



BANK OF CANADA
BANQUE DU CANADA

Bank of Canada

FMI Oversight Activities

2016 Annual Report

April 2017

Executive Summary

Financial market infrastructures (FMIs) are the backbone of the financial system through their provision of critical payment clearing and settlement services. FMIs support economic growth by providing a platform to transfer funds, settle transactions and mitigate risks. They are also a potential source of risk to the financial system, which is why the Bank of Canada oversees those FMIs that have the potential to pose significant risk.

The *Bank of Canada FMI Oversight Activities 2016 Annual Report* (the Annual Report) outlines how the Bank fulfills its mandate for oversight of designated FMIs.¹ The Bank's primary oversight activities focus on monitoring and evaluating risks in designated FMIs to ensure that they are being adequately controlled. The Annual Report outlines key issues regarding the safety and soundness of designated FMIs, including priorities for both the Bank's own oversight activities and the risk-management enhancements pursued by designated FMIs. Oversight of these designated FMIs forms part of the Bank's broader mandate to promote the safety and efficiency of the Canadian financial system.

The Bank made significant progress on all of its oversight priorities for 2016, notably advancing the development of a resolution regime for designated FMIs in Canada and implementing the Bank's expanded role in oversight of prominent payment systems. The Bank's focus in 2017 will carry over multi-year priorities from 2016, including the Bank's involvement with the Payments Canada payments modernization initiative.

Designated FMIs made substantial enhancements to their risk-management practices throughout 2016 as they worked toward full observance of the Bank's risk-management standards. Further enhancements and their ongoing resilience will be a focus of designated FMIs in 2017.

¹ Designated FMIs include payment clearing and settlement systems designated for oversight by the Governor of the Bank under the *Payment Clearing and Settlement Act* (PCSA).

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1. The Bank of Canada's Approach to FMI Oversight

Given the potential systemic importance of financial market infrastructures (FMIs), there is a need to ensure sound risk-management frameworks are in place to support their resilience.

FMIs play an important role in enhancing the stability of the financial system. Through the provision of their critical payment clearing and settlement services, FMIs enable individuals and firms to safely and efficiently purchase goods and services, invest in financial assets, and manage risks.

Under the *Payment Clearing and Settlement Act* (PCSA), the Bank of Canada (the Bank) is responsible for the designation and oversight of FMIs that have the potential to pose systemic or payments system risks in Canada.² Oversight of these designated FMIs (designated systems) ensures that they operate in a manner where risks are being adequately controlled, supporting their resilience while continuing to promote the efficiency and stability they bring to the Canadian financial system.

A Risk-Based Approach to Oversight

The designated FMIs, listed in **Table 1** (below) and described in further detail in Appendix 1, include both domestic and foreign-domiciled FMIs and payment systems that are of systemic and economic importance to the Canadian financial system.³

The Bank's primary FMI oversight activities involve monitoring and evaluating risk in the designated FMIs to ensure that risk is being adequately controlled. These

² See the glossary in Appendix 2 for a full definition of systemic and payments system risk.

³ Under the PCSA, the Governor of the Bank, with agreement from the federal Minister of Finance, has the power to designate FMIs for oversight by the Bank.

Table 1: FMIs Designated for Bank of Canada Oversight

LVTS	The Large Value Transfer System (LVTS) is a Canadian electronic funds-transfer system operated by Payments Canada that settles large-value and time-critical payments.
ACSS	The Automated Clearing Settlement System (ACSS) is a retail payment system operated by Payments Canada that clears cheques and electronic items such as pre-authorized debits, direct deposits and Interac debit payments.
CDCS	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, repurchase agreements (repos), over-the-counter (OTC) equity derivatives and all derivatives traded on the Montréal Exchange.
CDSX	CDSX is a Canadian system operated by the Canadian Depository for Securities Limited (CDS) that consists of a securities settlement system, a central securities depository and a central counterparty service for eligible Canadian exchange-traded and OTC equities.
CLS Bank ¹	CLS Bank is a global payment system for the settlement of foreign exchange transactions, including those involving the Canadian dollar.
SwapClear ¹	SwapClear is an LCH.Clearnet clearing platform for interest rate swaps and other OTC interest rate derivatives denominated in multiple currencies, including the Canadian dollar.

¹ Foreign-domiciled designated systems

activities focus on assessing the risk-management practices of the designated systems through the review of proposed changes to their operations, rules and procedures, as well as periodic audits and inspections.⁴

The Bank's oversight of FMIs is conducted in close collaboration with FMI operators and relevant authorities, such as Finance Canada, provincial regulators and, in the case of the foreign-domiciled designated FMIs, the Bank of England and the Federal Reserve System.⁵

The Bank applies a strategic, risk-based approach to its oversight of designated FMIs, including an annual cycle of setting risk-management priorities for these FMIs to pursue. This approach allows for more focused efforts in areas that the

⁴ See the Bank's [Guideline Related to Bank of Canada Oversight Activities Under the Payment Clearing and Settlement Act](#) for an overview of the Bank's oversight activities.

⁵ In 2014, the Bank entered into a memorandum of understanding with the Autorité des marchés financiers (AMF) (Québec), the British Columbia Securities Commission (BCSC) and the Ontario Securities Commission (OSC) to facilitate co-operation in carrying out their respective oversight responsibilities for FMIs, with particular regard to CDSX and CDCC.

Box 1: Defining Designated Financial Market Infrastructures

Designated FMIs		
	Systemic FMIs	Prominent Payment Systems
Domestic Designated FMIs	<ul style="list-style-type: none"> • LVTS • CDCS • CDSX 	<ul style="list-style-type: none"> • ACSS
Foreign-Domiciled Designated FMIs	<ul style="list-style-type: none"> • CLS Bank • SwapClear 	—
Risk-Management Standard	Risk-Management Standards for Systemic FMIs	Risk-Management Standards for PPSs

Bank sees as most relevant to the safety and soundness of the FMIs and the broader financial system.

The Bank's Risk-Management Standards

The Bank maintains its own Risk-Management Standards for Systemic FMIs and Risk-Management Standards for Prominent Payment Systems (PPSs), which serve as benchmarks for the risk-management practices of these systems.⁶ See **Box 1** (above) for a description of the designated FMIs and the risk-management standards that apply to them.

The Risk-Management Standards for Systemic FMIs fully incorporate the Principles and Key Considerations of the CPMI-IOSCO *Principles for financial market infrastructures* (PFMIs), which establish minimum expectations in relation to risk management for systemically important FMIs to preserve and strengthen financial stability.^{7, 8} These standards apply to the FMIs that have the potential to pose systemic risk to the Canadian financial system.

⁶ For more detail, see the Bank's [Risk-Management Standards for Systemic \(Designated\) FMIs](#) and the [Criteria](#) and [Risk-Management Standards for Prominent Payment Systems](#).

⁷ CPMI-IOSCO is the Bank for International Settlements' Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO).

The Bank's Risk-Management Standards for PPSs, finalized in February 2016, apply to designated payment systems that are not systemically important but are nonetheless important to the Canadian economy.⁹ The Risk-Management Standards for PPSs incorporate elements of the PFMIIs but are proportional to the level of risk present in a PPS, which is relatively less than that found in a systemic FMI.

The Bank publishes periodic guidance in support of its risk-management standards and, in June 2016, finalized a number of these documents, including guidance on recovery planning. At that time, the Bank also published its expectation that the systemically important FMIs be in observance of the Bank's risk-management standards for these systems by 31 December 2016.¹⁰ Ensuring that the systemically important FMIs observe these standards is a priority for the Bank in fulfilling its oversight mandate.

Developing an FMI Resolution Regime for Canada

The Bank's oversight activities include actions to promote the stability of the Canadian financial system. Notably, over the course of 2016, federal authorities (including the Bank)¹¹ advanced the development of a resolution regime for the domestic designated FMIs—a multi-year initiative that will continue to be a priority for the Bank in 2017.

To date, the Bank's contribution to the development of this regime has focused on core elements of the related policy framework, including scope of the regime, powers and tools required by an FMI resolution authority, and governance arrangements. Proposed elements of this policy framework were shared with industry stakeholders for feedback during the fourth quarter of 2016.

Canada's FMI resolution regime is being developed in line with international guidance from the Financial Stability Board (FSB) under its *Key Attributes of Effective Resolution Regimes for Financial Institutions* (Key Attributes).¹² Progress is also keeping pace with ongoing international dialogue on developing FMI

⁸ For more detail, see the CPMI-IOSCO's [webpage on the Principles for financial market infrastructures](#).

⁹ The ACSS is currently the only designated FMI that is a prominent payment system.

¹⁰ See the 3 June 2016 Bank of Canada Market Notice, *Policy Guidance on the Bank of Canada's Risk-Management Standards for Systemic Financial Market Infrastructures*, for detailed information on the effective dates of observance for the Bank's Risk-Management Standards for Systemic FMIs available at <http://www.bankofcanada.ca/2016/06/policy-guidance-bank-canada-risk-management-standards/>.

¹¹ Finance Canada is leading the federal working group on the development of an FMI resolution regime in Canada. The Bank of Canada, the Canada Deposit Insurance Corporation and Office of the Superintendent of Financial Institutions are the participants in this working group.

¹² More information, including the FSB's Key Attributes publication, is available at <http://www.fsb.org/what-we-do/policy-development/effective-resolution-regimes-and-policies/key-attributes-of-effective-resolution-regimes-for-financial-institutions/>.

resolution regimes, in particular with elements discussed under the FSB's Resolution Steering Group and its working-level Cross-border Crisis Management Group for FMIs—two forums in which Canadian authorities actively participate.

Contributing to International Efforts

The Bank participates on a number of international committees that seek to develop, promote and uphold international risk-management standards for systemically important FMIs. Discussions in these forums and any resulting international guidance directly shape the risk-management standards that the Bank maintains for Canada's designated FMIs.

Notably, over the course of 2016, the Bank's contribution to the CPMI-IOSCO Working Group on Cyber Resilience supported the June 2016 CPMI-IOSCO publication *Guidance on cyber resilience for financial market infrastructures*.¹³

A key priority of the Bank's international engagement last year and again for 2017 is the completion of the joint initiative between the FSB, the Basel Committee on Banking Supervision, CPMI and IOSCO to enhance the resilience, recovery planning and resolvability of central counterparties (CCPs). In particular, the Bank is contributing to the CPMI-IOSCO guidance on resilience and recovery of central counterparties, which will be finalized in 2017.¹⁴ As the first piece of substantive international guidance on PFMI implementation for these types of systems, the Bank will consider this guidance in its oversight of CCP risk management going forward.

The Bank's participation in the FSB's Cross-border Crisis Management Group for FMIs is also an important part of the Bank's contributions to international efforts. Of note, the Bank's related work in 2016 fed directly into the FSB's consultation note *Essential Aspects of CCP Resolution Planning*,¹⁵ which aims to provide enhanced guidance to the Key Attributes on resolution planning for these types of systems. This guidance will be finalized by mid-2017.

Researching and Monitoring Trends in the FMI Landscape

The Bank's oversight activities include research into areas of FMI risk management and financial stability. Achievements in 2016 include a study of how the allocation of residual losses affects trading and welfare in CCPs, focusing on the use of

¹³ The CPMI-IOSCO *Guidance on cyber resilience for financial market infrastructures* is available at <http://www.bis.org/cpmi/publ/d146.htm>.

¹⁴ The CPMI-IOSCO draft guidance *Resilience and recovery of central counterparties (CCPs): Further guidance on the PFMI* is available at <http://www.bis.org/cpmi/publ/d149.htm>.

¹⁵ The FSB discussion note *Essential Aspects of CCP Resolution Planning* is available at <http://www.fsb.org/2016/08/essential-aspects-of-ccp-resolution-planning/>.

variation margin haircutting and cash calls as two means to allocate losses.¹⁶ Research in the area of CCPs also included a possible approach to address the procyclicality of initial margin increases resulting from spikes in market volatility during periods of extreme stress.¹⁷ The Bank also published in a staff working paper its research on interlinkages between FMIs, in which it treated systemic risk in a network of FMIs as the probability that two or more FMIs have a large credit risk exposure to the same FMI participant.¹⁸

A strong analytical focus in the area of payment systems continued throughout 2016. In support of Payments Canada's ongoing project to modernize its core payment infrastructure, the Bank worked with Payments Canada to perform an environmental scan of various jurisdictions' approaches to modernization of their respective clearing and settlement systems.¹⁹ The Bank and Payments Canada also held a joint workshop on the Modelling and Simulation of Payments and Other Financial System Infrastructure from 27 to 28 October 2016. In addition, the Bank examined various credit risk management schemes for the Automated Clearing Settlement System (ACSS) that are designed to cover the exposure of a defaulting member.²⁰

Oversight Activities Annual Report

As part of its risk-based approach to oversight, the Bank uses the *Bank of Canada FMI Oversight Activities 2016 Annual Report* (the Annual Report) to disclose its oversight priorities, as well as the risk-management priorities for designated FMIs.

The following sections examine the progress made by the designated FMIs on their priorities for 2016 and outline new priorities for them to pursue going forward.

¹⁶ See R. Raykov, "To Share or Not to Share? Uncovered Losses in a Derivatives Clearinghouse," Bank of Canada Staff Working Paper No. 2016-4 (February 2016).

¹⁷ See N. Chande and N. Labelle, "Using Speed and Credit Limits to Address the Procyclicality of Initial Margin at Central Counterparties," Bank of Canada Staff Discussion Paper No. 2016-18 (September 2016).

¹⁸ See F. Li and H. Pérez Saiz, "Measuring Systemic Risk Across Financial Market Infrastructures," Bank of Canada Staff Working Paper No. 2016-10 (March 2016).

¹⁹ See M. Thompkins and A. Olivares, "Clearing and Settlement Systems from Around the World: A Qualitative Analysis," Bank of Canada Staff Discussion Paper No. 2016-14 (June 2016).

²⁰ See H. Pérez Saiz and G. Xerri, "Credit Risk and Collateral Demand in a Retail Payment System," Bank of Canada Staff Discussion Paper No. 2016-16 (July 2016).

2. The Bank's Priorities for the Designated Domestic FMIs

The Bank works directly with the domestic designated FMIs to ensure that they adequately control their risks. As part of this effort, every year, the Bank identifies risk-management priorities for these FMIs to pursue. These risk-management priorities are established following a rigorous process to identify gaps in the FMIs' observance of the Bank's risk-management standards for their respective systems, as well as ongoing oversight activities that identify emerging vulnerabilities of, or enhancements to, an FMI's risk-management practices.

Section 2 discusses the performance of the domestic designated FMIs against the priorities set for them in last year's Annual Report, as well as the risk-management priorities that the Bank has identified for these FMIs to pursue in 2017. These priorities include both common priorities for the domestic systemic FMIs as well as specific priorities for each designated system.

In 2016, the domestic designated FMIs made substantial progress across all the priorities identified for them to pursue. As detailed below, many of these priorities are multi-year initiatives that will either continue through or conclude in 2017.

2.1 Common Risk-Management Priorities for Systemic FMIs

Certain risk-management priorities set by the Bank are intended for all the domestic systemic FMIs to pursue. These priority actions support the observance of the Bank's Risk-Management Standards for Systemic FMIs.

Common Priorities 2016

- implement cyber security action plans
- complete development of recovery plans
- develop tiered participation assessment frameworks

Common Priorities 2017

- continue ongoing enhancements to cyber security action plans
- ensure recovery plans are finalized and in place early in 2017

Common priorities from last year included finalizing the systemic FMIs' recovery plans; making progress on cyber security action plans; and building the capacity to collect data on tiered participation and to develop frameworks to identify, assess and manage associated risks. With many of these common priorities being multi-year initiatives, the Bank expects the systemic FMIs to continue to advance or conclude these priorities in 2017.

Recovery Planning at Domestic Designated FMIs

Recovery plans ensure that FMIs can continue to offer their critical payment clearing and settlement services as a going concern, even in times of extreme but plausible financial stress. In Canada, recovery plans are required for both systemic FMIs and PPSs under the respective risk-management standards that the Bank maintains for these systems. In particular, the Bank expected all domestic systemic FMIs to have recovery plans in place by 31 December 2016.

At the end of 2016, recovery planning at the all domestic designated FMIs was at an advanced stage. While none of the systemic FMIs had completed their work by the 31 December target date, all systems had either shared substantive drafts of their plans with the Bank or had finalized plans in place with associated rule changes to enact their plans still forthcoming.

The development of these recovery plans continues to be a common risk-management priority for all the designated domestic FMIs. FMI operators are expected to enhance the plans and, where appropriate, to implement the remaining rule changes necessary for these plans to be enacted. The Bank expects the recovery plans for domestic designated FMIs to be completed in the first quarter of 2017.

Ensuring Cyber Resilience

Cyber security remains a major priority across all participants in the financial system. Over the course of 2016, systemic FMIs continued to implement their cyber security action plans—plans that were developed following a cyber-defence self-assessment in 2015.

Cyber security enhancements involve multi-year initiatives undertaken by all the designated FMIs to ensure the resilience of their cyber defences. The dynamic nature of cyber risks requires that the cyber resilience of the domestic designated FMIs evolves in-step. Current initiatives, such as adopting measures to better detect a cyber event and enhance response strategies, will facilitate the effective management of cyber risks in the existing environment, but the Bank expects ongoing re-evaluation and improvement of the FMIs' cyber resilience posture over time.

2.2 Priorities for CDCC

The Canadian Derivatives Clearing Corporation (CDCC), the operator of the Canadian Derivatives Clearing Service (CDCS), made progress on all the priorities identified for the system last year. Key achievements include the advancement of CDCC's repo project and, in particular, the finalization of a limited-liability clearing model to facilitate participation by some pension plans in CDCC's repo clearing service. Work on this framework has been a multi-year initiative that will continue in 2017. With the progress made to date, the Bank expects the new service to be ready to go live at the end of 2017.

Making Progress on a New Risk System

In last year's Annual Report, the Bank highlighted the need for CDCC to enhance its financial risk management through the adoption of a more modern and comprehensive risk-management platform. This includes the introduction of new risk-management technology to ensure the ongoing resilience of CDCC's operations.

In 2016, CDCC complied with the Bank's request to develop an action plan for and to make substantial progress on improvements to its risk system. This initiative is now part of a larger project being undertaken by the TMX Group to develop a new clearing and risk platform to be used across its subsidiaries, including CDCC and the Canadian Depository for Securities Limited (CDS).

In 2017, the Bank expects CDCC to work with the TMX Group to further develop its new risk system. Since this is a multi-year initiative, the Bank expects the project to progress at a rate consistent with full implementation beginning in the third quarter of 2018 with the CDCC risk system.

Strengthening Credit and Liquidity Stress Testing

The Bank's Risk-Management Standards for Systemic FMIs calls for systemically important CCPs to conduct regular stress testing of their liquidity and credit exposures. These stress tests are performed to ensure with a high degree of confidence that potential credit and liquidity exposures are not in excess of pre-funded resources.

CDCC Priorities 2016

- complete a buy-side participation model
- develop an action plan for and make substantial progress on a new risk system
- complete the design of a segregation and portability framework

CDCC Priorities 2017

- make progress on a new risk system
- strengthen credit and liquidity stress testing
- improve management of risk models
- review liquidity arrangements
- enhance CDCC's default-management framework

The CPMI-IOSCO consultative report, *Resilience and recovery of central counterparties (CCPs): Further guidance on the PFMI*²¹ includes draft guidance on CCP stress testing. With the guidance to be finalized this year, the Bank is asking CDCC to review and strengthen its credit and liquidity stress-testing frameworks to ensure their adequacy at a level consistent with this guidance. Related enhancements are expected to take place over the course of 2017.

Improving the Management of Risk Models

The Bank's ongoing oversight activities identified the need for CDCC to strengthen the management of its financial-risk models and to ensure that gaps in these models can be identified and addressed in a timely fashion.

As a result, CDCC is being asked to develop and implement a model risk-management policy that includes yearly independent validation of these models and regular testing of margin-model sensitivity to changes in the models' assumptions and parameters. Improving CDCC's management of risk models is a priority to be completed by the end of 2017.

Reviewing Liquidity Arrangements

Recent increases in fixed-income clearing volumes have increased liquidity demands for CDCC. Future activity of buy-side participants in CDCC's repo project is expected to bring greater fixed-income volumes to the CCP and, absent a change in its liquidity management arrangements, has the potential to slow further the settlement of CDCS trades within CDSX.²²

To ensure the effective management of liquidity risk and mitigate the frequency and duration of settlement congestion, the Bank expects CDCC to review the sufficiency of its existing liquidity risk management tools over the course of 2017. Any modifications to ensure the ongoing sufficiency and robustness of its liquidity arrangements should be implemented before year-end.

Enhancing CDCC's Default-Management Framework

In 2016, the Bank conducted an in-depth review of CDCC's default-management framework. As a result of the review, the Bank identified enhancements to be pursued in 2017. These include the development of a comprehensive auction framework and arrangements for using outside agents for closing or hedging

²¹ The CPMI-IOSCO report *Resilience and recovery of central counterparties (CCPs): Further guidance on the PFMI* is available at: <http://www.bis.org/cpmi/publ/d149.htm>.

²² Settlement congestion (or gridlock) occurs for CDCS when CDCC reaches its intraday credit limit and is unable to settle buy transactions. During settlement gridlock, CDCS transactions do not settle until securities held in its inventory are sold, freeing up intraday credit and allowing CDCS transaction settlement to continue.

positions. These changes will ensure that CDCC can take timely action to contain losses and liquidity pressures in the event of participant default, while continuing to meet its obligations.

2.3 Priorities for CDS

As the operator of CDSX, CDS made substantial progress on many of the priorities identified for the system in 2016.

Notably, over the course of the year, CDS enhanced its event-reporting policy to ensure the clear and timely communication of operational incidents and other events to stakeholders. CDS also made significant progress on its transition to earlier novation in its Continuous Net Settlement (CNS) equity CCP, becoming the legal counterparty two days after execution of trades instead of three, thereby reducing participant exposures to counterparty risk by one day. In 2017, CNS is expected to move to T+1 novation, and thus the CCP would become the legal counterparty to equity trades one day after they are executed.

The Bank's Risk-Management Standards for Systemic FMIs require CCPs to meet a cover-one requirement²³ at a confidence level of at least 99 per cent. In 2016, CDS made adjustments to its margin requirements to ensure it can continuously meet or exceed this standard. The Bank expects CDS to implement a permanent solution to continuously meet or exceed the cover-one requirement in early 2017 and establish procedures to remediate inadequacies in its margin confidence levels more promptly should they arise in the future.

Enhancing Liquidity Risk Management

In 2016, the Bank conducted an in-depth review of CDS's liquidity risk management framework to ensure the system has sufficient resources to meet its liquidity exposures on an ongoing basis. As a result of the review, the Bank identified areas for improvement in CDS's liquidity risk management.

CDS Priorities 2016

- enhance event reporting
- begin transition to earlier novation in CNS
- continuously achieve margin confidence levels in CNS

CDS Priorities 2017

- enhance liquidity risk management
- ensure sufficient pre-funded resources under extreme scenarios
- enhance the default-management framework
- modernize clearing and risk systems

²³ Cover one requires a CCP to hold pre-funded financial resources sufficient to cover the default-related losses of the single largest participant and its affiliates under extreme but plausible market conditions.

Specifically, over the course of 2017, the Bank expects CDS to introduce more-comprehensive scenarios for liquidity stress testing and to ensure that liquidity exposures are assessed and covered over the entire period required to extinguish related payment obligations. In addition, the Bank is asking CDS to develop a framework to identify its liquid resources and act promptly to adjust them in the event that ongoing monitoring reveals they are insufficient.

Ensuring Sufficient Pre-Funded Resources Under Extreme Scenarios

The Bank's standards require CCPs to hold pre-funded resources sufficient to meet a cover-one requirement. Within CDSX, both the New York Link (NYL) service and the CNS equity CCP service are expected to meet this requirement.

Currently, CDS sizes its pre-funded CNS resources to cover 99.5 per cent of losses observed through stress testing. In 2017, the Bank is asking CDS to revise its approach so that 100 per cent of potential losses are covered. CDS is also expected to demonstrate it can meet the cover-one requirement for its NYL service on an ongoing basis.²⁴ CDS will also need to establish a clear decision framework to promptly increase its pre-funded resources to meet cover-one levels if its monitoring reveals a breach in this coverage.

Enhancing CDS's Default-Management Framework

In 2016, the Bank conducted an in-depth review of CDS's default-management framework to ensure CDS can take timely action to contain losses and liquidity pressures in the event of participant default. As a result of this review, the Bank identified several new enhancements for CDS to pursue in 2017.

Specifically, CDS is being asked to ensure it has more than one participant to act as a specialist broker to close out the positions of a defaulting participant, mitigating the risk that the defaulting participant is the specialist broker itself. CDS is also expected to expand its emergency liquidity facility to permit access in situations other than a default. In expanding access to the facility, CDS will also implement strong, well-documented governance arrangements that guide the use of the liquidity facility in order to minimize moral hazard. Where settlement agents are not participants in the Large Value Transfer System (LVTS), CDS is expected to ensure these participants retain adequate alternative liquidity arrangements to support payment obligations arising from a default event. Finally,

²⁴ While the NYL service is not strictly a CCP, CDS bears similar obligations as if NYL were a CCP service. More specifically, CDS participants use the service to access a CCP in the United States, and CDS guarantees their obligations in the event that one of them defaults.

to ensure resilience across all service lines, CDS is expected to complete work on documenting default-management procedures for its cross-border services.

Modernizing Clearing and Risk Systems

Dated programming and aging technology have the potential to introduce operational risk to CDSX services. To ensure the ongoing resilience of its systems and mitigate potential risks, the TMX Group is currently developing a new clearing and risk platform to be used across its subsidiaries, including CDS and CDCC.

As with CDCC, in 2017, the Bank expects CDS to work with the TMX Group to further the development of its new risk system. Since this is a multi-year initiative, the Bank expects the project to progress at a rate consistent with implementation beginning in the third quarter of 2018 with the CDCC risk system, and the CDS risk system following thereafter.

2.4 Priorities for LVTS

Payments Canada, the operator of the LVTS, made substantial progress on the priorities identified for the system in last year's Annual Report. In addition to addressing the common priorities for 2016 discussed earlier, Payments Canada commenced implementation of its enterprise risk management (ERM) policy and began making enhancements to its disaster recovery procedures.

Payments Modernization

The LVTS and the ACSS are Canada's core payment clearing and settlement systems operated by Payments Canada. Implemented in 1999 and 1984, respectively, these systems continue to operate and are fully supported; however, they operate on aging underlying technology.

The ability to incorporate the more advanced functionality of a modern payment system requires new technologies and processes because of the complexity and increased operational risk to enhance or alter the legacy architecture.

LVTS Priorities 2016

- continue implementation of the new governance and accountability framework
- enhance resilience and security
- continue implementation of the finalized ERM framework
- enhance intraday liquidity monitoring

LVTS Priorities 2017

- make progress on the payments modernization initiative and ensure the resilience of the existing LVTS platform
- monitor liquidity risk

Payments Canada is thus undertaking a multi-year project to modernize Canada's core payments infrastructure. Over the course of 2016, the modernization project focused primarily on finalizing an industry roadmap and high-level plan.²⁵ In 2017, the Bank expects Payments Canada to determine the business requirements and technological solution for the new core clearing and settlement systems, prioritizing the replacement of the LVTS.

Since implementation will be a multi-year initiative, ensuring the continuous reliability and resilience of the LVTS and the ACSS will continue to be a priority for Payments Canada in 2017 and beyond, until new systems are in place.

Monitoring Liquidity Risk

The Bank expects all systemic FMIs to effectively measure, monitor and manage liquidity risk in their systems. Payments Canada maintains throughput guidelines for the submission of payments intended to manage the flow of liquidity in the LVTS; however, these guidelines serve as recommendations and are not actively enforced.

Monitoring liquidity risk in the LVTS was identified as a priority for Payments Canada in both 2015 and 2016. However, as a result of competing resource demands, completion of the project has been delayed. In 2016 Payments Canada conducted *ex post* analysis to understand system-wide compliance with throughput guidelines. In 2017, Payments Canada is expected to develop a strategy to monitor and (if necessary) take actions to manage liquidity risks in accordance with the Bank's Risk-Management Standards for Systemic FMIs.

Payments Canada is also expected to consider enhanced functionality for the management of liquidity risk in the development of its new core payment clearing and settlement systems.

2.5 Priorities for ACSS

In May 2016, the ACSS was the first system to be designated as PPS by the Bank of Canada. As a result of this designation, Payments Canada, the operator of the ACSS, conducted a detailed self-assessment against the Bank's Risk-Management Standards for PPSs to identify areas for enhancement.

While the Payments Canada modernization initiative will introduce a new system design and platform to replace existing technology and enhance the functionality of the ACSS, Payments Canada is still expected to make certain adjustments to

²⁵ More information on the Payments Canada industry roadmap and high-level plan is available at <https://www.payments.ca/modernization/industry-roadmap-high-level-plan>.

ACSS risk-management practices in the interim to ensure the system is in observance with the Bank’s Risk-Management Standards for PPSs.

Collateralizing Credit Exposures

The Bank expects the ACSS to maintain sufficient financial resources to cover the credit exposure arising from the single largest participant default in that system (i.e., a cover-one requirement). The ACSS currently uses an arrangement of *ex post* contributions from its surviving participants to cover losses in the event of a single-participant default.

The Bank views the sole reliance on *ex post* funding to ensure settlement as a significant risk exposure in the event that an ACSS participant fails. As such, Payments Canada is to develop a methodology that collateralizes the system’s credit exposure with pre-funded resources in line with a cover-one requirement, as per the Bank’s Risk-Management Standards for PPSs. While the Bank expects the model to be adopted by the third quarter of 2017, full implementation may require some additional time to make necessary changes to related system bylaws.

Enhancing Contingency Procedures

Payments Canada has established service-level requirements related to the reliability of the ACSS system and conducts periodic testing of ACSS contingency arrangements. Nonetheless, the Bank believes there is scope to enhance the comprehensiveness of these contingency procedures.

Since the ACSS is a newly designated PPS, the Bank expects Payments Canada to review the ACSS contingency procedures and develop more-comprehensive testing plans, including default simulations. These enhancements, to be carried out over the course of 2017, will ensure the effectiveness of those contingency procedures.

ACSS Priorities 2016

- review existing risk-management frameworks against the Risk-Management Standards for PPSs and develop a plan to address gaps identified

ACSS Priorities 2017

- collateralize credit exposure
- review and enhance contingency procedures

3. Risk-Management Priorities for Foreign-Domiciled Designated FMIs

The Bank's oversight responsibilities include the designation and oversight of foreign-domiciled FMIs that have the potential to pose systemic risk to the Canadian financial system. As with the domestic systemic FMIs, oversight of these foreign-domiciled systemic FMIs (foreign FMIs) focuses on efforts to ensure that they are adequately controlling risk in an efficient and effective manner.

A Co-operative Approach to Oversight of Foreign FMIs

To achieve this objective, the Bank relies on co-operative oversight arrangements that take the form of oversight colleges. These colleges are led by the lead FMI regulator in the jurisdiction in which the foreign FMI is domiciled. Priorities for the foreign FMIs are set by these lead regulators. Through the oversight colleges, the Bank works closely with lead regulators and authorities from other jurisdictions that are participating in the co-operative oversight arrangements.

The Bank's main objectives for participating in the oversight colleges are to ensure that the foreign FMIs have risk controls in place that are equivalent to the Bank's Risk-Management Standards for Systemic FMIs and that the Bank is consulted on material developments affecting these FMIs—for example, major changes to an FMI's rules. The Bank's oversight focuses particularly on Canadian-dollar denominated activities in the foreign FMIs and the risks that the FMIs bring to their Canadian participants.

3.1 Priorities for LCH.Clearnet SwapClear

SwapClear is a global system operated by LCH.Clearnet for the central clearing of over-the-counter (OTC) interest rate derivatives denominated in multiple currencies, including the Canadian dollar. The Bank is involved in the oversight of SwapClear through participation in the LCH Global College, organized and

administered by the Bank of England. The Bank of Canada also participates in the LCH Crisis Management Group, designed to provide a framework for authorities to plan the orderly resolution of LCH.Clearnet.

Strengthening LCH.Clearnet Risk Management in 2016

Over the course of 2016, LCH.Clearnet made progress to strengthen operational risk management, including management of cyber risk. In line with *The Bank of England's supervision of financial market infrastructures — Annual Report (2016)* on CCP oversight,²⁶ which advocated for a continued focus on these areas of risk, LCH.Clearnet appointed an independent director with considerable expertise in technology, operations and operational risk to oversee the management of these areas for its systems, including SwapClear.

Furthermore, the Bank of England conducted a review of LCH's recovery and orderly wind-down plans with select Global College members. The Bank of Canada was one of the members engaged in this work, ensuring that the plans strengthened LCH's resilience in line with the CPMI-IOSCO Recovery Report.²⁷

The LCH Global College also assessed new initiatives proposed by LCH and, in particular, the proposal to offer portfolio margining between OTC and listed interest rate derivatives. After a thorough review, the Bank of England approved this new service offering, which LCH launched on 23 May 2016.

Risk Management of LCH.Clearnet Operations in 2017

A key priority for the Bank of England's supervision of FMIs, including CCPs such as LCH.Clearnet, is to work toward ensuring that they fully observe the PFMI. In line with this objective, the FMI supervisory priorities in the Bank of England's 2017 Annual Report²⁸ include planned work to assess operational resilience, tiering, recovery and resolution. There will also be a CCP default-management fire drill involving three CCPs, including LCH.

The Bank of Canada will continue to monitor the expansion of LCH.Clearnet's service offerings in 2017. In particular, the Bank will be involved in reviewing LCH.Clearnet's proposal to clear foreign exchange (FX) options. This proposal, developed in conjunction with CLS Bank, will rely on a special CLS Bank settlement session that was established for CCPs clearing FX derivatives.

²⁶ *The Bank of England's supervision of financial market infrastructures — Annual Report (2016)* is available at <http://www.bankofengland.co.uk/publications/Pages/fmi/annualreport2016.aspx>.

²⁷ The CPMI-IOSCO report *Recovery of financial market infrastructures* is available at <http://www.bis.org/cpmi/publ/d121.pdf>.

²⁸ *The Bank of England's supervision of financial market infrastructures — Annual Report (For the period 6 March 2016 – 22 February 2017)* is available at: <http://www.bankofengland.co.uk/publications/Documents/fmi/annualreport2017.pdf>.

3.2 Priorities for CLS Bank

CLS Bank provides a global payment system for the settlement of FX transactions, including those involving the Canadian dollar. CLS Bank is supervised and regulated by the US Federal Reserve Board and is overseen by the CLS Oversight Committee, which is composed of central banks, including the Bank of Canada, whose currencies are settled in CLS Bank.

Ensuring Observance of Risk-Management Standards

The Federal Reserve Board requires CLS Bank to meet the risk-management standards prescribed in Regulation HH (12 C.F.R. Part 234). These standards are based on, and generally consistent with, the PFMI. The Federal Reserve Board assesses CLS Bank against these standards using a rating system that applies to FMIs designated as systemically important.²⁹

CLS Bank continues to improve its overall risk management through various initiatives. For example, CLS Bank is in the process of enhancing its liquidity risk management framework to ensure complete coverage of a single nostro agent failure,³⁰ focusing on the short positions of a nostro agent and its clients.

Monitoring New Developments at CLS Bank

Throughout 2016, CLS Bank continued to develop new products and services, increasing participation and expanding its membership. CLS Bank has been working with LCH.Clearnet to develop a separate CLS Bank settlement session for cleared FX products. Going forward, CLS Bank intends to offer this new service to other CCPs (through separate sessions) and apply its settlement model to a range of cleared FX derivatives, including OTC and exchange-traded FX options, FX futures and cross-currency swaps.

²⁹ Designation as a systemically important FMI in the United States is determined by the Financial Stability Oversight Council.

³⁰ Nostro agents send and receive payments to CLS Bank through a domestic real-time gross settlement system on behalf of other settlement members.

Appendix 1 | Overview of Designated FMIs

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	2014	2015	2016
Daily average value settled	\$154 billion	\$171 billion	\$175 billion
Daily average volume settled	31 thousand	32 thousand	34 thousand
Daily average collateral pledged	\$37 billion	\$38 billion	\$39 billion
Number of direct participants	16	17	17

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) that 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	2014	2015	2016
Daily average value of equity and fixed-income securities cleared and settled	\$475 billion	\$478 billion	\$493 billion
Daily average volume of equity and fixed-income securities cleared and settled	1,671 thousand	1,737 thousand	1,849 thousand
Average value of securities held at the central securities depository	\$4.6 trillion	\$4.6 trillion	\$5.1 trillion
Number of direct participants	100	99	97

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, repurchase agreements (repos), OTC equity derivatives and all derivatives traded on the Montréal Exchange.

Measure	2014	2015	2016
Daily average value of OTC repos cleared	\$22 billion	\$21.5 billion	\$26.8 billion
Daily average notional value cleared (exchange-traded derivatives)	\$109 billion	\$100 billion	\$121 billion
Daily average notional value cleared (OTC derivatives)	\$16.2 million	\$7.9 million	\$9.7 million
Number of direct participants	37	36	35

ACSS (Payment System | Designated PPS 2016)

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

Measure	2016 ¹
Daily average value settled	\$26 billion
Daily average volume settled	30 million
Number of direct participants	12

¹ Reporting of data begins in 2016, the first year of the ACSS's PPS designation.

CLS Bank (Payment System | Designated Systemic FMI 2002)

CLS Bank is a global payment system for the settlement of foreign exchange transactions, including those involving the Canadian dollar.

Measure	2014	2015	2016
Daily average foreign exchange settlement (total)	US\$5,093 billion	US\$4,750 billion	US\$4,820 billion
Daily average Canadian-dollar foreign exchange settlement ¹	Can\$142 billion ¹	Can\$173 billion ¹	Can\$178 billion
Settlement members	63	66	68

¹ 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.Clearnet SwapClear (Central Counterparty | Designated Systemic FMI 2013)

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

Measure	2014	2015 ¹	2016
Notional outstanding OTC interest rate swaps, in all currencies, as at 31 December	US\$362 trillion	US\$251 trillion	US\$252 trillion
Notional outstanding OTC interest rate swaps, denominated in Canadian dollars, as at 31 December	Can\$12.2 trillion ²	Can\$8.7 trillion	Can\$9.6 trillion
Number of direct participants ³	98	100	104

¹ The decreasing trend in notional outstanding is largely driven by increased use of compression.

² Figure revised using SwapClear data reported in Canadian dollars.

³ Based on the list of Global Service Members on LCH.Clearnet SwapClear's website, available at www.swapclear.com/service/our-members.html.

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 and 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, and plays an important role in helping to ensure the integrity of securities issues (that is, 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 prior to 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. For the clearing of futures and options, clearing also refers to the daily balancing of profits and losses and the daily calculation of collateral requirements.
Collateral	An asset or third-party commitment that is used by a collateral provider to secure an obligation vis-à-vis a collateral taker.
Core systems	The technology, networks and data that support the operations of financial entities.
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.
Cyber defences	The strategies, tools and technologies deployed by an entity to prevent, detect and recover from cyber attacks.
Default	An event stipulated in an agreement as constituting a default. Generally, such events relate to a failure to complete a transfer of funds or securities in accordance with the terms and rules of the system in question.
Default fund / Clearing fund	A pre-funded default arrangement that is composed of assets contributed by a CCP's participants that may be used by the CCP in certain circumstances to cover losses or liquidity pressures resulting from participant defaults.
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.

Enterprise risk management (ERM)	A process put in place by an entity's board of directors, management and personnel that is applied in setting strategy across the enterprise. ERM is also designed to identify potential events that may affect the entity and to manage risk so that it remains within the entity's risk appetite.
Financial market infrastructure (FMI)	A multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling or recording payments, securities, derivatives or other financial transactions.
Initial margin	Collateral that is collected to cover potential changes in the value of each participant's position (that is, potential future exposures) over the appropriate close-out period in the event that the participant defaults.
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	Payments system risk is the risk that a disruption to or a failure of an FMI could cause a significant adverse effect on economic activity in Canada by either impairing the ability of individuals, businesses or government entities to make payments, or producing a general loss of confidence in the Canadian payments system.
Procyclicality	The changes in risk-management requirements or practices that are positively correlated with business or credit cycle fluctuations and that may cause or exacerbate financial instability.
Recovery	<p>Recovery concerns the ability of a financial institution, including an FMI, to recover from a threat to its viability and financial strength so that it can continue to provide its critical services without requiring the use of resolution powers by authorities.</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 <i>ex ante</i> 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>Resolution is the set of actions that a resolution authority can take when recovery efforts have been unsuccessful, or when recovery measures are deemed by the authorities 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; or • 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
CNS	Continuous Net Settlement Service
CPMI	Committee on Payments and Market Infrastructures
ERM	Enterprise risk management
FMI	Financial market infrastructure
FSB	Financial Stability Board
IOSCO	International Organization of Securities Commissions
LVTS	Large Value Transfer System
OTC	Over-the-counter
PCSA	<i>Payment Clearing and Settlement Act</i>
PPS	Prominent payment system