in physical exchanges. This decrease was partly offset by government-assistance payments, such as those from the Canada Emergency Response Benefit, which are processed in the ACSS. Volumes and values recovered in the latter half of 2020. Overall, the ACSS still processed 7.9 billion transactions for a total of \$7.2 trillion in 2020, which is about 5 percent less volume and 1 percent less value compared with 2019.

Designated FMIs operated by TMX

Clearing activity for futures and options in the Canadian Derivatives Clearing Service (CDCS) increased significantly in March 2020 because of the high degree of market volatility and economic uncertainty associated with the pandemic. Although this combination of heightened volatility and increased market activity also resulted in large daily requirements for initial and variation margins, all clearing members met their

⁴ For more information, see the Bank of Canada's webpages: [COVID-19: Actions to Support the Economy and Financial System](#) and [Our COVID-19 response: Large-scale asset purchases](#).

⁵ The analysis considered stress as measured by the value and volume of rejected and delayed payments, the fraction of tranche 2 transactions and adjustments to intra-day bilateral credit limits.

financial obligations. Additionally, CDCC was able to maintain adequate margin levels commensurate with heightened risks. Once market volatility began to subside from April 2020 onwards, clearing activity quickly returned to historical levels. Similarly, in the repurchase agreements (repo) central counterparty (CCP) service of CDCS, volumes and values also spiked in March 2020. They fell below their historical averages in the second quarter and then recovered moderately throughout the third and fourth quarters. Because of the considerable market volatility and increase in volumes, CDCS's total initial margin levels more than doubled from under \$7 billion to over \$16 billion in March 2020 and remained at this elevated level until June 2020. Margin levels began to decline gradually from the third quarter onwards but remained above historical averages.

CDSX also experienced record-high levels of activity in March 2020 due to increased market volatility. But from the second quarter on, the value and volume of fixed-income and equity securities settled through CDSX gradually declined to historical averages (with anticipated peaks in June, September and December related to the expiration of futures and options contracts).⁶

Foreign-domiciled designated FMIs

As a reflection of volatility in global financial markets when the pandemic started, the two foreign-domiciled FMIs designated by the Bank also experienced record levels of activity in March.

The average daily foreign exchange trading activity in CLS's settlement service spiked in March to an all-time high above US\$7 trillion (around 20 percent higher than the average value in 2019). As the year progressed, this average fell below 2019 levels before regaining strength starting in June. November and December 2020 had higher average daily values than the corresponding period one year earlier.

In LCH's SwapClear service, a record \$402 trillion in notional was cleared in the first quarter of 2020, a 26 percent increase compared with the first quarter of 2019. While SwapClear clearing members did see an increase in margin requirements (over 20 percent from year-end 2019 to March 31, 2020), a substantial portion of this increase was due to higher levels of activity. Margins and trade volumes have since returned to normal levels.

Maintaining business continuity

Designated FMIs demonstrated resilience in maintaining system operations and business processes during increased system activity and during a period when most employees transitioned to working remotely. Given the uncertainties caused by the COVID-19 pandemic, designated FMIs adapted to support resilience as the situation evolved and the pandemic proved to be protracted.

⁶ Triple witching occurs when the contracts for index futures, index options and stock options all expire on the same day. This occurs four times per year, specifically on the third Friday of March, June, September and December.

Oversight priorities for Payments Canada systems

This section describes key oversight priorities for designated FMIs operated by Payments Canada. It includes updates on priorities prescribed in previous years as well as new areas of focus identified in 2020.

Key priorities addressed

Credit risk management

In 2019, the Bank identified a priority for Payments Canada to enhance the ACSS credit risk model by removing the impact of settlement exchange transactions (SETs) from collateral pool calculations. A SET is an intra-day liquidity exchange between members for the purpose of smoothing out cash dislocation between settlement systems (i.e., ACSS and LVTS), resulting in reduced exposure and lowered collateral requirements to the collateral pool under the credit risk model.

Through rule changes in June 2020, Payments Canada increased collateral pool requirements to account for this impact.

Default management

As part of its review of ACSS default management and procedures, the Bank identified a need for Payments Canada to clarify the treatment of unsettled payment items in the event of a direct clearer's default, because these could create exposures for participants. Following consultations with members to understand their tools for limiting such exposures, Payments Canada amended ACSS default rules. More recently, Payments Canada completed the annual ACSS default exercise, which assessed members' understanding of revised default rules and potential loss exposures. The exercise drew members' attention to the need to develop internal procedures to manage unsettled payment items.

ACSS refresh

In November 2020, Payments Canada successfully completed the ACSS refresh project—an important initiative to address the aging architecture of the ACSS system. The project replaced the existing ACSS application with a new one, which is hosted in more modern technology, enhancing security capabilities and overall resilience while also improving efficiency and participant experience.

Ongoing priorities

The Modernization initiative and cyber risk management continue to be key oversight priorities for Payments Canada.

Modernization

Payments Canada is working to transform its payment systems by:⁷

- replacing the LVTS with Lynx
- introducing the Real-Time Rail (RTR) for faster, data-rich retail payments
- redesigning the retail batch payments system

Replacing the LVTS with Lynx is a multi-year initiative to modernize Payments Canada's large value payment system. Throughout 2020, Payments Canada made substantive progress toward the targeted implementation date in 2021. Payments Canada made significant strides in developing a legal framework for Lynx, including drafting the by-law and rules, and finalizing the financial risk framework. Additionally, Payments Canada and its members developed the Lynx implementation plan in preparation for the launch. On the technology front, user acceptance testing for the Lynx build was also completed—a milestone in the Lynx technical build process.

Lynx will be implemented in two releases organized around the introduction of new SWIFT messaging standards. The first release is expected to go-live in August 2021 and will use the existing SWIFT MT payment messaging standards.⁸ Prior to implementation, Payments Canada will need to finalize the Lynx legal framework, which includes approval from both the Bank of Canada and the Minister of Finance. The second release will support ISO 20022 message standards and go live in November 2022.⁹ This will coincide with SWIFT's global adoption of ISO 20022 for cross-border payments. Lynx will operate with both MT and ISO 20022 for the period of co-existence.

With respect to RTR, Payments Canada made significant progress on the operational design and procurement. By the end of October 2020, Payments Canada had completed its public consultations on the RTR policy framework, which will form the basis of the new system's by-laws and rules. Payments Canada selected Mastercard's Vocalink as the solution provider for the clearing and settlement component of the system and, more recently, Interac as the solution provider for the exchange component.¹⁰ Going forward,

⁷ See [Payments Canada's Modernization Delivery Roadmap December 2020 Update](#) for more information.

⁸ SWIFT MT (message types) are messages exchanged between parties in the financial services industry via the SWIFT network, identified by "MT" followed by three digits. Particularly, MT 1xx and MT 2xx are for customer payments and financial institution transfers, respectively.

⁹ ISO 20022 is an international standard for financial institutions and systems across different financial markets to communicate using consistent terminology and syntax, supporting interoperability and more remittance information within a payment message. For more information about Payments Canada and ISO 20022, please see this [webpage](#).

¹⁰ For more information, please see Payments Canada's press releases on the [selection of Vocalink](#) and [selection of Interac Corp.](#)

Payments Canada will focus on building the system and drafting the by-laws, rules and standards.

The retail batch payments system will be redesigned to deliver new business capabilities and functionality over the longer term. Jointly with the Bank, Payments Canada has started to undertake preliminary research and analysis to explore the conceptual design of the future state retail batch payments system.

Newly identified priorities

Cyber risk management

As a result of the core assurance review completed in 2020, the Bank found that Payments Canada demonstrates a strong commitment to enhancing its cyber posture. Further, the Bank asked Payments Canada to enhance its cyber resilience strategy and cyber risk management framework and to ensure that once the cyber resiliency framework was complete, the audit and testing program scope was updated in alignment with the framework. Payments Canada has since begun addressing these requests, starting with an initiative to develop a new cyber resilience strategy, which is expected to receive Board approval by June 2021.

Improvements to contingency

Payments Canada is working with industry to enhance the contingency arrangements for payments processing in Lynx to mitigate worst-case scenarios where core operations cannot restart after a disruption. Payments Canada's operational resiliency framework is expected to include changes to rules, processes and procedures to enhance existing contingencies and to strengthen the rigour of testing and participant playbooks and guidelines. Over the long term, Payments Canada is also exploring the development of operationally resilient contingency solutions.

Liquidity risk management

Following the 2020 core assurance review, the Bank requested that Payments Canada develop a comprehensive liquidity risk monitoring framework for Lynx. Payments Canada has developed a framework for the ex post monitoring and reporting of throughput targets, minimum liquidity requirements, payment trends, settlement mechanism efficiencies and stress testing. Further developments, including intra-day notification to identify potential liquidity issues, will be implemented as part of the launch of Lynx.

Oversight priorities for TMX systems

This section presents key priorities for designated FMIs operated by TMX. It includes updates on focus areas identified in previous years, as well as priorities identified in the Bank's 2020 oversight reviews.

Key priorities addressed

Liquidity risk management

In early 2020, the Canadian Depository for Securities (CDS) and the Canadian Derivatives Clearing Corporation (CDCC) implemented changes to meet cover 1 liquidity requirements for operations conducted in Canadian dollars. CDS further completed the work to collect additional US dollar cash collateral from participants in the New York Link service and to deposit these funds at selected US banks.

Default management

To further strengthen the abilities of CDCC and CDS in handling participant default, the Bank identified priorities with respect to CDCC's auction process and CDS's default management plan for its cross-border service in early 2020.

In addition, the Bank requested that both entities develop a comprehensive framework for default management simulations.

CDCC auction process

In 2020, CDCC designed a formal training and testing program to familiarize participants with its auction process. Additional auction-related priorities to be addressed in 2021 include automating internal processes, conducting a cost-benefit analysis of developing tools to facilitate participant bidding, and considering the benefits and feasibility of developing a framework for client participation in auctions.

CDS default management plan for cross-border service

The Bank required CDS to develop a default management plan for its DTC Direct Link service.¹¹ CDS addressed this priority in early 2020.

¹¹ CDS already had a default management plan for its New York Link service (i.e., its sponsorship of participation in the National Securities Clearing Corporation), and for other clearing and settlement services.

Comprehensive framework for testing default management

To align with emerging global best practices, the Bank required CDCC and CDS to develop frameworks that document how they plan to test aspects of default management with increasing scope and realism over time.¹²

Ongoing priorities

The CDS Post Trade Modernization Project and the management of cyber and business risks continue to be key priorities for TMX systems.

Modernization

CDS continued to make progress on the CDS Post Trade Modernization project. In 2020, they achieved the priorities set by the Bank for that year. CDS developed business and technical requirements and communicated them to participants. It also proposed rule changes and developed a testing and training strategy. Early-adopter testing with the service providers who connect CDSX with participants started in the second half of 2020.

In 2021, CDS will have to finalize and communicate its implementation strategy, perform comprehensive industry testing and training in coordination with participants, and work towards receiving the necessary regulatory approvals for the rule, procedure and system changes.

Cyber risk management

TMX made significant progress toward meeting priorities from the Bank's 2019 core assurance review and is expected to continue these efforts in 2021. Several cyber priorities remain open in 2021, particularly two important ones that are related to cyber recovery planning and cyber participation requirements. The Bank also requested FMI operators to make some technical improvements.

Business risk

The Bank's 2019 core assurance review was conducted within the broader context of continued international policy discussion on the treatment of non-default losses (i.e., how an FMI manages losses stemming from a shock not related to the default of a participant). TMX systems made progress on all priorities from the review and will be well-positioned to respond to any further guidance from international standard setters on these subjects.

CDCC and CDS held meetings with their respective participant risk committees to discuss non-default scenarios and related mitigation strategies as well as potential participant

¹² For reference, please see the CPMI-IOSCO paper [Central counterparty default management auctions - Issues for consideration](#).

exposures. They are considering next steps while awaiting further guidance from international standard setters before making substantial changes.

CDCC and CDS assessed the sufficiency of their operating risk capital against potential business and operational losses. Both systems maintain enough capital to cover a wide range of losses; however, some losses could potentially exceed available capital. Also, certain losses would be allocated to participants. The treatment of these losses is expected to be addressed as international standards evolve. In the meantime, CDCC and CDS are expected to conduct this kind of analysis regularly and to enhance their methodology over time.

CDCC and CDS have also updated their recovery plans—an exercise the Bank expects them to undertake regularly to ensure they remain effective. They also did some initial work on enhancing their plans to recapitalize following a recovery event. The Bank expects to discuss next steps with the FMIs based on international policy discussions on these issues.

Newly identified priorities

Liquidity risk management

CDCC faces liquidity risk if one of the settlement banks it relies on to receive payment experiences a financial or operational failure. The Bank's review found that mitigation tools to ensure that clearing members can use alternative means to send and receive cash payments are not sufficiently robust. Moreover, the provision of settlement services to CDCC members is concentrated. Accordingly, the Bank set two priorities. First, CDCC needs additional tools for CDCS to ensure that payment flow will be stabilized and that its liquidity exposure will be mitigated if a settlement bank fails. Second, the failure of a settlement bank should be considered within the stress testing framework for CDCS.¹³

In addition, the settlement of CDCC repo transactions in CDSX can result in fixed-income settlement being temporarily stalled until buyers of securities complete settlement. This congestion can affect both the settlement of clearing members' obligations elsewhere and their intraday liquidity risk. Since there has been a steady rise in settlement congestion in the fixed-income service over the past few years, the Bank has made it a priority for CDCC to complete a detailed analysis of the risks associated with the issue. As part of this analysis, CDCC is to assess existing risk controls and see which additional controls would be most effective.

The Bank concluded that CDS does not yet have in place a complete liquidity risk management framework for CDSX that covers all sources of liquidity risk and resources in a comprehensive and integrated manner. CDS had already been planning to finalize such a framework in 2021, and the Bank has set this as an oversight priority. CDS will also need

¹³ The Bank recognizes that the concentration among banks offering settlement services in CDCS and credit extension in CDSX raises some systemic issues. Therefore, Bank staff are conducting further analysis to understand the market for these services, and this analysis could affect our oversight priorities for CDCC.

to update the default management procedures for CDSX to reflect changes for cash collateral that were implemented in 2020 as well as the process for pledging collateral in international links.¹⁴

Another important priority is for CDS to ensure that qualifying liquid resources are sufficient across all its services to manage liquidity risk associated with a participant default. In addition, CDS should ensure that the scope of its liquidity stress testing corresponds to the Bank's standards, including associated CPMI-IOSCO supplementary guidance.

Lastly, CDS should explore how the monitoring and estimation of liquidity risk in CDSX can be enhanced by accounting for intraday exposures.

Access and tiered participation

The Bank's 2020 core assurance review found that, in general, both CDCC and CDS have objective, risk-based and publicly disclosed criteria permitting fair and open access. With respect to tiering, the systems demonstrated different levels of maturity. CDS was unable to gather the necessary data to identify and monitor material risks from tiering in CDSX. However, throughout 2020, CDS took steps to address this issue and is prepared to begin gathering the necessary information in 2021.

In future years, CDCC and CDS are expected to develop and implement comprehensive operational access standards to supplement their current membership requirements. Participants would be required to provide the FMIs with the documentation necessary to attest that certain operational criteria—including for cyber resilience—are being met.

In addition, CDCC will be expected in future years to enhance its approach to managing potential material risks from tiered participation arrangements. CDCC will have to assess what risk management tools should be put in place, including before such risks arise. In addition, it will need predefined criteria or thresholds for its risk management actions for every stage in its framework. CDS will also be asked to consider this after it gathers more information about tiered participation in its system.

¹⁴ A list of CDS's international links, please see this [webpage](#).

Bank of Canada activities

In addition to monitoring the risk management practices of designated FMIs, the Bank is involved in several other activities related to its mandates for FMI oversight, resolution and crisis preparedness. These activities are described in this section:

- designating *Interac* e-Transfer®
- increasing FMI resolution preparedness
- strengthening cyber resiliency
- contributing to international efforts
- researching and monitoring trends in the FMI landscape

Designating *Interac* e-Transfer®

The Bank designated *Interac*'s e-Transfer system as a prominent payment system (PPS) in August 2020. While the system has been in operation since 2003, its usage has grown markedly in recent years. Growth in volumes and values remains in the double digits, and use cases have expanded beyond person-to-person to include person-to-business and government-to-business. *Interac* e-Transfer is now used by millions of Canadians and has become the most widely used electronic person-to-person payment system in Canada.

Oversight of *Interac* e-Transfer will enable the Bank to actively monitor and evaluate risks. The system must adhere to the Bank's risk management standards for PPS, and Bank staff will undertake regular assessments to ensure that it continues to do so. If enhancements are needed, *Interac* will be required to address them. Furthermore, designation of *Interac* e-Transfer results in certain obligations for *Interac*. These include notifying the Bank of any significant changes to the system, as well as immediately notifying the Bank of any system problems or delays that might have significant impact on operations or that might affect critical deadlines. *Interac* e-transfer will be incorporated into the regular annual reporting process for designated systems.

Increasing FMI resolution preparedness

FMIs provide critical financial system functions. Although they have robust risk controls and strong oversight, FMIs could face circumstances so severe they are not able to recover on their own. If this happened to a designated FMI located in Canada, the Bank, as resolution authority, could help it continue its critical functions.

In June 2020, the Bank published a [guideline](#) to inform stakeholders on how it intends to carry out its statutory responsibilities as the FMI resolution authority.

The Bank has established a formal coordination mechanism at the federal level for resolution planning and execution purposes. The FMI Resolution Committee, which was established in April 2020, is chaired by the Governor of the Bank of Canada and includes

senior officials from the Department of Finance Canada, the Office of the Superintendent of Financial Institutions and the Canada Deposit Insurance Corporation.

A similar coordination mechanism will be established with provincial authorities in the near future. In order to advance this work, the Bank is establishing a memorandum of understanding with the Ontario Securities Commission, the Autorité des marchés financiers and the British Columbia Securities Commission, all of which have regulatory responsibilities over CDS and CDCC.

In addition, the Bank has nearly completed the first iteration of resolution plans for CDSX and CDCS and their operators. The last elements being completed are finalizing the legal analysis and addressing potential impediments to resolution.

Strengthening cyber resiliency

The cyber threat landscape grows continually in sophistication and complexity, and technology is always evolving. Therefore, FMIs and the financial sector as a whole must keep strengthening and evolving their cyber resilience practices.

The Bank expects designated FMIs to fully meet the expectations laid out in guidance from CPMI-IOSCO. In 2020, the Bank began developing Expectations for Cyber Resilience of Financial Market Infrastructures, which will complement the [CPMI-IOSCO guidance](#) and provide greater clarity on the Bank's expectations for designated FMIs. As part of this work, the Bank consulted with designated FMIs in 2020 to seek their feedback on a draft of the document. The final version will be published in 2021.

In 2020, the Bank, in consultation with FMIs, also began to develop a guideline to harmonize and clarify its expectations surrounding the reporting of cyber and information technology incidents by FMI operators. The guideline will identify which types of cyber incidents should be reported to the Bank. In addition, it will outline procedures for FMI operators to follow during the reporting life cycle.

The Canadian Financial Sector Resiliency Group (CFRG) is a public-private partnership to strengthen the resilience of Canada's financial sector in the face of risks to business operations, including cyber incidents.¹⁵ In 2020, CFRG prepared for a cyber simulation which will test the CFRG's activation protocols and assess how its members respond to a simulated systemic financial sector cyber incident.

Contributing to international efforts

The Bank regularly collaborates with international committees, including the Financial Stability Board (FSB) and CPMI-IOSCO, to promote and uphold international risk management standards for systemically important FMIs. The discussions and resulting

¹⁵ More information about the CFRG can be found in this [Bank of Canada press release](#).

guidance help shape the risk management standards that the Bank applies to Canada's designated FMIs.

At the international level, the Bank continues to participate in the G7 Cyber Expert Group (G7 CEG). In November 2020, the G7 published the *G-7 Fundamental Elements of Cyber Exercise Programmes* to help public and private financial sector entities that are developing programs to regularly rehearse response-and-recovery procedures for disruptive cyber events. In 2020, the G7 CEG also examined available policy tools that could be deployed in each jurisdiction in the event of a cyber incident. This work will be used to inform future G7 cyber exercise scenarios.

In 2020, the Bank contributed to the development of a global vision to improve cross-border payments. Together with its G20 counterparts, the Bank developed and endorsed a multi-year roadmap that consists of concrete actions and milestones designed to meaningfully improve cross-border payments within a reasonable time frame. The FSB will lead the global coordination of this multi-year roadmap, relying on central banks, international organizations and other payments ecosystem partners to effectively implement the various actions identified. The Bank is working closely with domestic and international stakeholders to move forward in a coordinated manner.

In June 2020, CPMI-IOSCO published the report *Central counterparty default management auctions – Issues for consideration*, to which Bank staff contributed. The report outlines certain issues that CCPs should consider regarding the processes for default management auctions and suggests practices for developing and improving the auctions to address those issues. CPMI and IOSCO intend to continue engaging the industry on these topics. They strongly encourage industry participants to work together to further develop default management auctions practices.

CPMI-IOSCO have started assessing the practices of CCPs in the identification, measurement and management of non-default losses (i.e., financial losses other than those resulting from the default of a clearing member). The Bank is participating in this work. Canadian FMIs have engaged with their participants to increase the transparency of the FMIs' risk management for non-default losses. This will help the FMIs prepare to meet any new standards or best practices that may emerge from the international work.

With respect to FMI resolution, the Bank continues to contribute to the work of the FSB's Cross-Border Crisis Management Group for FMIs (fmiCBCM). In 2020, the fmiCBCM finalized its *Guidance on Financial Resources to Support CCP Resolution and on the Treatment of CCP Equity in Resolution*, which helps authorities determine whether gaps exist in financial resources or the tools available in resolution. In 2021, the fmiCBCM will collaborate with CPMI-IOSCO on further policy work into financial resourcing in recovery and resolution, including an assessment of whether any new types of pre-funded resources are needed to improve CCP resolvability.

Researching and monitoring trends in the FMI landscape

The Bank of Canada's oversight activities include research on payments modernization, FMI risk management and financial stability. In 2020, Bank staff published two studies showing that, in the long run, a substantial portion of payments, including large LVTS payments, might find their way to either the future real-time or batch retail system. Research on the adequacy of collateral in CCPs—evaluating the collateral levels needed to buffer systemic risk in Canada's futures market—has also been accepted for publication in an external journal. Moreover, Bank staff published a study that examines the impact of financial education on the financial inclusion opportunities created by big technology companies, and how this could eventually impact financial stability. Staff research on the benefits for a bank's stability from affiliation with a multibank holding company has also been published in an external journal.

- Links to the staff research:
 - Jonker, N. and A. Kosse. 2020. ["The Interplay of Financial Education, Financial Literacy, Financial Inclusion and Financial Stability: Any Lessons for the Current Big Tech Era?"](#) Bank of Canada Staff Working Paper No. 2020-32.
 - Kosse, A., Z. Lu and G. Xerri. 2020. ["An Economic Perspective on Payments Migration."](#) Bank of Canada Staff Working Paper No. 2020-24.
 - Kosse, A., Z. Lu and G. Xerri. 2020. ["Predicting Payment Migration in Canada."](#) Bank of Canada Staff Working Paper No. 2020-37.
 - Raykov, R. Forthcoming. ["Systemic Risk and Collateral Adequacy: Evidence from the Futures Market."](#) *Journal of Financial and Quantitative Analysis*.
 - Raykov, R. and Consuelo Silva-Buston. 2020. ["Holding Company Affiliation and Bank Stability: Evidence from the US Banking Sector."](#) *Journal of Corporate Finance* 65 (101739).

Appendix 1 | Annual summary figures of designated FMIs

Domestic systemically important financial market infrastructures

LVTS (payment system | designated systemic FMI 1999)

The Large Value Transfer System (LVTS) is a Canadian electronic funds-transfer system operated by Payments Canada that settles large-value and time-critical Canadian-dollar payments.

Measure	2017	2018	2019	2020
Daily average value settled	\$173 billion	\$181 billion	\$189 billion	\$398 billion
Daily average volume settled	36,000	38,000	40,000	41,000
Daily average collateral pledged	\$37 billion	\$38 billion	\$40 billion	\$43 billion
Number of direct participants	17	17	16	16

CDSX (securities settlement system, central securities depository, central counterparty | designated systemic FMI 2003)

CDSX is a Canadian system operated by the Canadian Depository for Securities Limited (CDS). It consists of a securities settlement system, a central securities depository and a central counterparty service for Canadian exchange-traded and over-the-counter (OTC) equities.

Measure	2017	2018	2019	2020
Daily average value of equity and fixed-income securities cleared and settled	\$541 billion	\$578 billion	\$692 billion	\$782 billion
Daily average volume of equity and fixed-income securities cleared and settled	1.7 million	2.1 million	1.9 million	2.5 million
Average value of securities held at the central securities depository	\$5.4 trillion	\$5.2 trillion	\$5.8 trillion	\$6.8 trillion
Number of direct participants	95	94	98	98

CDCS (central counterparty | designated systemic FMI 2012)

The Canadian Derivatives Clearing Service (CDCS) is a Canadian central counterparty operated by the Canadian Derivatives Clearing Corporation (CDCC) that clears transactions in certain fixed-income securities, OTC repurchase agreements (repos), OTC equity derivatives and all derivatives traded on the Montréal Exchange.

Measure	2017	2018	2019	2020
Daily average value of OTC repos cleared	\$17 billion	\$18 billion	\$25 billion	\$22 billion
Daily average notional value cleared (exchange-traded derivatives)	\$134 billion	\$139 billion	\$144 billion	\$117 billion
Daily average notional value cleared (OTC derivatives)	\$13.3 million	\$10.6 million	\$8.6 million	\$4.7 million
Number of direct participants	34	38	38	37

Prominent payment systems

ACSS (payment system | designated prominent payment system 2016)

The Automated Clearing Settlement System (ACSS) is a retail payment system operated by Payments Canada that clears paper items such as cheques and electronic items, pre-authorized debits, direct deposits and Interac debit payments.

Measure	2017	2018	2019	2020
Daily average value processed	\$28 billion	\$28 billion	\$29 billion	\$30 billion
Daily average volume processed	30 million	32 million	33 million	31 million
Number of direct participants	12	12	12	12

Interac e-Transfer® (payment system | designated prominent payment system 2020)

Operated by Interac Corp., Interac e-Transfer® is a Canadian electronic funds transfer system for personal and business bank accounts. It is available 24 hours a day, 7 days a week.

Measure	2020
Daily average value processed	\$673 million
Daily average volume processed	2.09 million
Number of participants	29*

*Interac has 29 participants, of which 19 connect directly to the network and 10 connect indirectly.

Foreign-domiciled systemically important financial market infrastructures

CLS Bank (payment system | designated systemic FMI 2002)

CLS is a special-purpose bank that offers the settlement of foreign exchange transactions, including those involving the Canadian dollar.

Measure	2017	2018	2019	2020
Daily average foreign exchange settlement (total)	US\$5,185 billion	US\$5,830 billion	US\$5,877 billion	US\$5,852 billion
Daily average Canadian-dollar foreign exchange settlement*	Can\$199 billion	Can\$216 billion	Can\$217 billion	Can\$212 billion
Settlement members	69	73	70	71

* The methodology for calculating the daily average Canadian-dollar foreign exchange settlement was revised to remove data points equal to zero on Canadian holidays.

LCH SwapClear (central counterparty | designated systemic FMI 2013)

SwapClear is an LCH clearing platform for interest rate swaps and other OTC interest rate derivatives denominated in multiple currencies, including the Canadian dollar.

Measure	2017	2018	2019*	2020**
Notional outstanding OTC interest rate swaps, in all currencies, as at December 31	US\$292 trillion	US\$309 trillion	US\$316 trillion	US\$333 trillion
Notional outstanding OTC interest rate swaps, denominated in Canadian dollars, as at December 31	Can\$12.1 trillion	Can\$18.4 trillion	Can\$17.5 trillion	Can\$17.8 trillion
Number of direct participants	105	109	110	109

* Five new currencies were added for clearing in 2019: the Colombian peso, the Brazilian real, the Chilean peso, the Thai baht and the Taiwanese dollar.

**In 2020, the Israeli new shekel was added for clearing.

Appendix 2 | Glossary of terms

central counterparty (CCP)	An entity that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer, thereby ensuring the performance of open contracts.
central securities depository	An entity that provides securities accounts, central safekeeping services and asset services, which may include the administration of corporate actions and redemptions. A central securities depository plays an important role in helping to ensure the integrity of securities issues (that is, it ensures that securities are not accidentally or fraudulently created or destroyed or their details changed).
clearing	The process of transmitting, reconciling and, in some cases, confirming transactions before settlement, potentially including the netting of transactions and the establishment of final positions for settlement. On occasion, this term is also used (imprecisely) to cover settlement. In the context of futures and options, clearing also refers to the daily balancing of profits and losses and the daily calculation of collateral requirements.
clearing fund	A collection of assets prefunded by a CCP's participants that may be used to cover the financial losses or liquidity pressures during a participant default. Clearing funds are typically sized to cover extreme but plausible circumstances.
collateral	An asset or third-party commitment that is used by a collateral provider to secure an obligation for a collateral taker.
credit risk	The risk that a counterparty, whether a participant or other entity, will be unable to fully meet its financial obligations when due or at any time in the future.
default	Generally, an event related to the failure to complete a transfer of funds or securities in accordance with the terms and rules of the system in question.
default-management auction	A default-management auction is one of the tools a CCP may use to transfer a defaulted participant's positions, or

	a subset thereof, to a non-defaulting participant, thereby removing the position and risks from the CCP and restoring it to a matched book.
designated system / designated financial market infrastructure	A financial market infrastructure designated under the <i>Payment Clearing and Settlement Act</i> for oversight by the Bank of Canada.
financial market infrastructure (FMI)	A multilateral system among participating institutions, including the operator of the system, used to clear, settle or record payments, securities, derivatives or other financial transactions.
liquidity risk	The risk that a counterparty, whether a participant or other entity, will have insufficient funds to meet its financial obligations as and when expected, although it may be able to do so in the future.
payment system	A set of instruments, procedures and rules for the transfer of funds between or among participants. The system includes the participants and the entity operating the arrangement.
payments system risk	The risk that a disruption to or a failure of an FMI could cause a significant adverse effect on economic activity in Canada either by impairing the ability of individuals, businesses or governments to make payments or by producing a general loss of confidence in the Canadian payments system.
payment-versus-payment (PvP)	A settlement mechanism that ensures that the final transfer of a payment in one currency occurs if and only if the final transfer of a payment in another currency or currencies takes place.
recovery	<p>The ability of a financial institution, including an FMI, to resume operations after a threat to its viability and financial strength so that it can continue to provide its critical services without authorities having to use resolution powers.</p> <p>More specifically, in the context of an FMI, recovery is defined as the actions of the FMI that are consistent with its rules, procedures and other ex ante contractual arrangements to address any uncovered loss, liquidity shortfall or capital inadequacy, whether arising from participant default or other causes (such as business, operational or other structural weaknesses), including actions to replenish any depleted pre-funded financial resources and liquidity arrangements, as necessary, to maintain the FMI's viability as a going concern and the continued provision of critical services.</p>

<p>resolution</p>	<p>The set of actions that a resolution authority can take when recovery efforts have been unsuccessful or when authorities deem recovery measures to be insufficient to return the financial institution or FMI to viability.</p>
<p>securities settlement system</p>	<p>An entity that enables securities to be transferred and settled by book entry according to a set of predetermined multilateral rules. Such systems allow the transfer of securities either free of payment or against payment.</p>
<p>systemic risk</p>	<p>The risk that the inability of a participant to meet its obligations in an FMI as they become due or that a disruption to or a failure of an FMI could, by transmitting financial problems through the FMI, cause:</p> <ul style="list-style-type: none"> • other participants in the FMI to be unable to meet their obligations as they become due • financial institutions in other parts of the Canadian financial system to be unable to meet their obligations as they become due • the FMI's clearing house or the clearing house of another FMI within the Canadian financial system to be unable to meet its obligations as they become due • an adverse effect on the stability or integrity of the Canadian financial system

Appendix 3 | Abbreviations

ACSS	Automated Clearing Settlement System
CCP	central counterparty
CDCC	Canadian Derivatives Clearing Corporation
CDCS	Canadian Derivatives Clearing Service
CDS	Canadian Depository for Securities Limited
CEG	Cyber Expert Group
CFRG	Canadian Financial Sector Resiliency Group
CNS	Continuous Net Settlement
CPMI	Committee on Payments and Market Infrastructures
CSA	Canadian Securities Administrators
FMI	financial market infrastructure
fmiCBCM	FMI Cross-Border Crisis Management
FRFIs	federally regulated financial institutions
FSB	Financial Stability Board
IOSCO	International Organization of Securities Commissions
LVTS	Large Value Transfer System
MRM	model risk management
NCSS	National Securities Clearing Corporation
NYL	New York Link
ORAC	Oversight Risk Advisory Committee
OSFI	Office of the Superintendent of Financial Institutions
OTC	over-the-counter
PCSA	<i>Payment Clearing and Settlement Act</i>
PFMI	Principles for Financial Market Infrastructures

PPS	prominent payment system
PvP	payment-versus-payment
RTGS	real-time gross settlement
RTR	Real-Time Rail
SET	settlement exchange transaction
SOE	settlement optimization engine
TW	triple witching